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Report On

FCC Testing of the ip.access Ltd
E-Class Access Point, Model: 495X
In accordance with FCC CFR 47 Part 2 and FCC CFR 47 Part 96

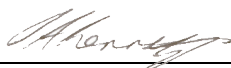
COMMERCIAL-IN-CONFIDENCE

FCC ID: QGGIPA495X

PREPARED BY


Neil Rousell
Senior Engineer

APPROVED BY


Simon Bennett
Authorised Signatory

DATED

04 September 2019

Document 75945166 Report 02 Issue 3

September 2019



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SECTION 1

REPORT INFORMATION



1.1 REPORT DETAILS

Manufacturer	ip.access Ltd
Address	Building 2020 Cambourne Business Park Cambourne Cambridge Cambridgeshire CB23 6DW United Kingdom
Product Name	E-Class Access Point
Model	495X
Serial Number(s)	000295-0100008307
Software Version	5978
Hardware Version	Rev A
Test Specification/Issue/Date	FCC CFR 47 Part 2: 2018 FCC CFR 47 Part 96: 2018
Start of Test	15 April 2019
Finish of Test	06 May 2019
Name of Engineer(s)	Neil Rousell Graeme Lawler
Related Document(s)	KDB 971168 D01 v03r01 KDB 662911 D01 v02r01 KDB 940660 D01 Part 96 CBRS Eqpt v02 ANSI C63.26:2015

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate compliance with FCC CFR 47 Part 2 and FCC CFR 47 Part 96. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

A handwritten signature in blue ink, appearing to read 'Neil Rousell'.

Neil Rousell

A handwritten signature in blue ink, appearing to read 'Graeme Lawler'.

Graeme Lawler

This report has been up-issued to Issue 3 to provide clarification over the EIRP on page 5.



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results for each configuration, in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 96, and is shown below.

Section	Specification Clause		Test Description	Result
	FCC CFR 47 Part 2	FCC CFR 47 Part 96		
2.1	2.1046	96.41 (b)(c)(g)	Output Power and Peak to Average Ratio - Conducted	Pass
2.2	2.1047	-	Modulation Characteristics	Pass
2.3	2.1049	96.41 (e)(3)	Occupied Bandwidth	Pass
2.4	2.1051	96.41 (e)(3)	Band Edge	Pass
2.5	2.1051	96.41 (e)(1)	Spurious Emissions at Antenna Terminals	Pass
2.6	2.1055	-	Frequency Stability	Pass
2.7	2.1053	96.41(e)(1)(2)	Radiated Emissions	Pass
2.8	2.1047	-	Modulation Characteristics	Pass

Measurement Uncertainty Decision Statement

Determination of conformity with the specification limits is based on the results of the compliance measurement and does not take into account measurement instrumentation uncertainty as defined in ANSI C63.26:2015 Clause 1.3.



1.3 CONFIGURATION DESCRIPTION

A1 - Single carrier			
Bandwidth (MHz)	Bottom (MHz)	Middle (MHz)	Top (MHz)
10	3555	3625	3695
20	3560	3625	3690



1.4 APPLICATION FORM

Equipment Description

Technical Description: <i>(Please provide a brief description of the intended use of the equipment)</i>	LTE TDD Small Cell
Manufacturer:	ip.access Ltd
Model:	E61 Band 48
Part Number:	495X
Hardware Version:	Rev A
Software Version:	5978
FCC ID (if applicable)	QGGIPA495X
IC ID (if applicable)	Not Applicable

Intentional Radiators

Technology	LTE	LTE
Frequency Band (MHz)	3550 to 3700 MHz	3550 to 3700 MHz
Conducted Declared Output Power (dBm)	24 per port, 27 total	23 per port, 26 total
Antenna Gain (dBi)	2	2
Total EIRP (W)	0.79	0.63
Supported Bandwidth(s) (MHz)	10	20
Modulation Scheme(s)	QPSK, 16QAM and 64QAM	QPSK, 16QAM and 64QAM
ITU Emission Designator	10M0G1W	20M0G1W
Bottom Frequency (MHz)	3550 MHz	3550 MHz
Middle Frequency (MHz)	3625 MHz	3625 MHz
Top Frequency (MHz)	3700 MHz	3700 MHz

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	3700 MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	1.4 MHz
Class A Digital Device (Use in commercial, industrial or business environment) ☐	
Class B Digital Device (Use in residential environment only) ☒	

AC Power Source

AC supply frequency: Click to edit (Hz)	
Click to edit V	Max current: Click to edit A
Single Phase ☐ Three Phase ☐	



DC Power Source

Nominal voltage: 12.0 V
Extreme upper voltage: 12.6 V
Extreme lower voltage: 11.4 V
Max current: 1.75. A

Battery Power Source

Voltage: Click to edit V
End-point voltage: Click or tap here to enter text V (<i>Point at which the battery will terminate</i>)
Alkaline ☐ Leclanche ☐ Lithium ☐ Nickel Cadmium ☐ Lead Acid* ☐ <i>*(Vehicle regulated)</i>
Other ☐ Please detail: Click to edit

Charging

Can the EUT transmit whilst being charged	Yes ☐ No ☒
---	---

Temperature

Minimum temperature: 0 °C	Maximum temperature: 45 °C
---------------------------	----------------------------

Antenna Characteristics

Antenna connector ☐ State impedance Click to edit Ohm
Temporary antenna connector ☐ State impedance Click to edit Ohm
Integral antenna ☒ Type Click to edit State impedance 2 dBi
External antenna ☐ Type Click to edit State impedance Click to edit dBi

Ancillaries (if applicable)

Manufacturer: Click to edit	Part Number: Click to edit
Model: Click to edit	Country of Origin: Click to edit

I hereby declare that the information supplied is correct and complete.

Name: Adrian Pearce
 Position held: Engineering Director
 Date: 01 August 2019



1.5 PRODUCT INFORMATION

1.5.1 Technical Description

The Equipment Under Test (EUT), E-Class Access Point, Model: 495X was an ip.access radio unit working in the public mobile service 3550-3700 MHz band which provides communication connections to the 3550-3700 MHz network. The 495X operates from 12 V DC or a 120 V AC PoE power supply.

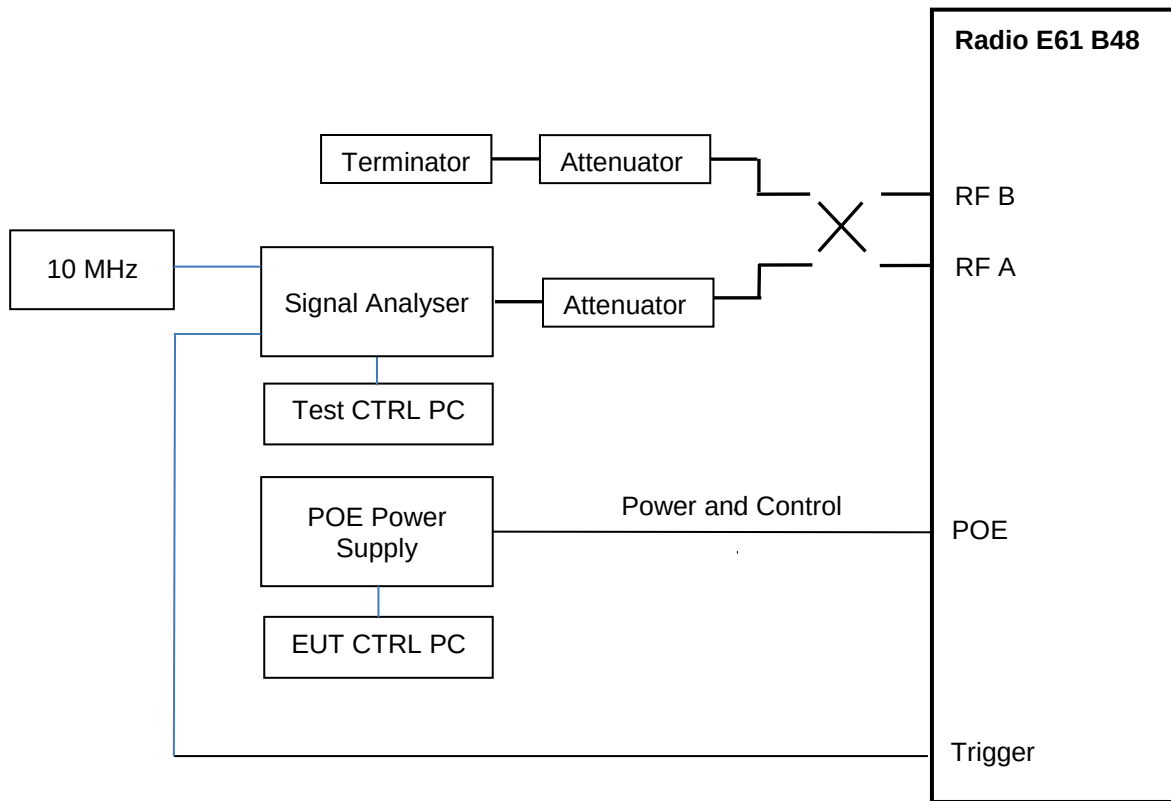
The Equipment Under Test (EUT) is shown in the photograph below. A full technical description can be found in the Manufacturer's documentation.



Equipment Under Test



1.6 TEST SETUP





1.7 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or a chamber as appropriate.

The EUT was powered from a PoE 120 V / 60 Hz AC supply.

FCC Measurement Facility Registration Number
90987 Octagon House, Fareham Test Laboratory

1.8 DEVIATION FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.9 MODIFICATION RECORD

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer	N/A	N/A
1	The output power of the 20 MHz carrier was reduced to meet the requirements of the spurious emissions FCC CFR 47 Part 96.41 (e)(1)(2).	Neil Rousell	15-06-2019

N/A Not Applicable

1.10 TEST SITE

TÜV SÜD conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)
Power Limits EIRP, Power Management, Peak-average Power Ratio (PAPR), PSD	Neil Rousell
Occupied Bandwidth	Neil Rousell
Band Edge	Neil Rousell
Spurious Emissions at Antenna Terminals	Neil Rousell
Frequency Stability	Neil Rousell
Radiated Emissions	Graeme Lawler

Office Address:
Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom



1.11 ADDITIONAL INFORMATION

This testing was performed in accordance with FCC Part 96 PAG, as submitted to the FCC Tracking Number 635880.

Initial pre-testing was carried out to determine the worst case modulation scheme by measuring the output power from QPSK, 16QAM and 64QAM on the middle channel of one antenna port. It was determined that QPSK was the worst case and was used for all testing.



SECTION 2

TEST DETAILS



2.1 OUTPUT POWER AND PEAK TO AVERAGE RATIO - CONDUCTED

2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 96, Clause 96.41 (b)(c)(g)

2.1.2 Date of Test and Modification State

15 April 2019 - Modification State 1

2.1.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.4 Environmental Conditions

Ambient Temperature 22.1°C
Relative Humidity 29.8%

2.1.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01, clause 5.2.1 and summed in accordance with FCC KDB 662911 D01.

2.1.6 Test Results

Configuration A1

Product classification – Class B

Maximum Output Power 24 dBm per port, 10.0 MHz bandwidth

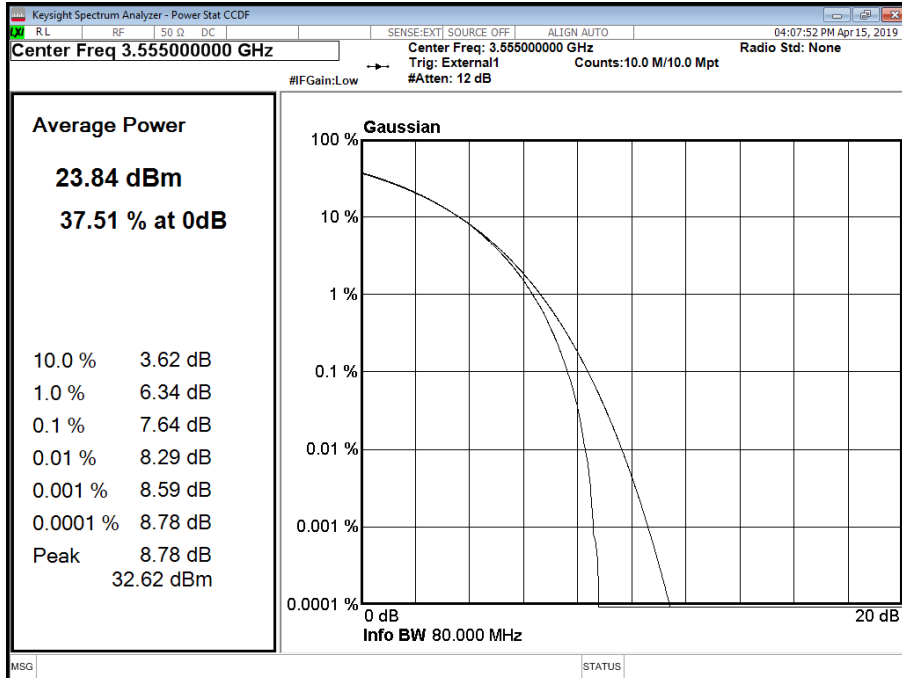
Maximum Output Power 23 dBm per port, 20.0 MHz bandwidth

Antenna	LTE Modulation	LTE Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power				
			Channel Position B				
			PAR (dB)	Average Power (EIRP)			
				dBm	dBm/10 MHz	EIRP	dBm/MHz
A	QPSK	10.0 MHz	7.64	23.97	23.96	25.96	14.42
B	QPSK	10.0 MHz	7.73	23.78	23.78	25.78	14.29
Total			-	26.89	26.88	28.88	17.36
A	QPSK	20.0 MHz	7.82	23.96	21.42	23.42	11.36
B	QPSK	20.0 MHz	8.28	22.19	19.67	21.67	9.72
Total			-	26.18	23.64	25.64	13.62

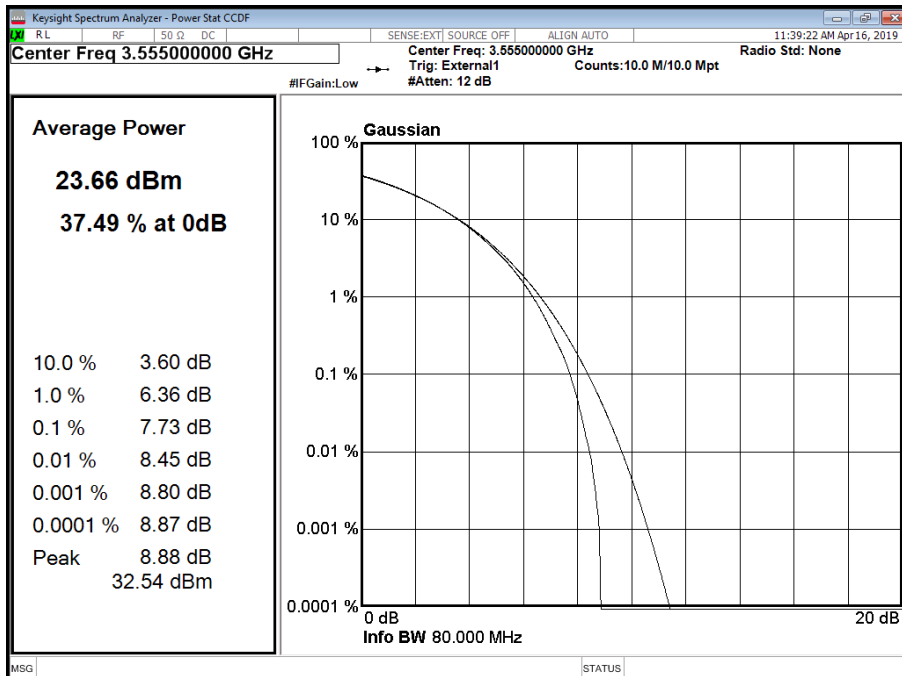
Antenna gain = 2dBi

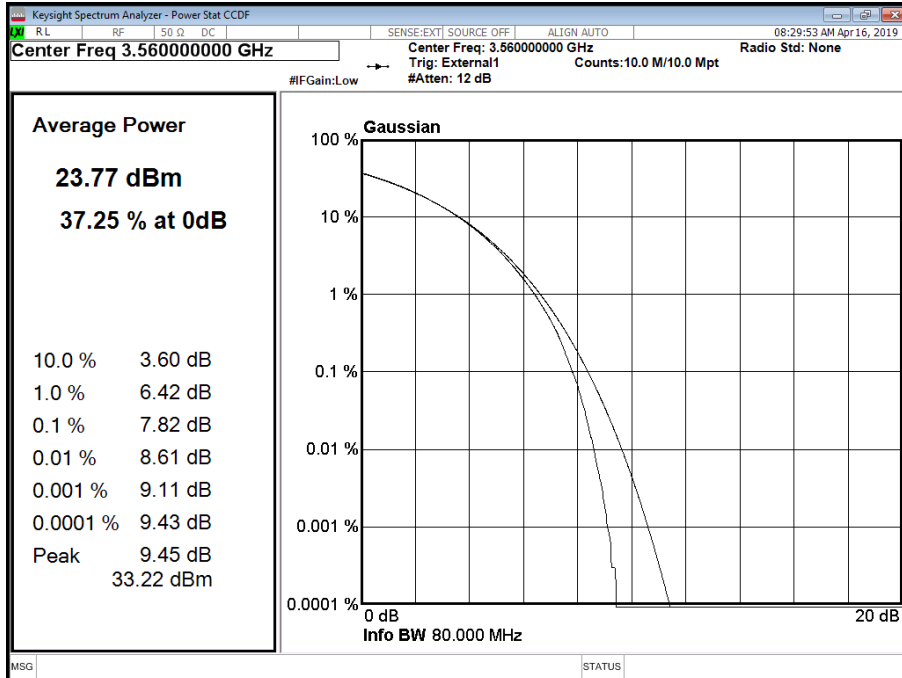
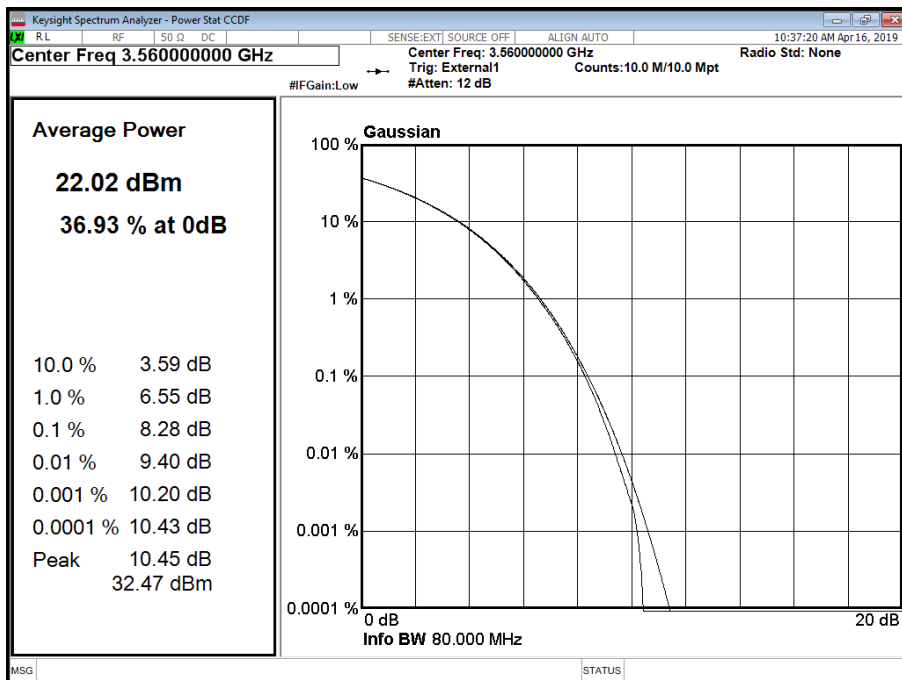


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position BAntenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B



Configuration A1

Product classification – Class B

Maximum Output Power 24 dBm per port, 10.0 MHz bandwidth

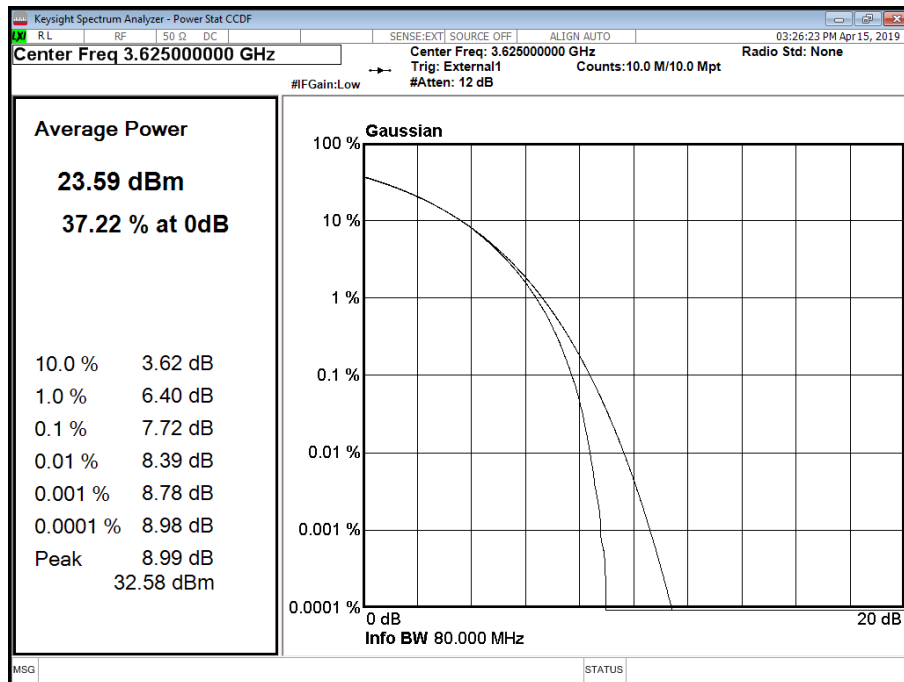
Maximum Output Power 23 dBm per port, 20.0 MHz bandwidth

Antenna	LTE Modulation	LTE Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power				
			Channel Position M				
			PAR (dB)	Average Power (EIRP)			
				dBm	dBm/10 MHz	EIRP	dBm/MHz
A	QPSK	10.0 MHz	7.72	23.61	23.62	25.62	14.12
B	QPSK	10.0 MHz	7.94	24.00	24.01	26.01	14.49
Total			-	26.82	26.83	28.83	17.32
A	QPSK	20.0 MHz	8.18	22.25	19.82	21.82	9.89
B	QPSK	20.0 MHz	8.48	21.62	19.13	21.13	9.14
Total			-	24.96	22.50	24.50	12.54

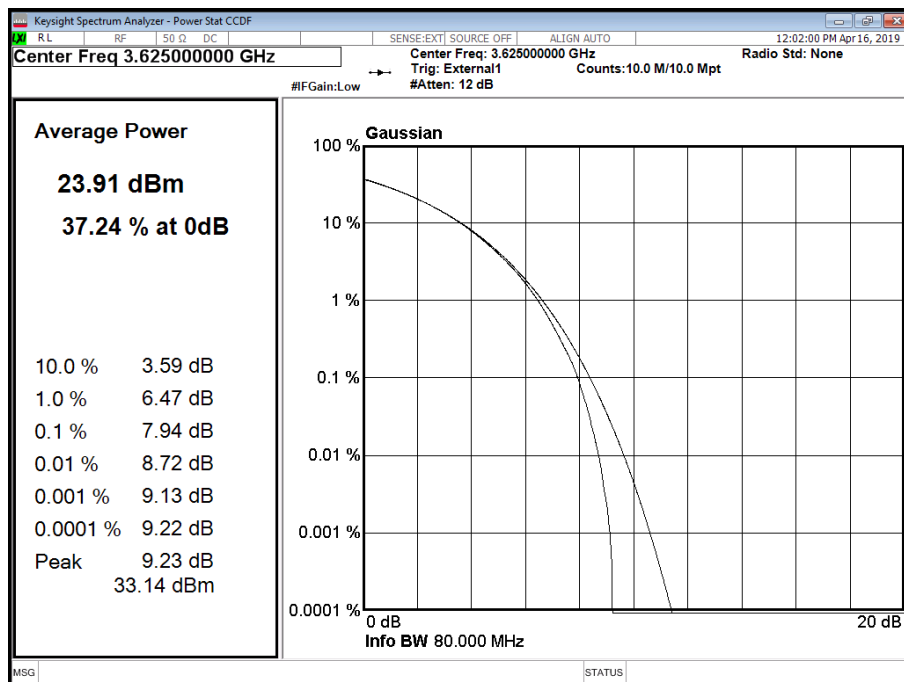
Antenna gain = 2dBi

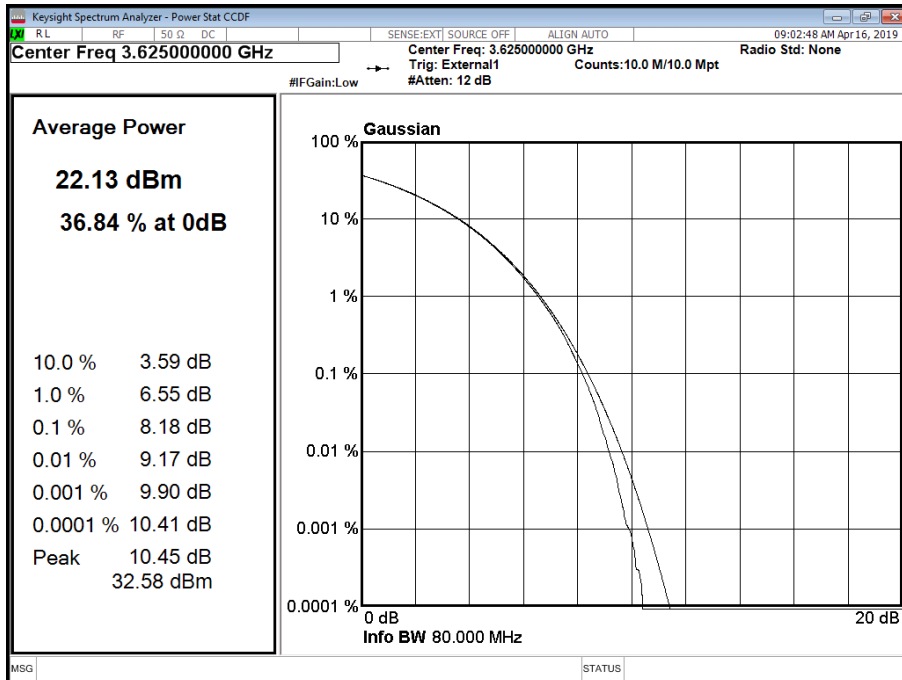


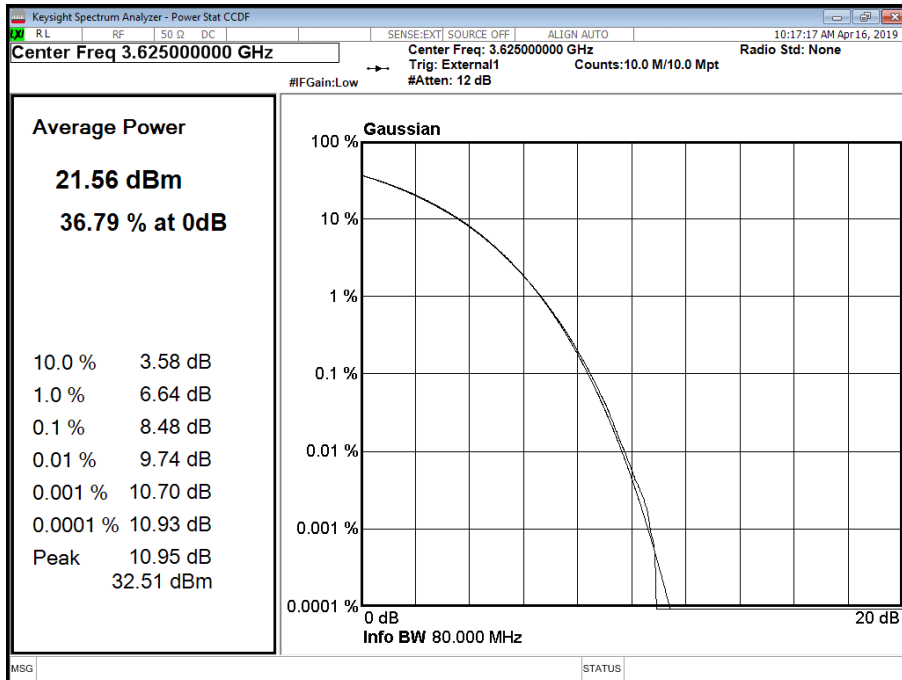
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M

Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M



Configuration A1

Product classification – Class B

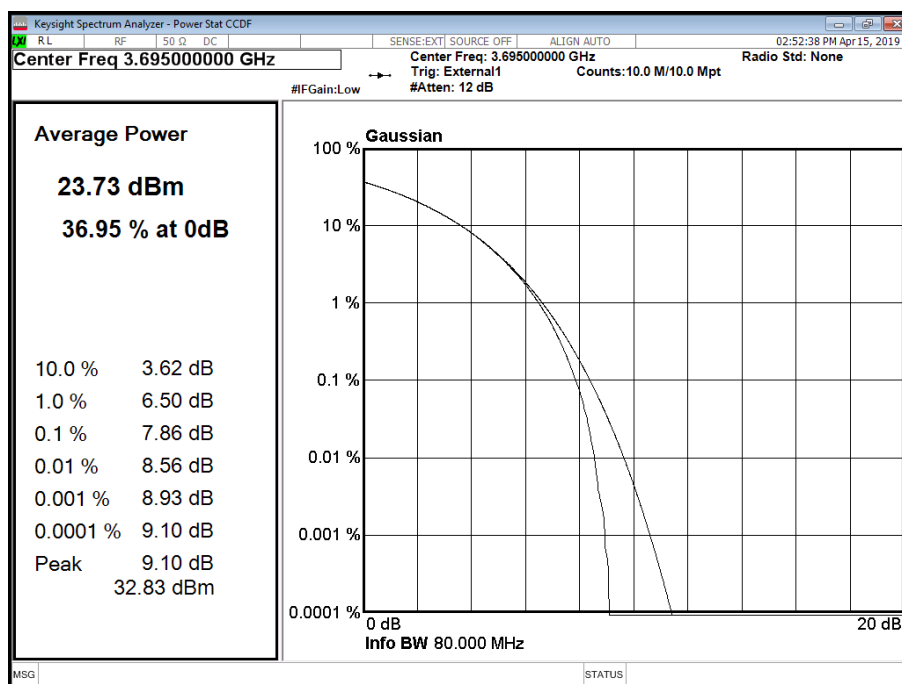
Maximum Output Power 24 dBm per port, 10.0 MHz bandwidth

Maximum Output Power 23 dBm per port, 20.0 MHz bandwidth

Antenna	LTE Modulation	LTE Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power				
			Channel Position T				
			PAR (dB)	Average Power (EIRP)			
				dBm	dBm/10 MHz	EIRP	dBm/MHz
A	QPSK	10.0 MHz	7.86	23.80	23.70	25.70	14.39
B	QPSK	10.0 MHz	7.60	24.10	24.03	26.03	14.74
Total			-	26.96	26.88	28.88	17.58
A	QPSK	20.0 MHz	8.43	21.35	19.03	21.03	9.17
B	QPSK	20.0 MHz	8.41	22.04	19.67	21.67	9.77
Total			-	24.72	22.37	24.37	12.49

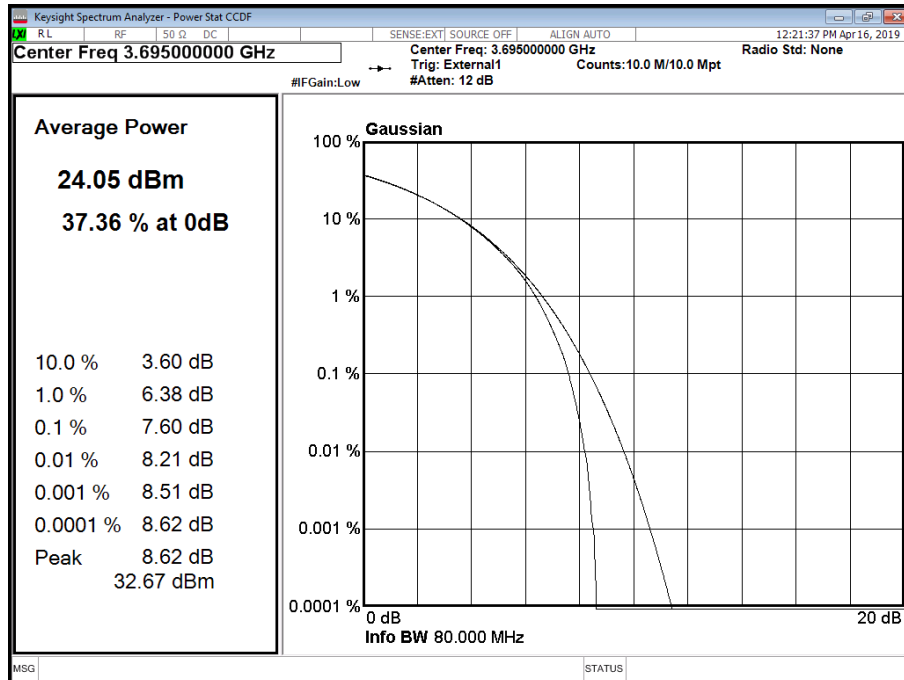
Antenna gain = 2dBi

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T

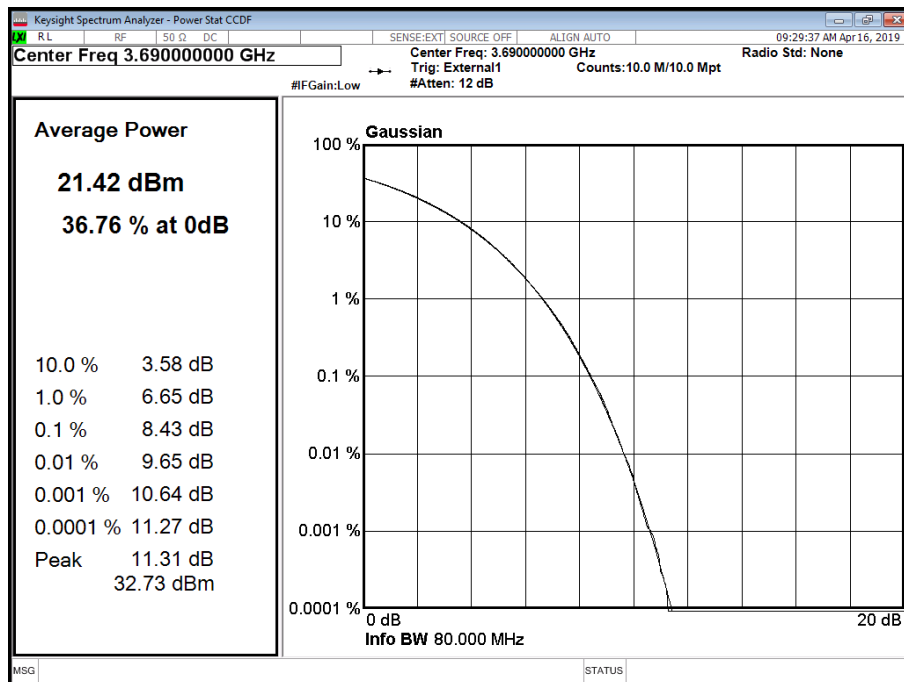


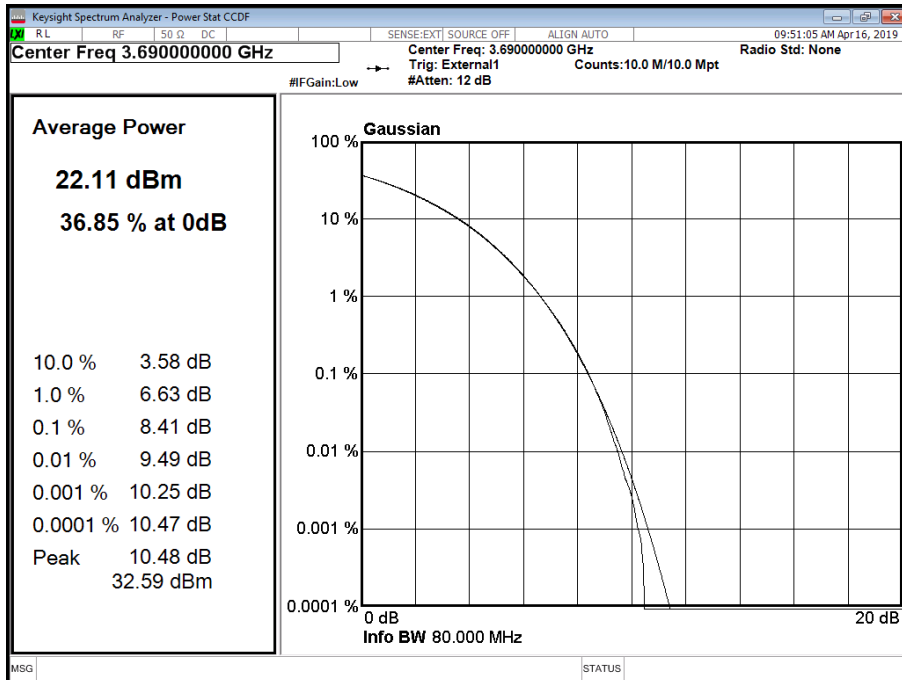


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T



Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T



Configuration A1

Minimum Output Power -32 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position B		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	QPSK	10.0 MHz	-	-31.78	-41.17
B	QPSK	10.0 MHz	-	-30.76	-39.32
Total			-	-28.23	-37.14
A	QPSK	20.0 MHz	-	-31.81	-44.57
B	QPSK	20.0 MHz	-	-30.56	-40.78
Total			-	-28.13	-39.26

Configuration A1

Minimum Output Power -32 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position M		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	QPSK	10.0 MHz	-	-32.51	-41.94
B	QPSK	10.0 MHz	-	-30.86	-39.51
Total			-	-28.60	-37.55
A	QPSK	20.0 MHz	-	-32.77	-45.40
B	QPSK	20.0 MHz	-	-31.21	-42.23
Total			-	-28.91	-40.52

Configuration A1

Minimum Output Power -32 dBm

Antenna	LTE Modulation	LTE Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position T		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	QPSK	10.0 MHz	-	-33.62	-42.97
B	QPSK	10.0 MHz	-	-32.37	-40.99
Total			-	-29.94	-38.85
A	QPSK	20.0 MHz	-	-33.43	-46.08
B	QPSK	20.0 MHz	-	-32.30	-43.67
Total			-	-29.82	-41.70



Limit	
Maximum EIRP	Category A CBSD Maximum EIRP: 30 dBm/10 MHz Maximum PSD: 20 dBm/MHz
	Category B CBSD Maximum EIRP: 47 dBm/10 MHz Maximum PSD: 37 dBm/MHz
Peak to Average Ratio	13 dB



2.2 OCCUPIED BANDWIDTH

2.2.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049
FCC CFR 47 Part 96, Clause 96.41 (e)(3)

2.2.2 Date of Test and Modification State

15 April 2019 - Modification State 1

2.2.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.4 Environmental Conditions

Ambient Temperature 22.1°C
Relative Humidity 29.8%

2.2.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01.

2.2.6 Test Results

Configuration A1

Product classification – Class B

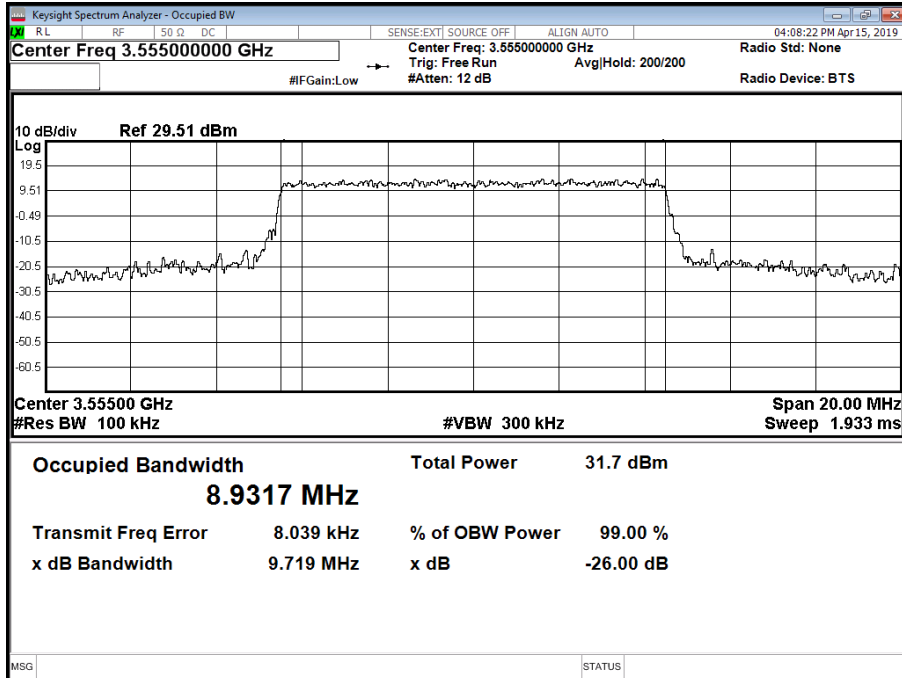
Maximum Output Power 24 dBm per port, 10.0 MHz bandwidth

Maximum Output Power 23 dBm per port, 20.0 MHz bandwidth

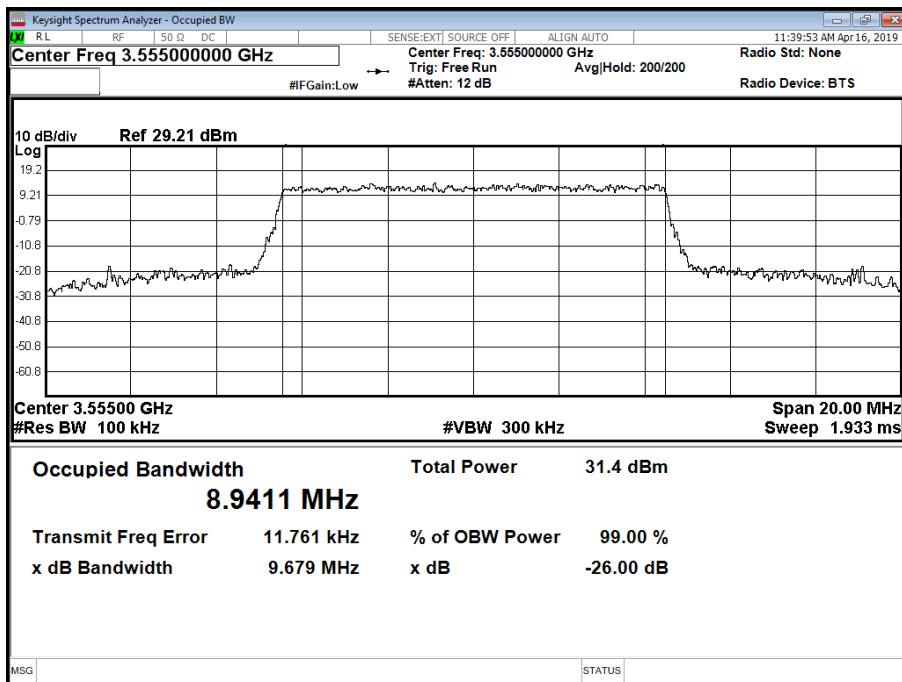
Antenna	LTE Modulation	LTE Carrier Bandwidth	Result (kHz)					
			Channel Position B		Channel Position M		Channel Position T	
			99% Occupied Bandwidth	-26 dB Bandwidth	99% Occupied Bandwidth	-26 dB Bandwidth	99% Occupied Bandwidth	-26 dB Bandwidth
A	QPSK	10.0 MHz	8,931.73	9,718.95	8,973.69	9,703.16	8,963.52	9,722.05
B	QPSK	10.0 MHz	8,941.05	9,679.49	8,954.39	9,766.65	8,957.85	9,735.79
A	QPSK	20.0 MHz	17,877.30	19,285.49	17,865.80	19,125.25	17,913.31	19,122.40
B	QPSK	20.0 MHz	17,873.43	19,361.41	17,881.40	19,280.19	17,878.42	19,309.01



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B

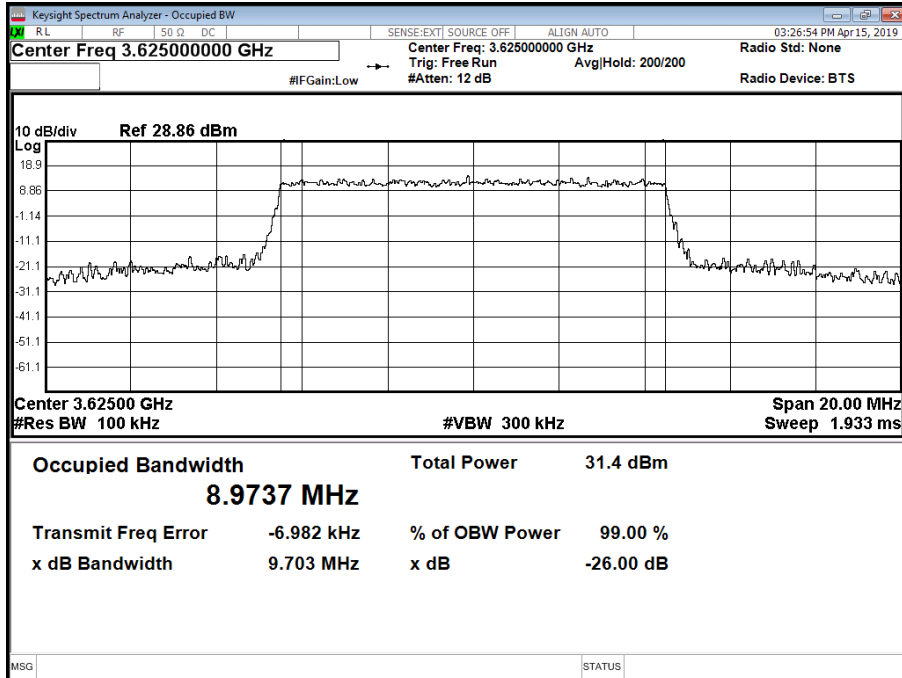


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B

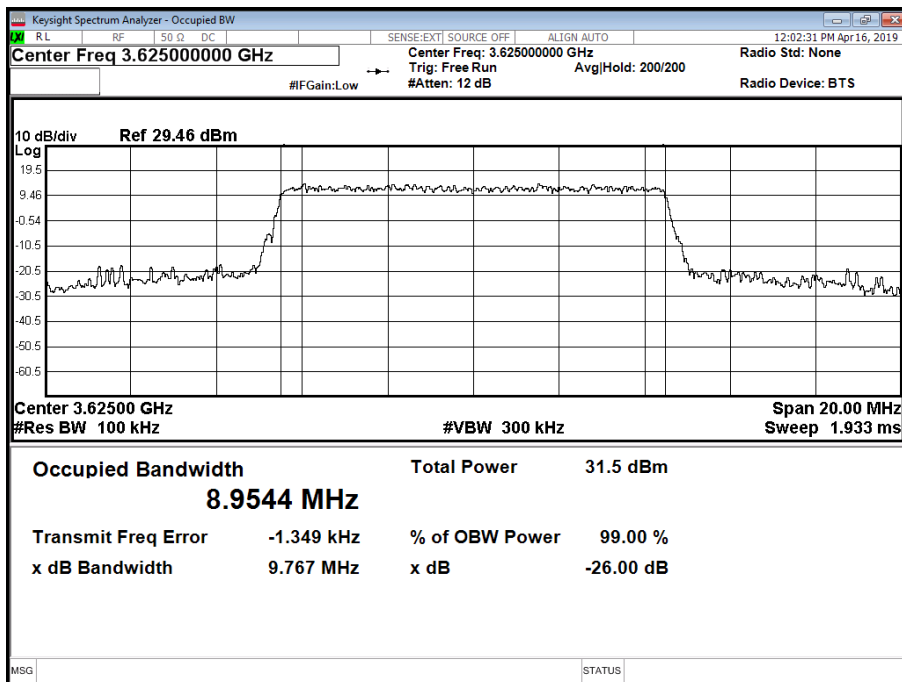


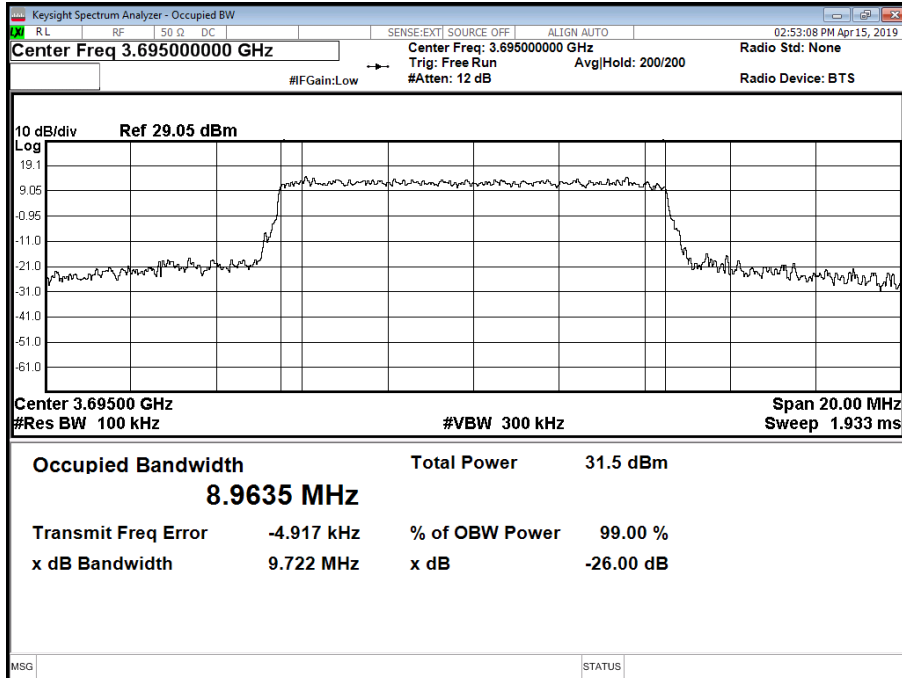
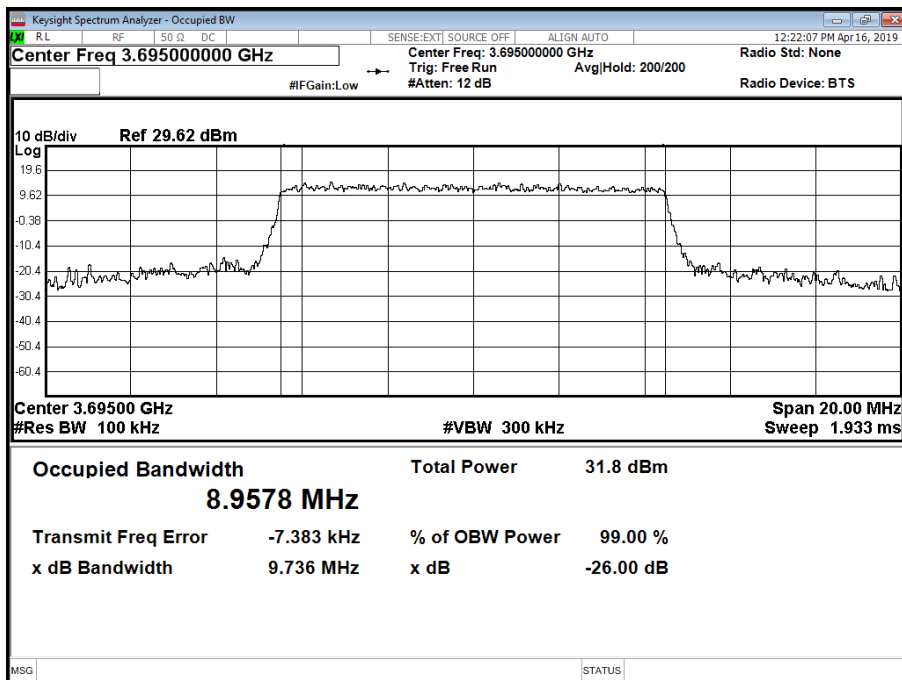


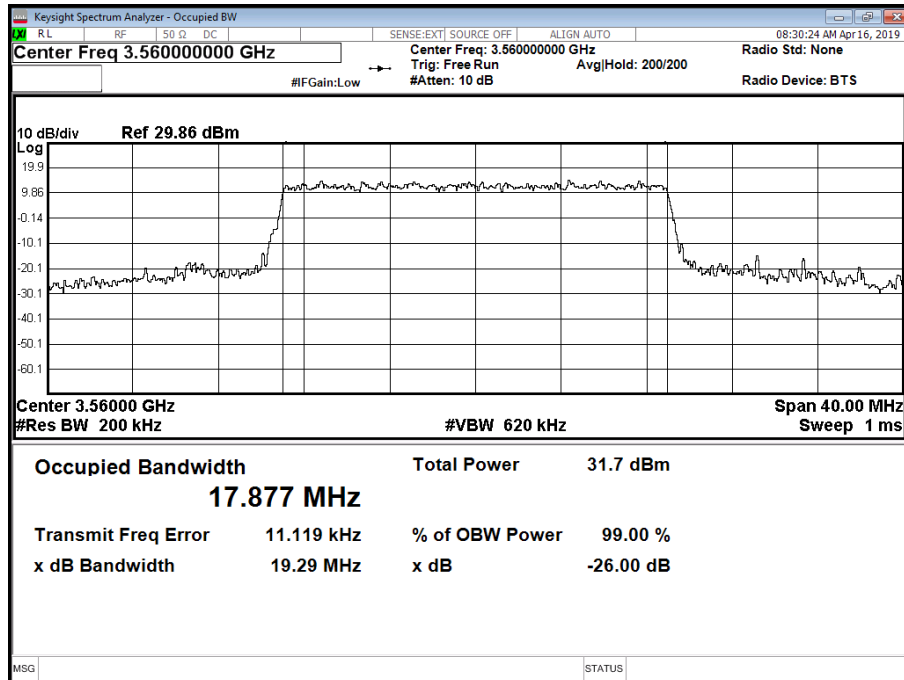
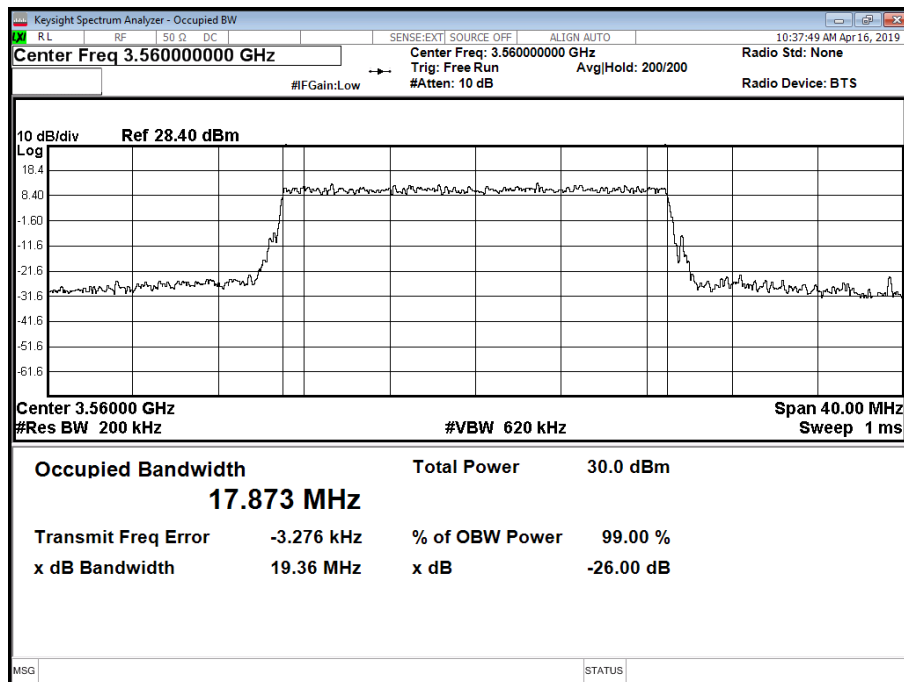
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M

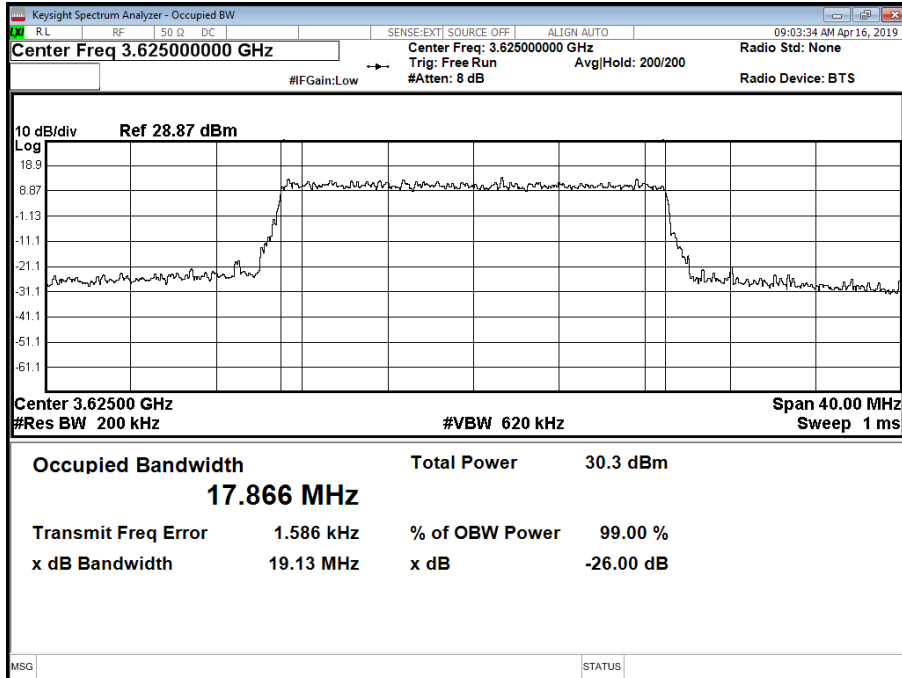
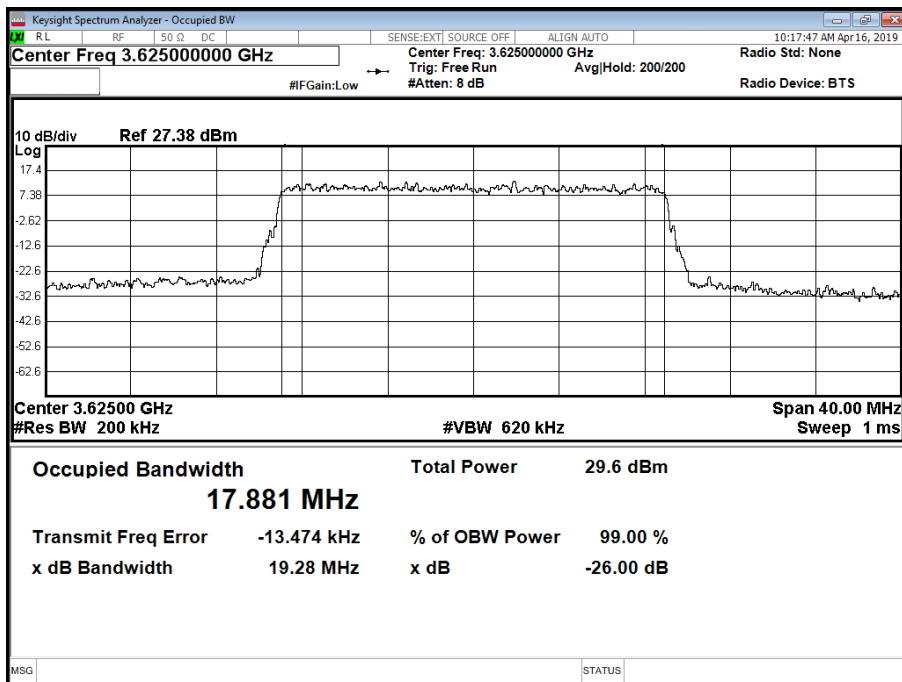


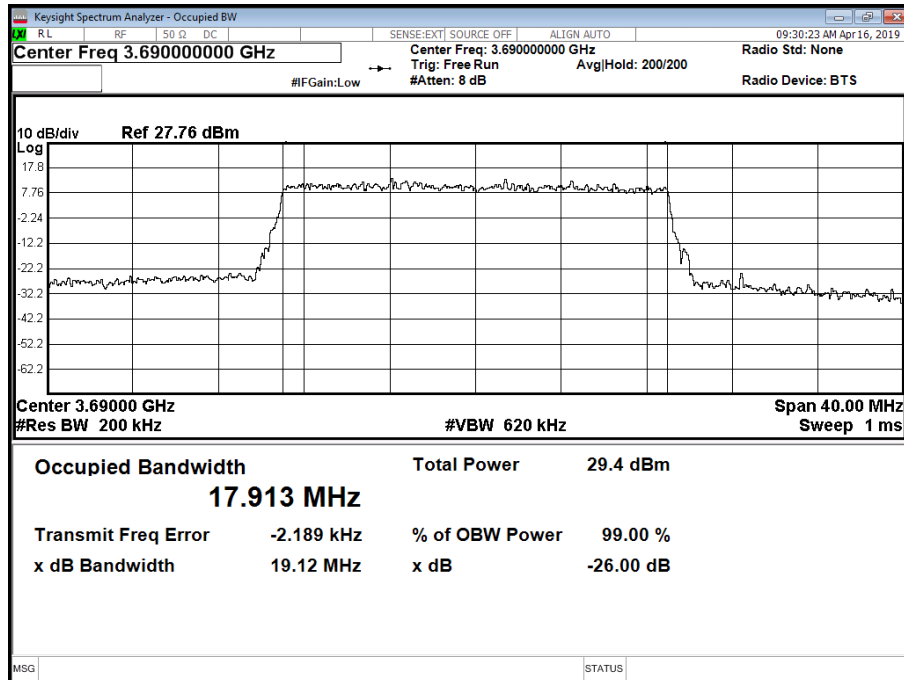
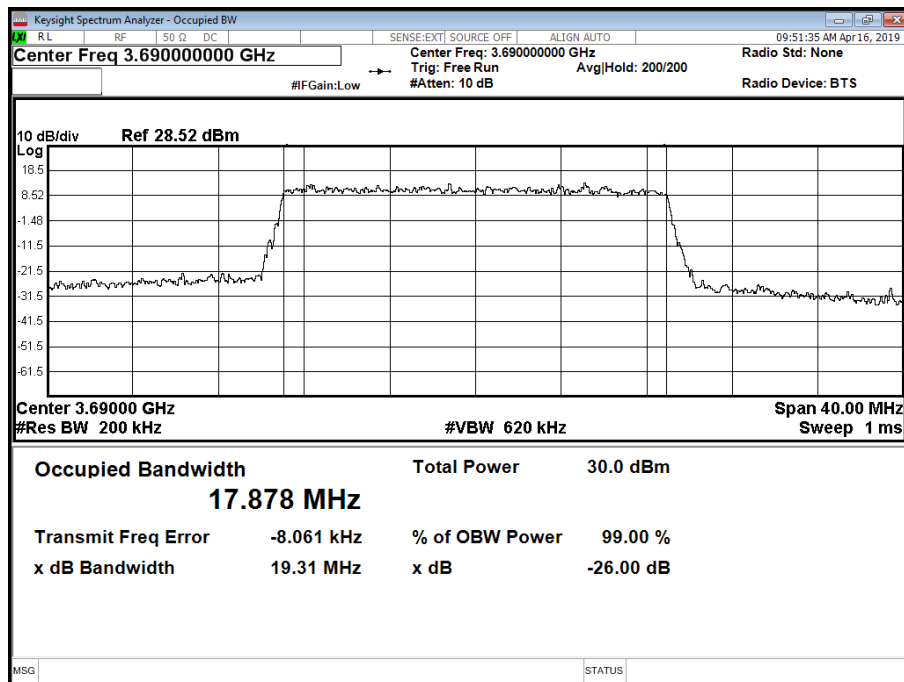
Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position TAntenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position BAntenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position MAntenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position TAntenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T



2.3 BAND EDGE

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 96, Clause 96.41 (e)(3)

2.3.2 Date of Test and Modification State

15 April 2019 - Modification State 1

2.3.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.4 Environmental Conditions

Ambient Temperature 22.1°C
Relative Humidity 29.8%

2.3.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01.

Each antenna port was measured. The limit was tightened by $10 * \log(N)$, where N is equal to the number of MIMO antenna ports.

For single carrier, the limit was calculated as being $-13 \text{ dBm} - 10 * \log(2) = -16 \text{ dBm}$.

2.3.6 Test Results

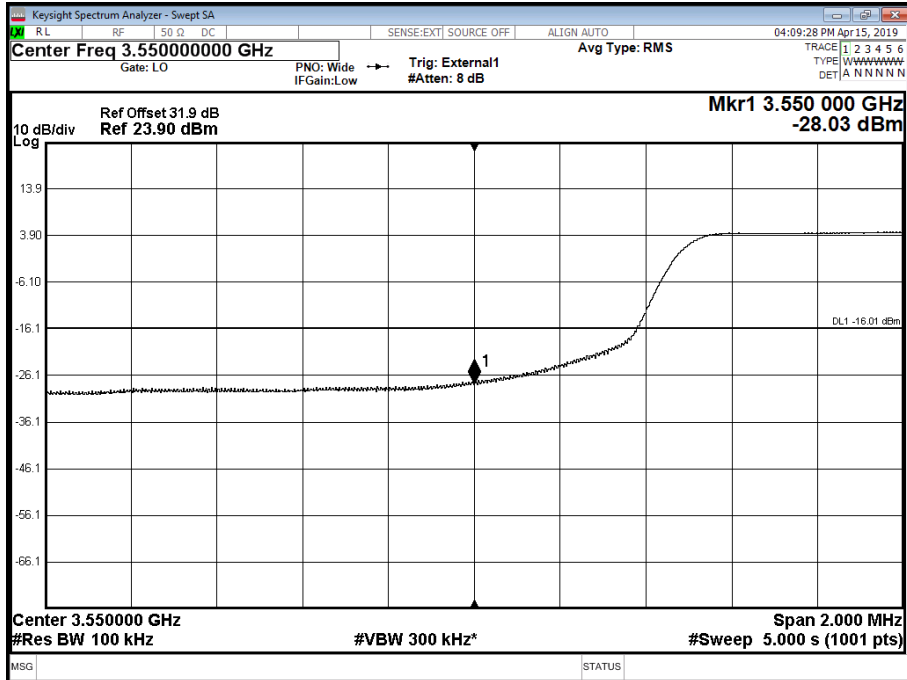
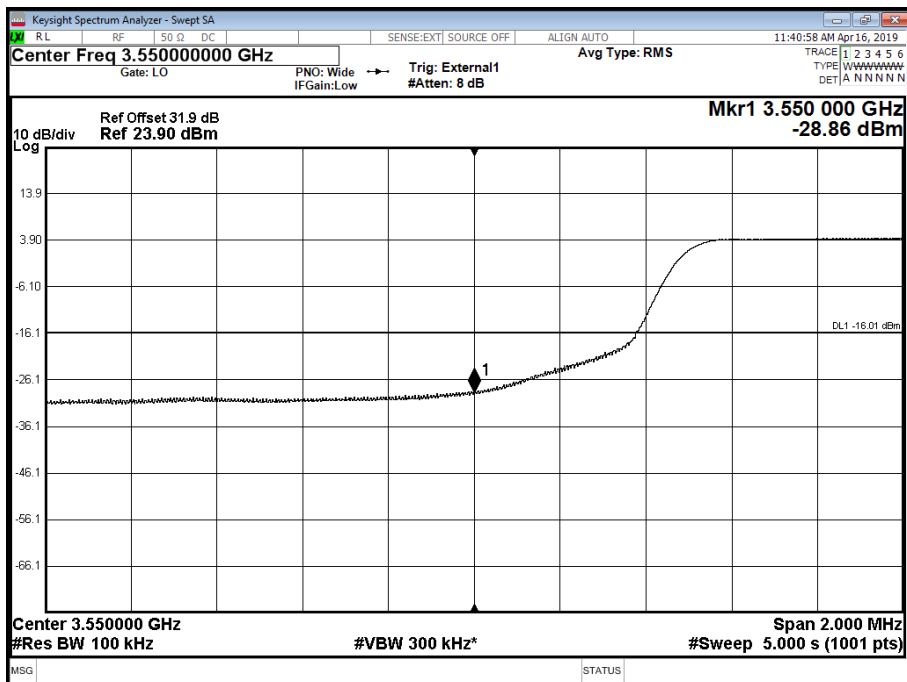
Configuration A1

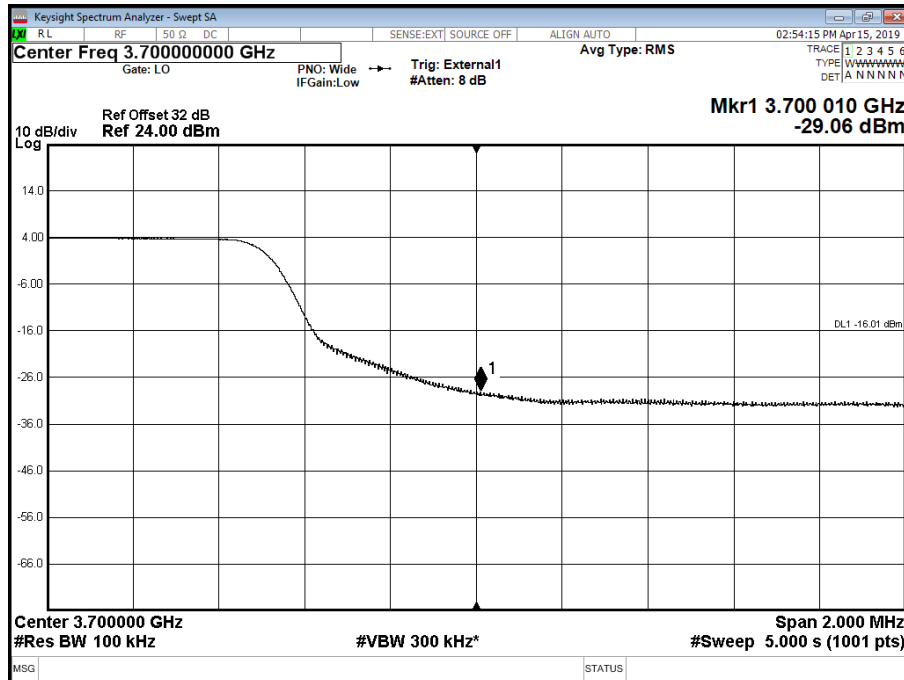
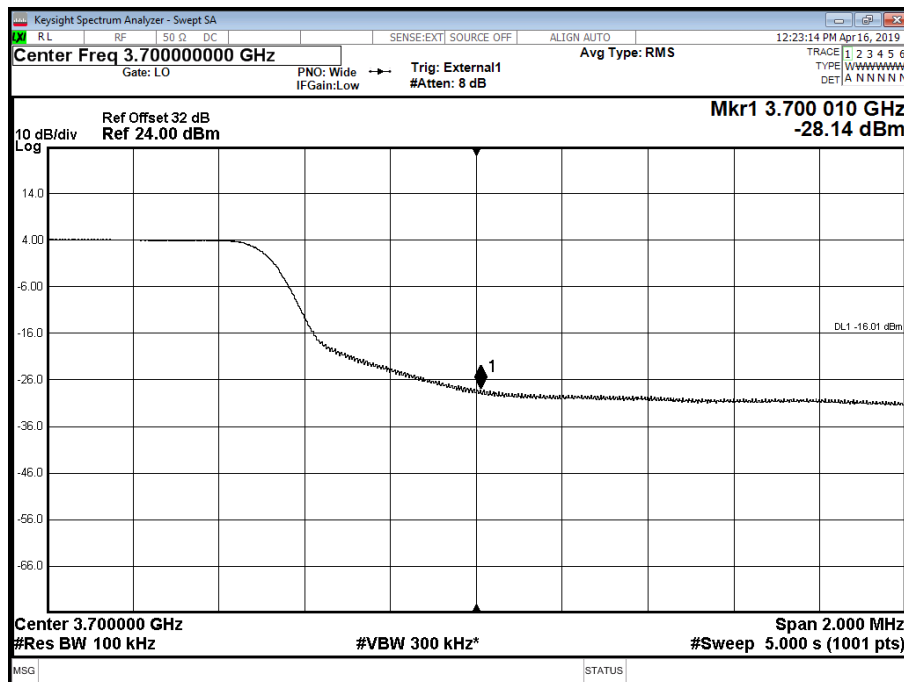
Product classification – Class B

Maximum Output Power 24 dBm per port, 10.0 MHz bandwidth

Maximum Output Power 23 dBm per port, 20.0 MHz bandwidth

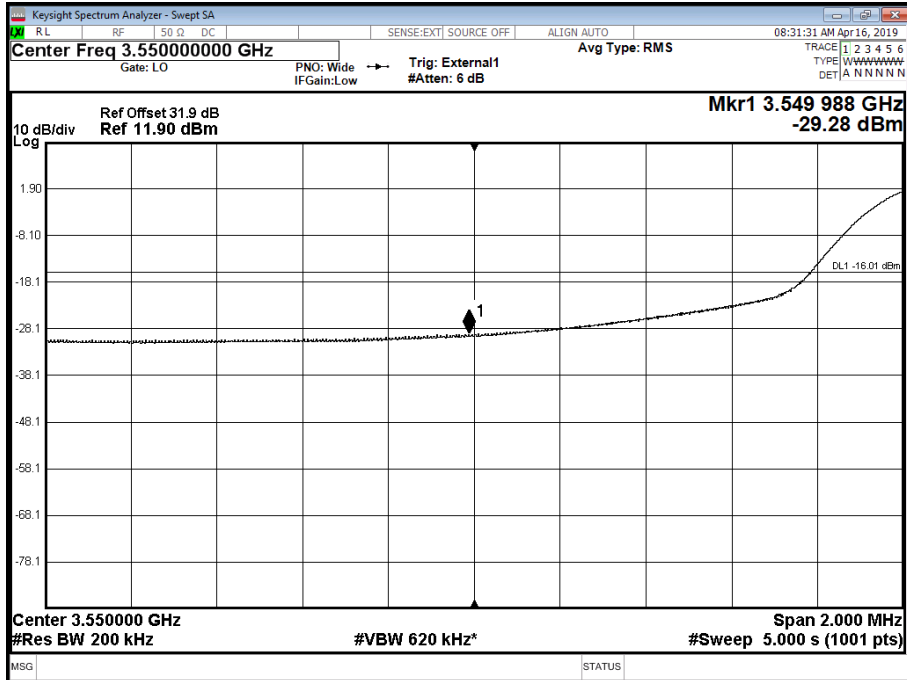
Antenna	LTE Modulation	LTE Carrier Bandwidth	Band Edge (MHz)	
			Channel Position B	Channel Position T
A	QPSK	10.0 MHz	3,550.0	3,695.0
B	QPSK	10.0 MHz	3,550.0	3,695.0
A	QPSK	20.0 MHz	3,560.0	3,690.0
B	QPSK	20.0 MHz	3,560.0	3,690.0

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position BAntenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B

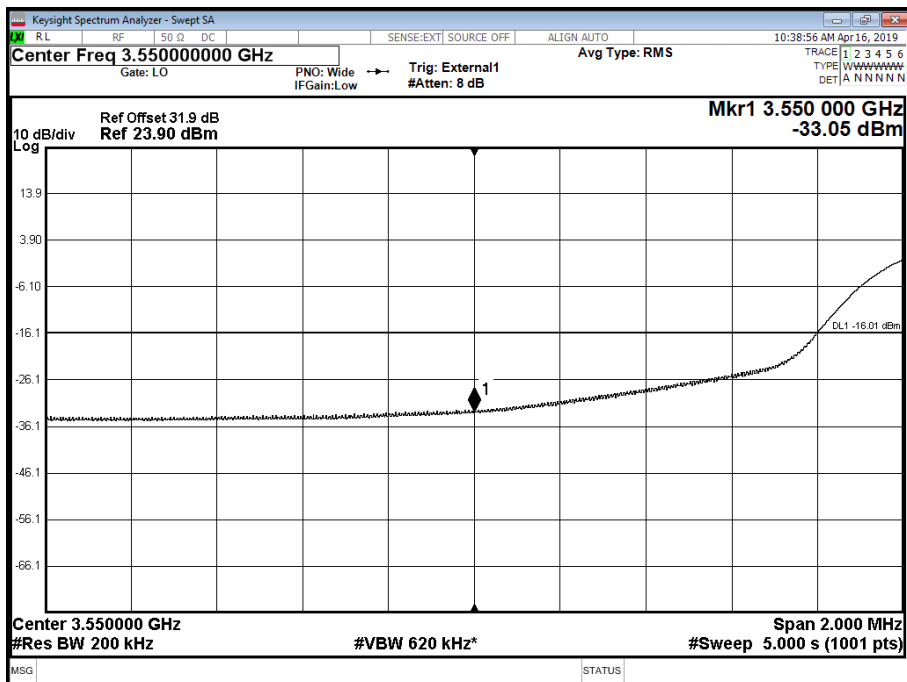
Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position TAntenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T



Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B



Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B



Keysight Spectrum Analyzer - Swept SA

RL RF 50 Ω DC SENSE:EXT SOURCE OFF ALIGN AUTO Avg Type: RMS

09:31:36 AM Apr 16, 2019

Center Freq 3.70000000 GHz Gate: LO PNO: Wide IFGain: Low Trig: External1 #Atten: 6 dB

TRACE 1 2 3 4 5 6 TYPE: W W W W W W W W DET: A N N N N N

Ref Offset 32 dB Ref 12.00 dB

Mkr1 3.700 010 GHz -34.92 dBm

10 dB/div Log

DL1 -16.01 dBm

Center 3.70000 GHz #Res BW 200 kHz #VBW 620 kHz* Span 2.000 MHz #Sweep 5.000 s (1001 pts)

MSG STATUS

Keysight Spectrum Analyzer - Swept SA

09:52:42 AM Apr 16, 2019

Center Freq 3.700000000 GHz Avg Type: RMS

Gate: LO PNO: Wide IF Gain: Low Trig: External1 #Atten: 6 dB

Ref Offset 32 dB Ref 12.00 dBm

Mkr1 3.700 010 GHz -34.14 dBm

10 dB/div Log

DL1 -16.01 dBm

Center 3.700000 GHz Span 2.000 MHz

#Res BW 200 kHz #VBW 620 kHz #Sweep 5.000 s (1001 pts)

The image shows a Keysight Spectrum Analyzer display. The main plot area shows a signal at 3.700010 GHz with a level of -34.14 dBm. The y-axis is labeled '10 dB/div Log' and ranges from -80.0 to 2.00. The x-axis is labeled 'Center 3.700000 GHz' and 'Span 2.000 MHz'. The plot shows a signal that is relatively flat across the span, with a slight dip in the center. A marker '1' is placed on the signal peak. The top of the display shows various settings: 'Center Freq 3.700000000 GHz', 'Avg Type: RMS', 'Gate: LO', 'PNO: Wide', 'IF Gain: Low', 'Trig: External1', '#Atten: 6 dB', 'Ref Offset 32 dB', 'Ref 12.00 dBm', 'Mkr1 3.700 010 GHz -34.14 dBm', 'DL1 -16.01 dBm', 'Center 3.700000 GHz', 'Span 2.000 MHz', '#Res BW 200 kHz', '#VBW 620 kHz', and '#Sweep 5.000 s (1001 pts)'. The bottom of the display shows 'MSG' and 'STATUS'.

Limit	-13 dBm/MHz $-10\log(2) = -16$ dBm/MHz (2 port MIMO)
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2.4 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 96, Clause 96.41 (e)(1)(2)

2.4.2 Date of Test and Modification State

15 April 2019 - Modification State 1

2.4.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.4 Environmental Conditions

Ambient Temperature	22.1°C
Relative Humidity	29.8%

2.4.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01.

The EUT could transmit with 1 or 2 ports simultaneously. Testing was performed on all ports with the test limits being reduced from the specification limit by a factor of $10\log(2)$ in accordance with KDB 662911 D01 v02r01 to cover all MIMO configurations.

Note that spurious emissions measurements ± 1 MHz from the carrier edge were performed as part of the Band Edge measurements.



2.4.6 Test Results

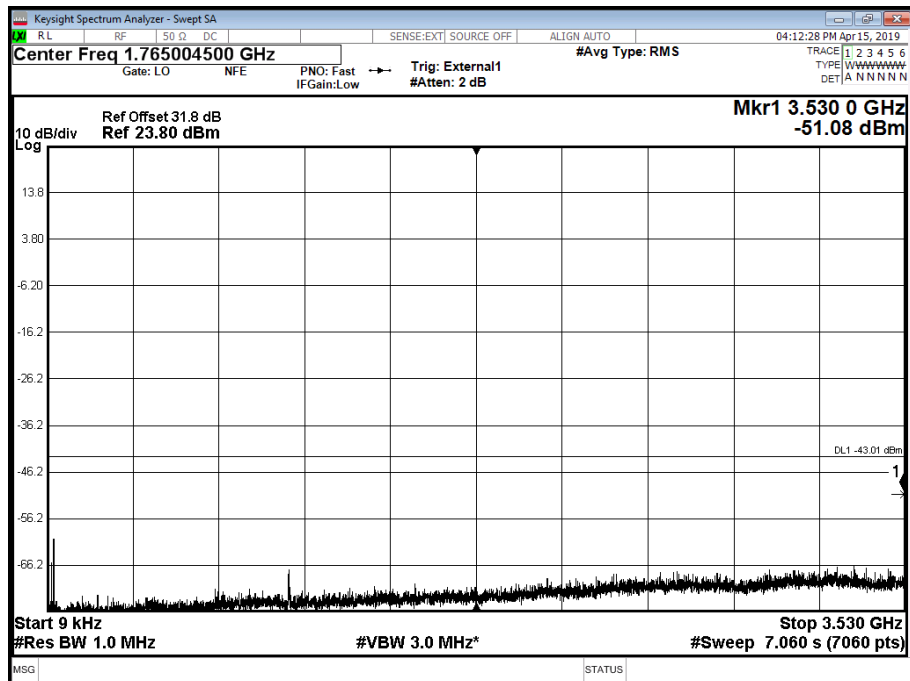
Configuration A1

Product classification – Class B

Maximum Output Power 24 dBm per port, 10.0 MHz bandwidth

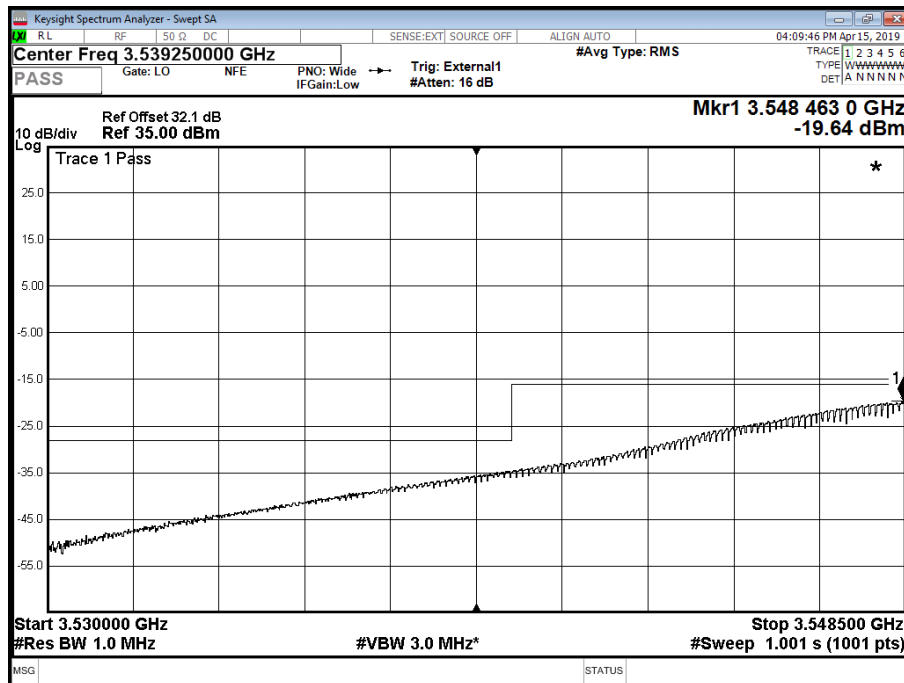
Maximum Output Power 23 dBm per port, 20.0 MHz bandwidth

Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 1 - Range 0.009 to 3530 MHz

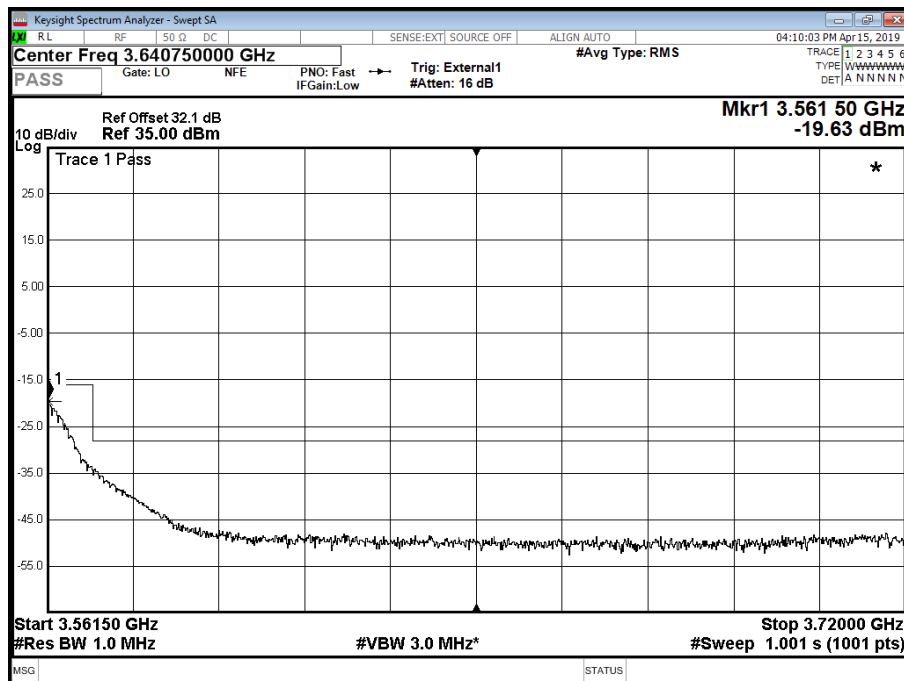




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B -
Band Mask Low 1 - Range Mask Low 1

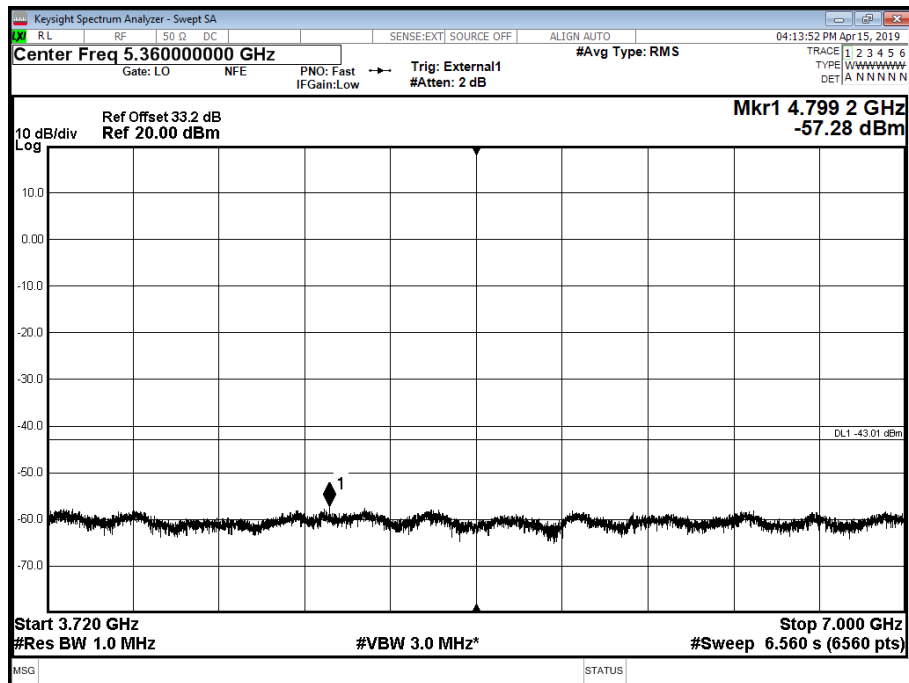


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B -
Band Mask High 1 - Range Mask High 1

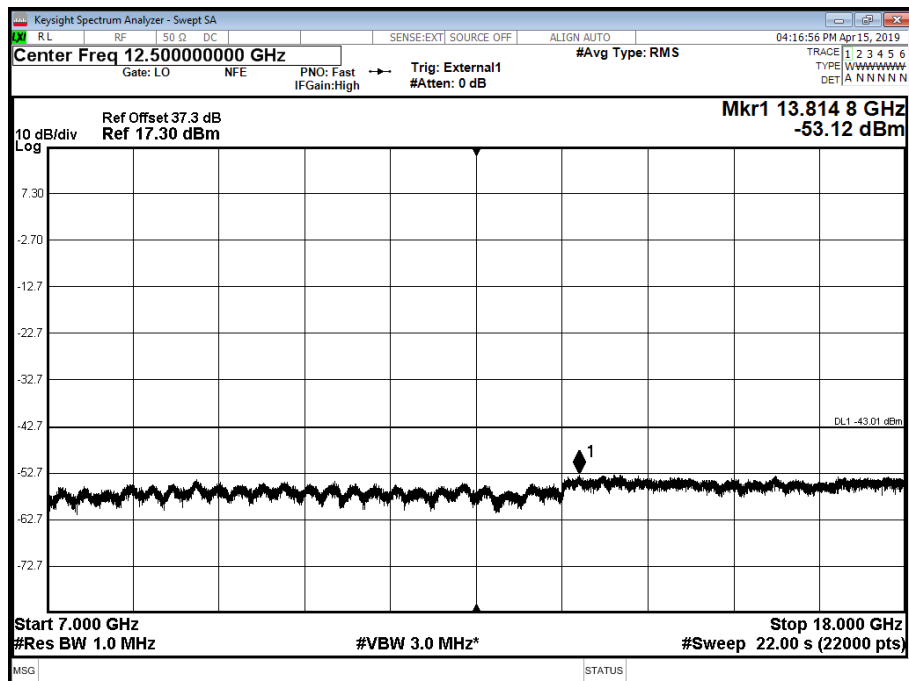




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 2 - Range 3720 to 7000 MHz

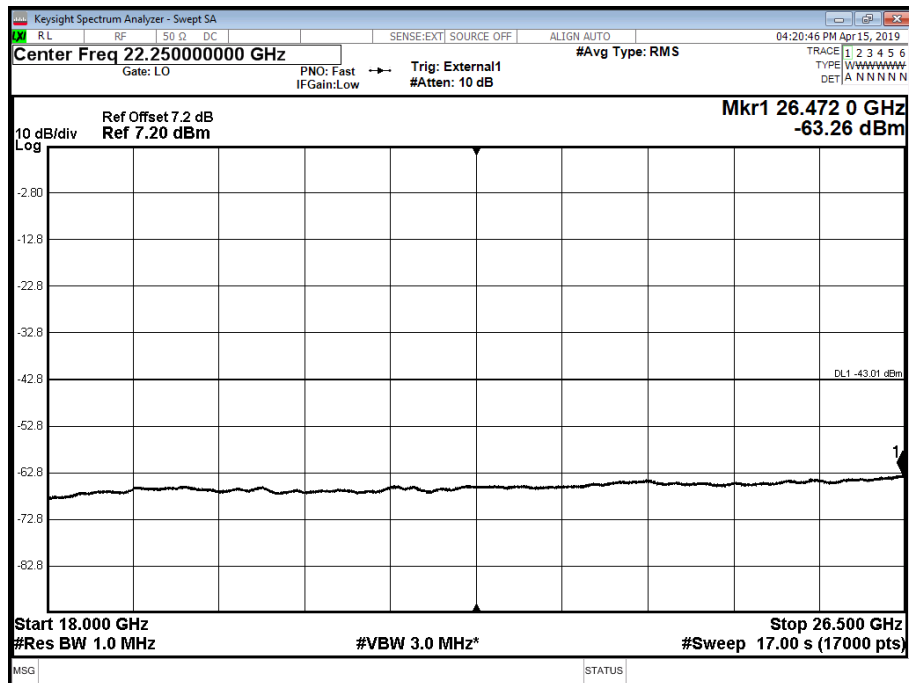


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 3 - Range 7000 to 18000 MHz

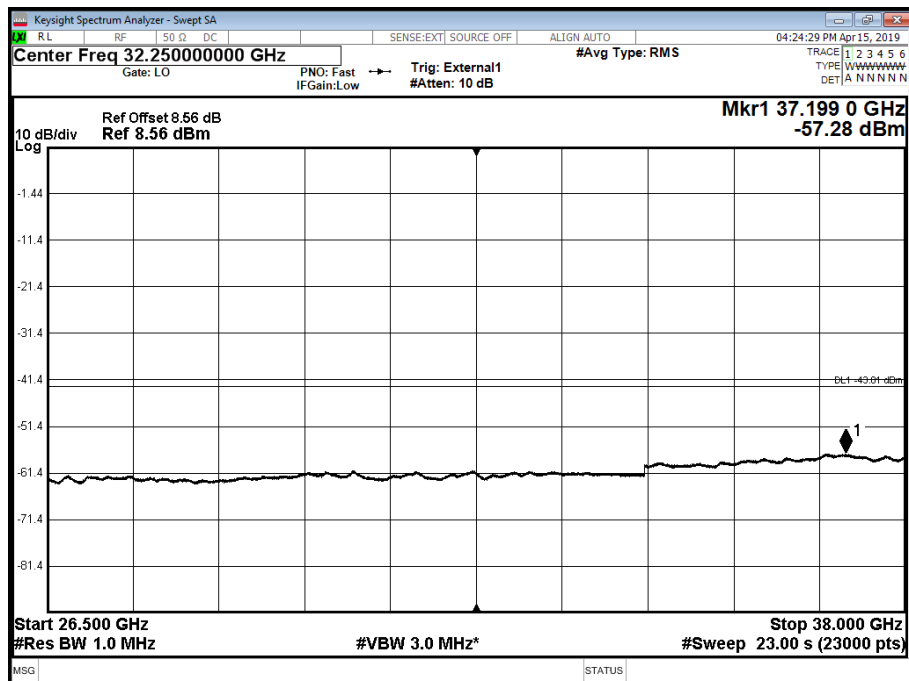




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 4 - Range 18000 to 26500 MHz

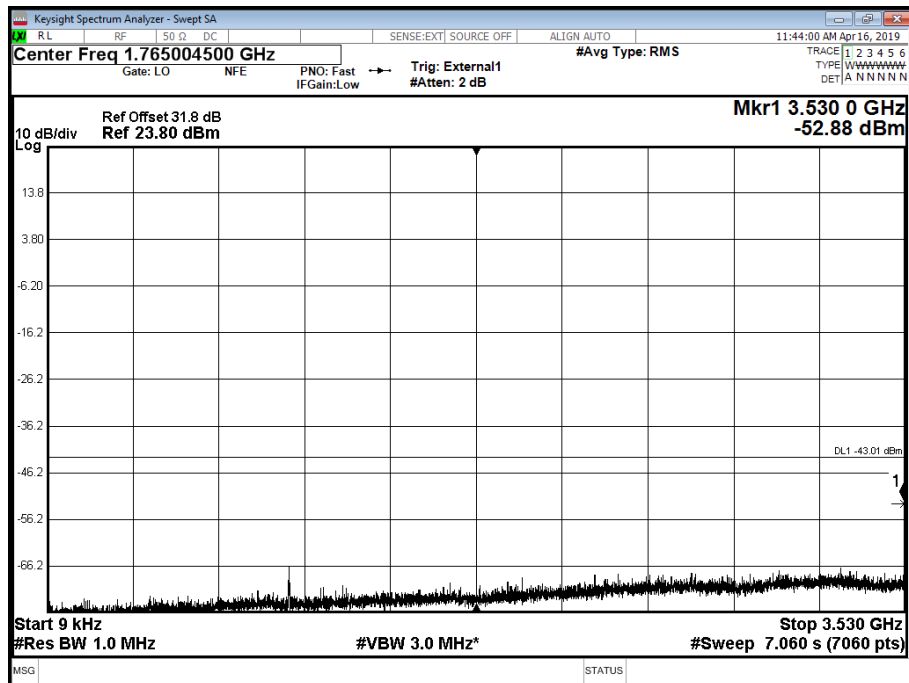


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 5 - Range 26500 to 38000 MHz

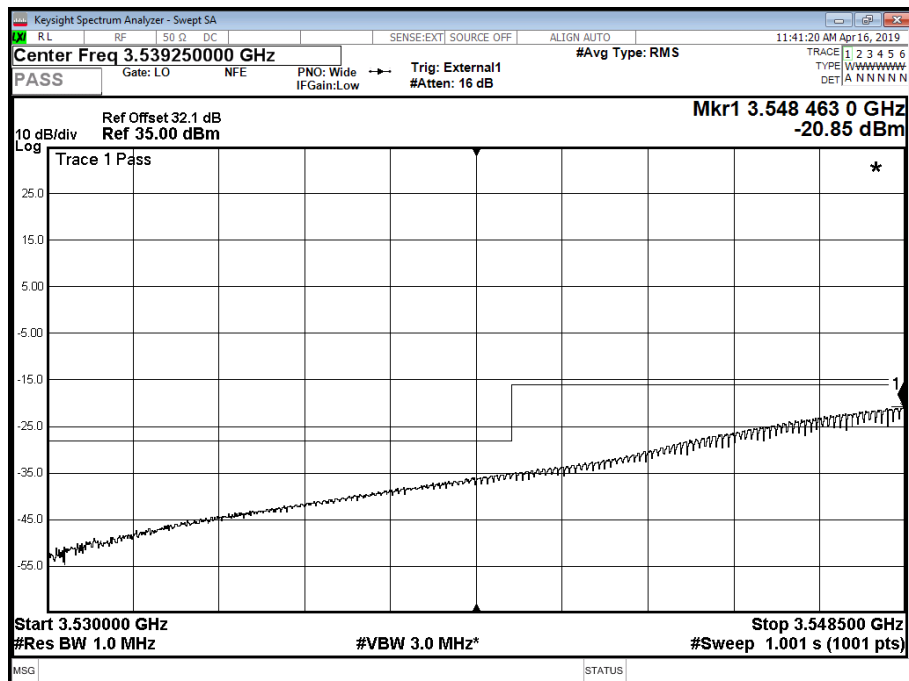




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 1 - Range 0.009 to 3530 MHz

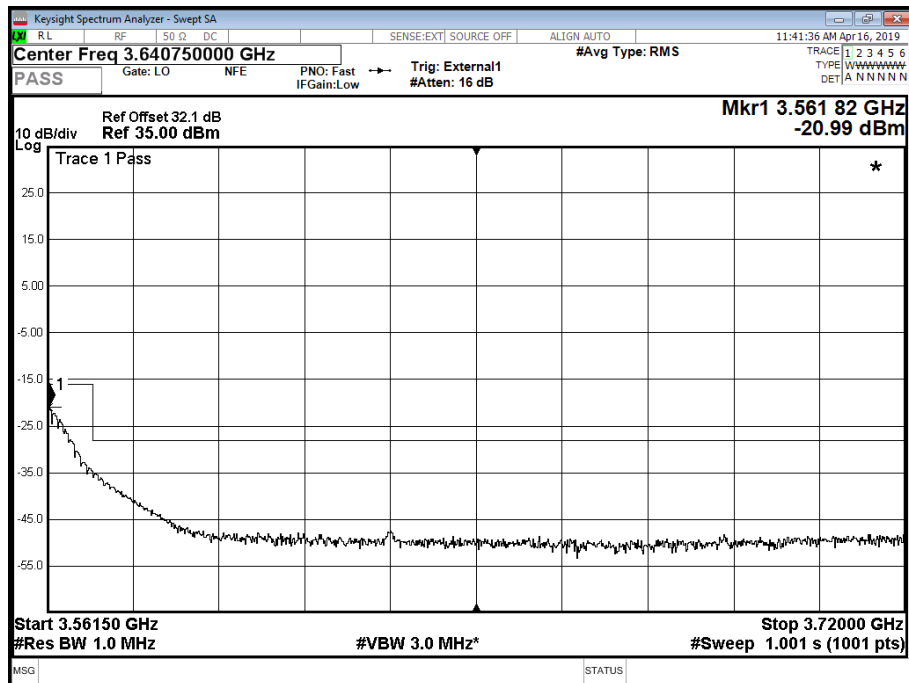


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band Mask Low 1 - Range Mask Low 1

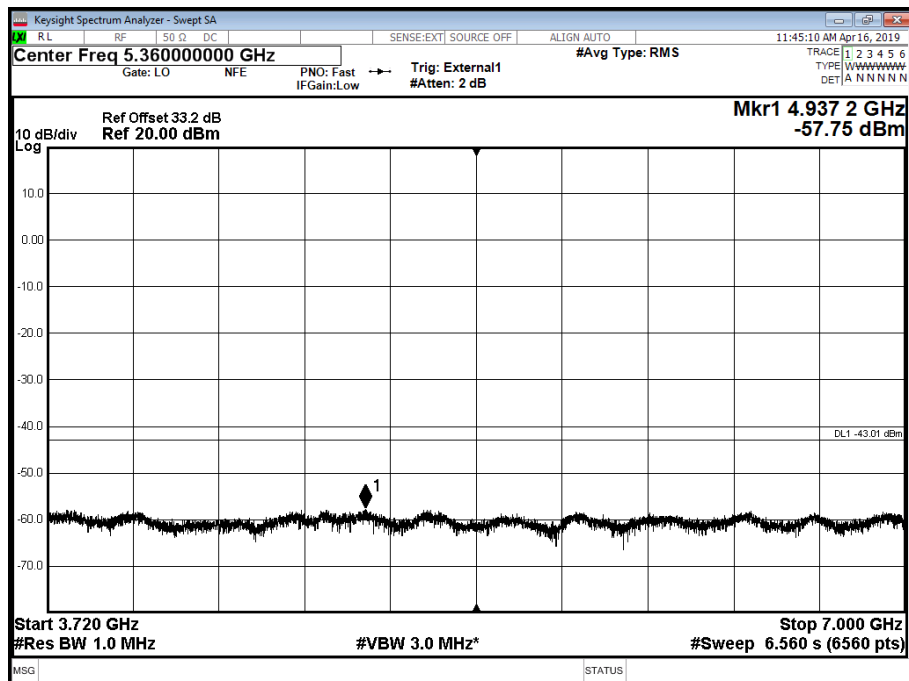




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B -
Band Mask High 1 - Range Mask High 1

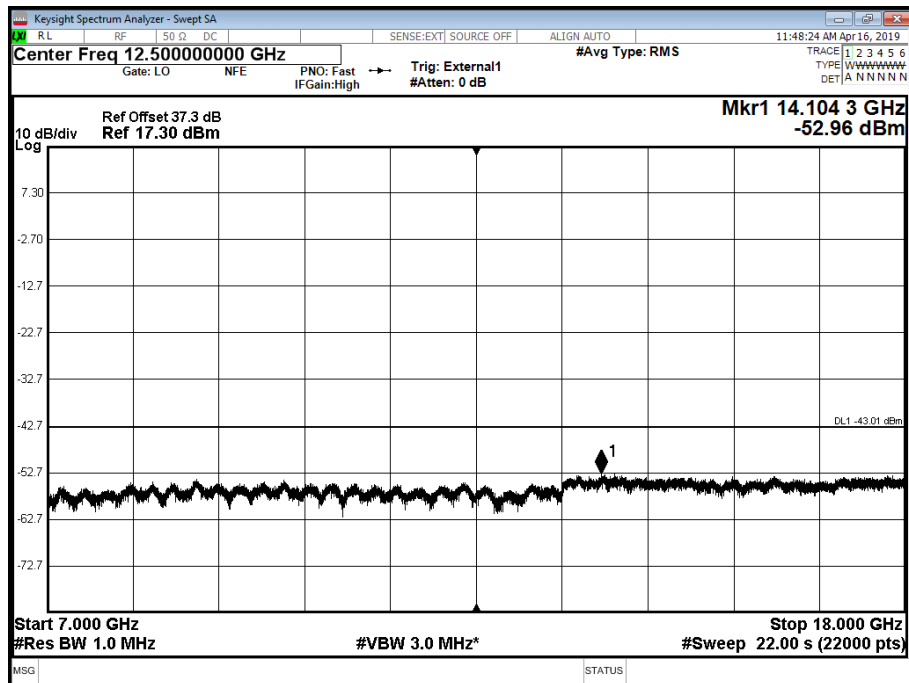


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B -
Band 2 - Range 3720 to 7000 MHz

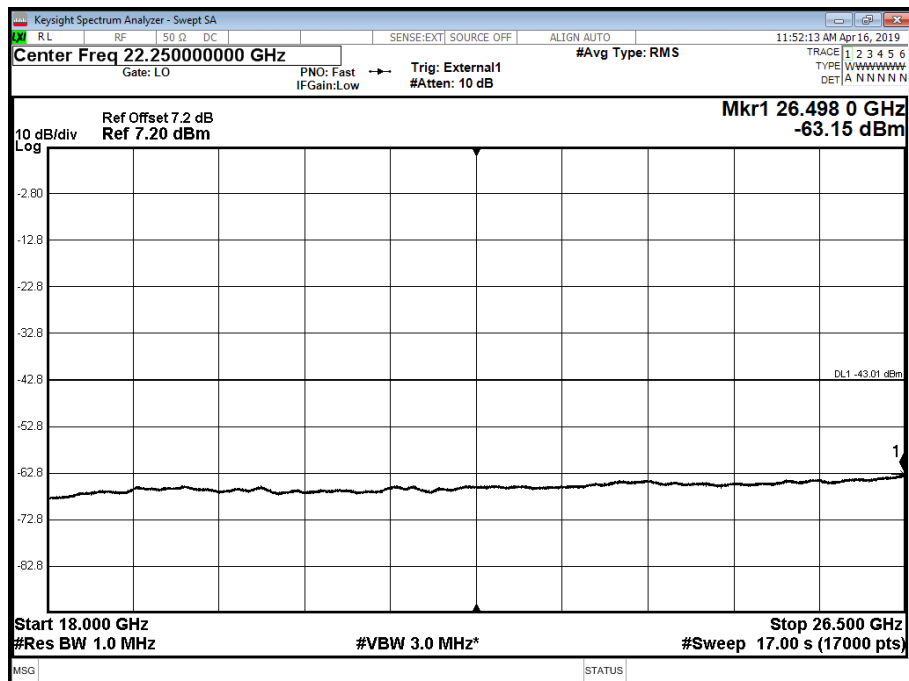




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 3 - Range 7000 to 18000 MHz

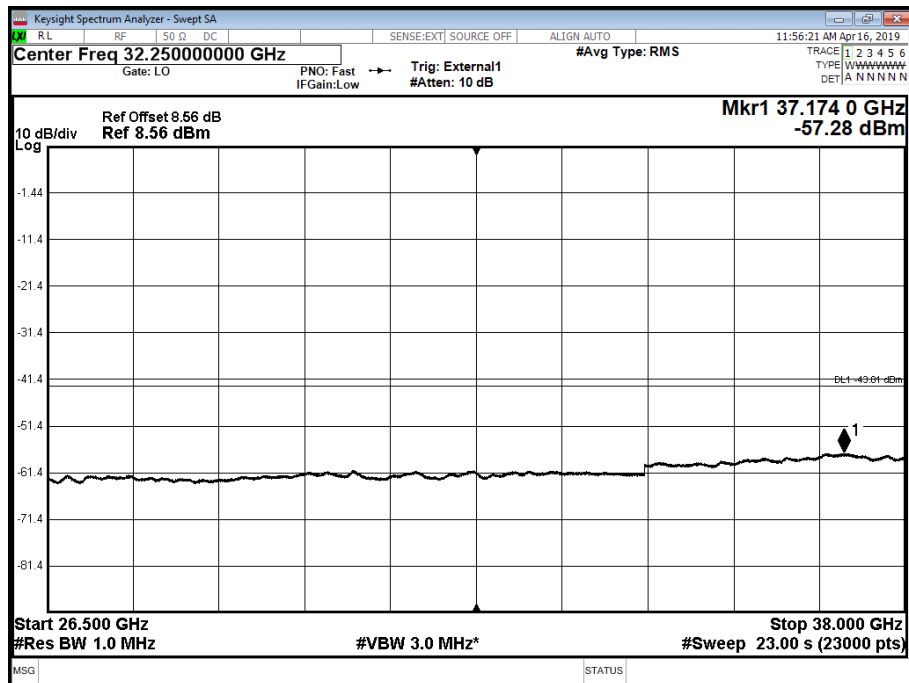


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 4 - Range 18000 to 26500 MHz

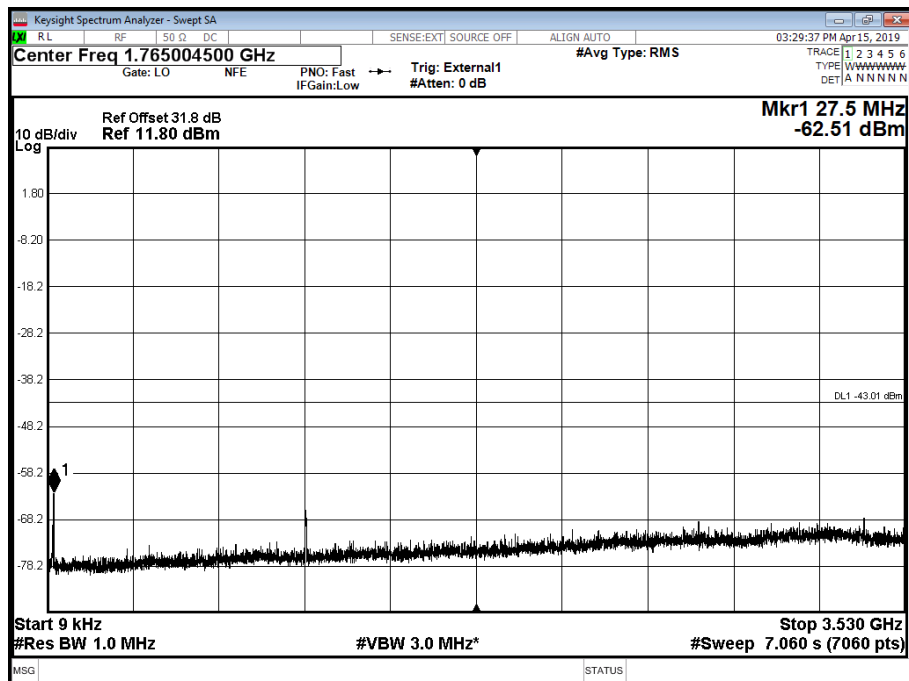




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B - Band 5 - Range 26500 to 38000 MHz

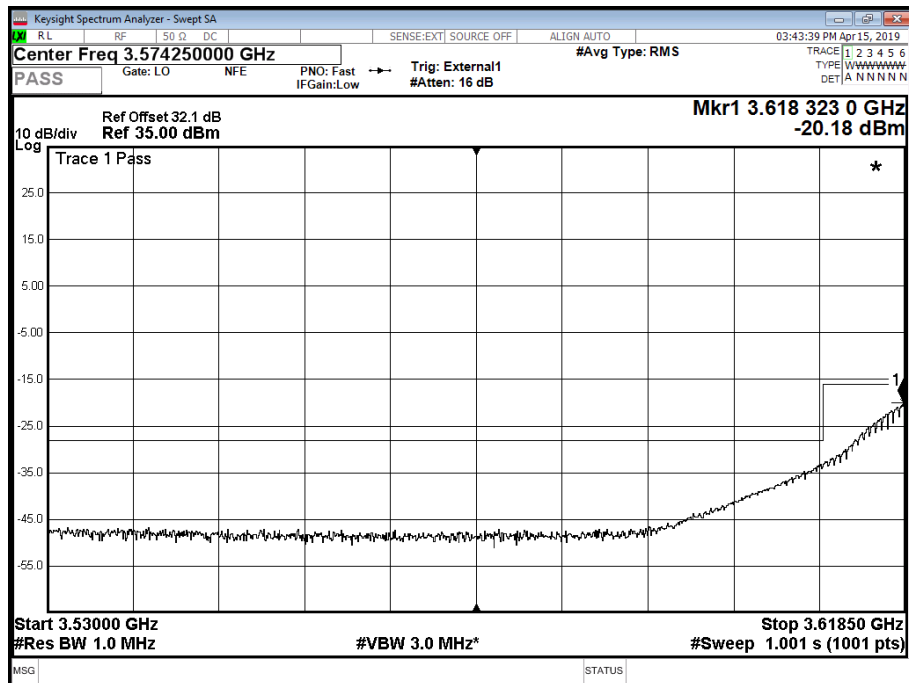


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band 1 - Range 0.009 to 3530 MHz

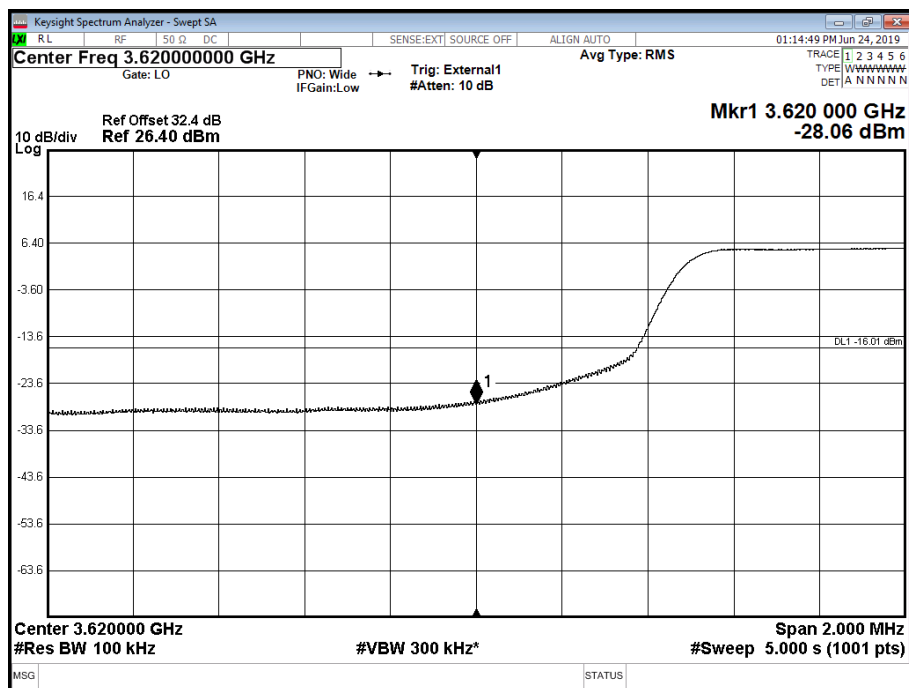




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band Mask Low 1 - Range Mask Low 1

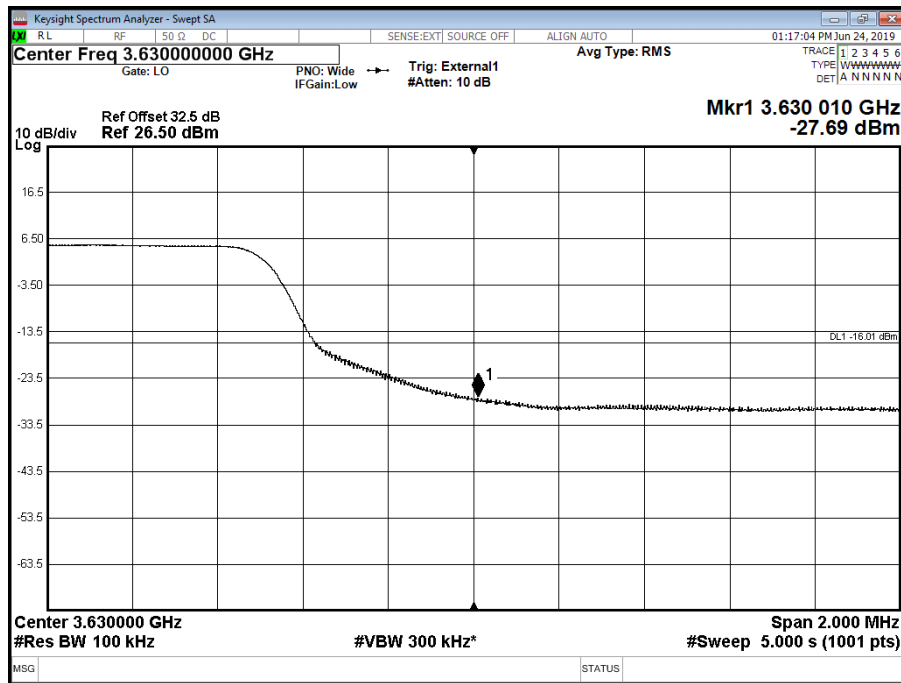


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band Mask Low 1 - Range Carrier Edge Low

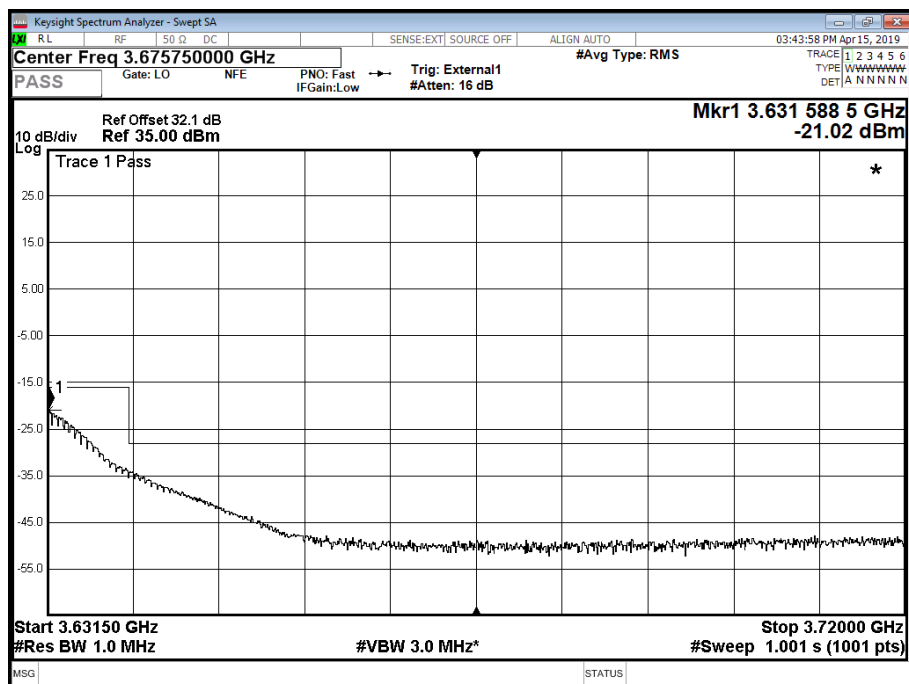




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band Mask Low 1 - Range Carrier Edge High

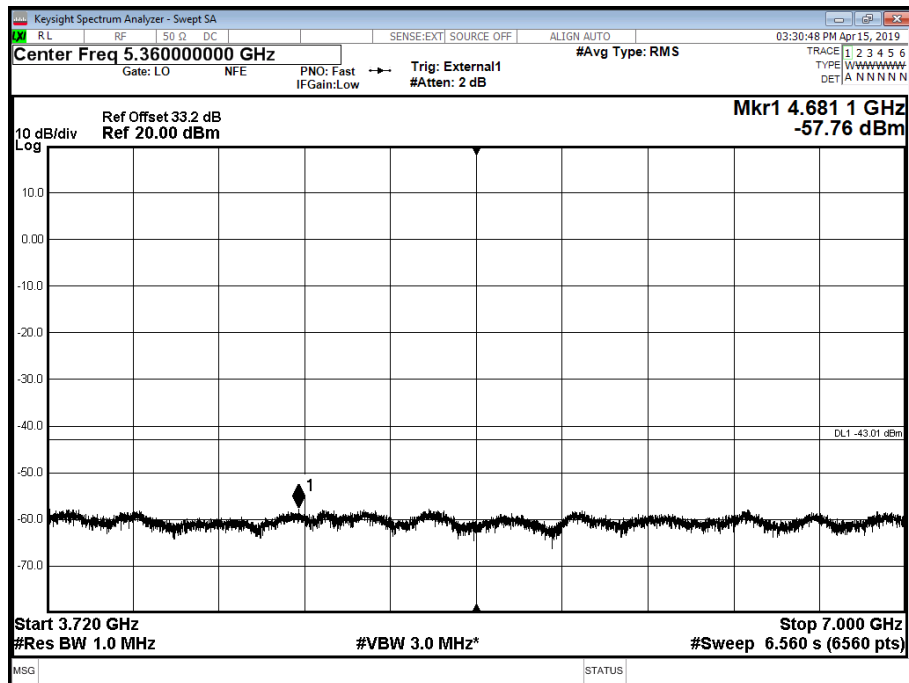


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band Mask_High_1 - Range Mask_High_1

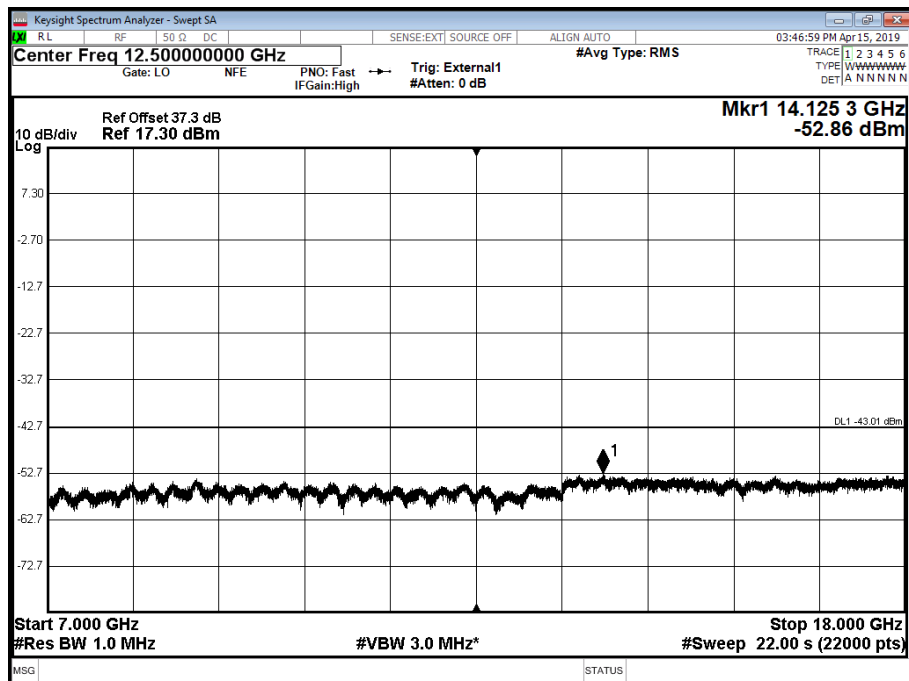




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band 2 - Range 3720 to 7000 MHz

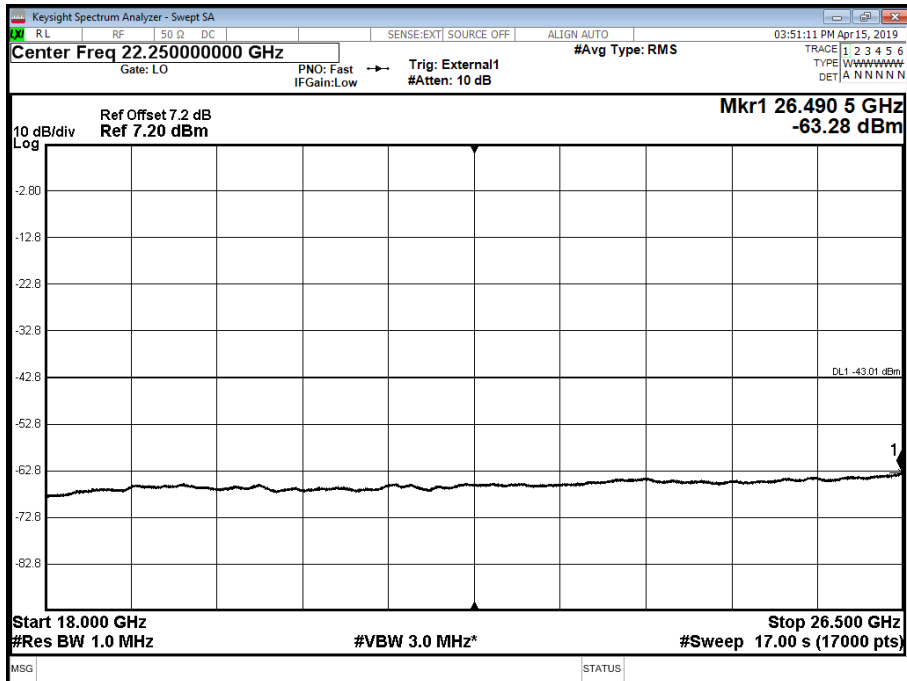


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band 3 - Range 7000 to 18000 MHz

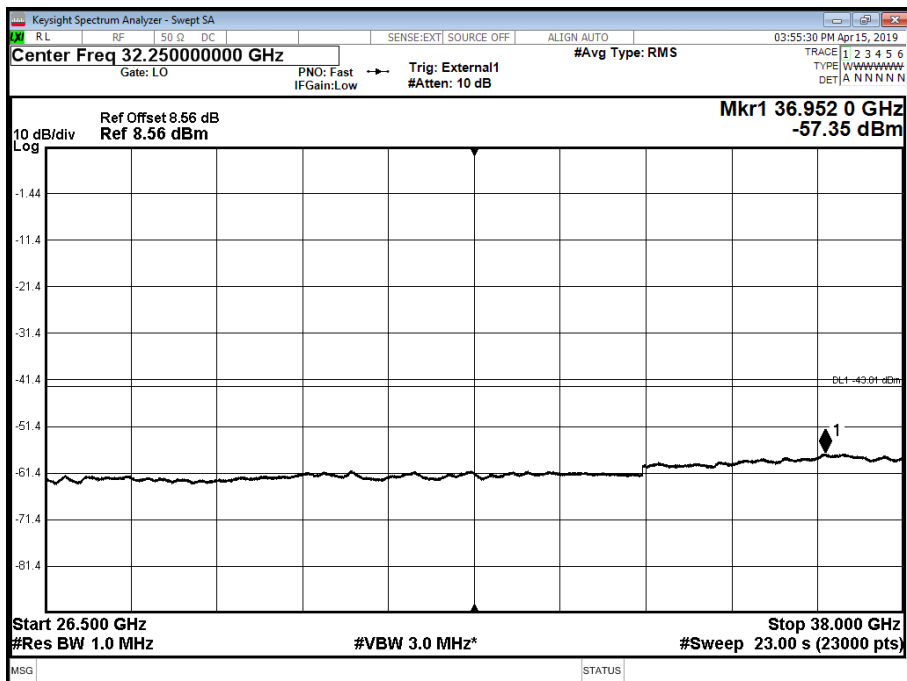




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band 4 - Range 18000 to 26500 MHz

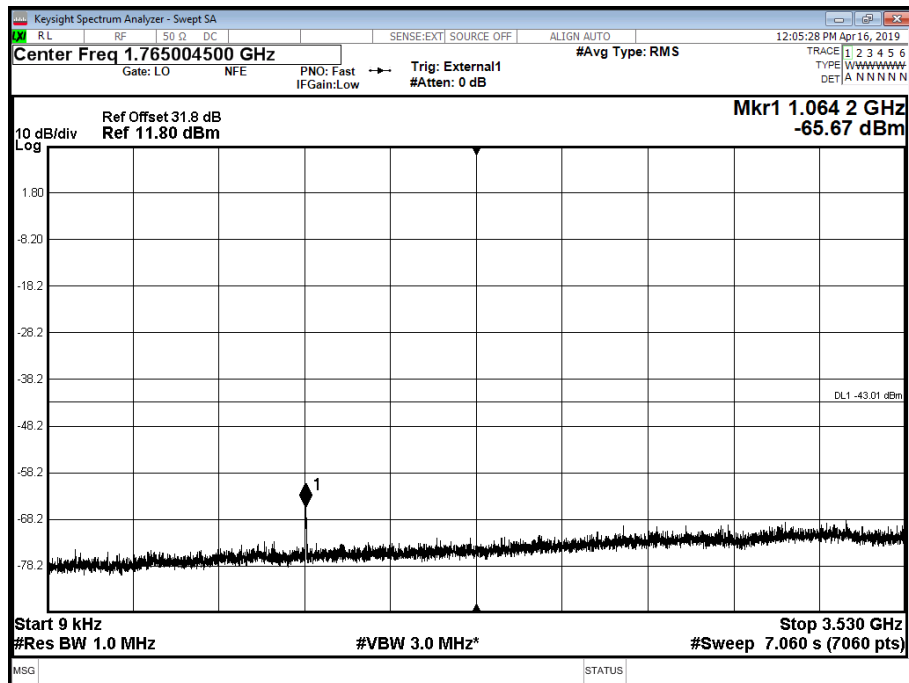


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band 5 - Range 26500 to 38000 MHz

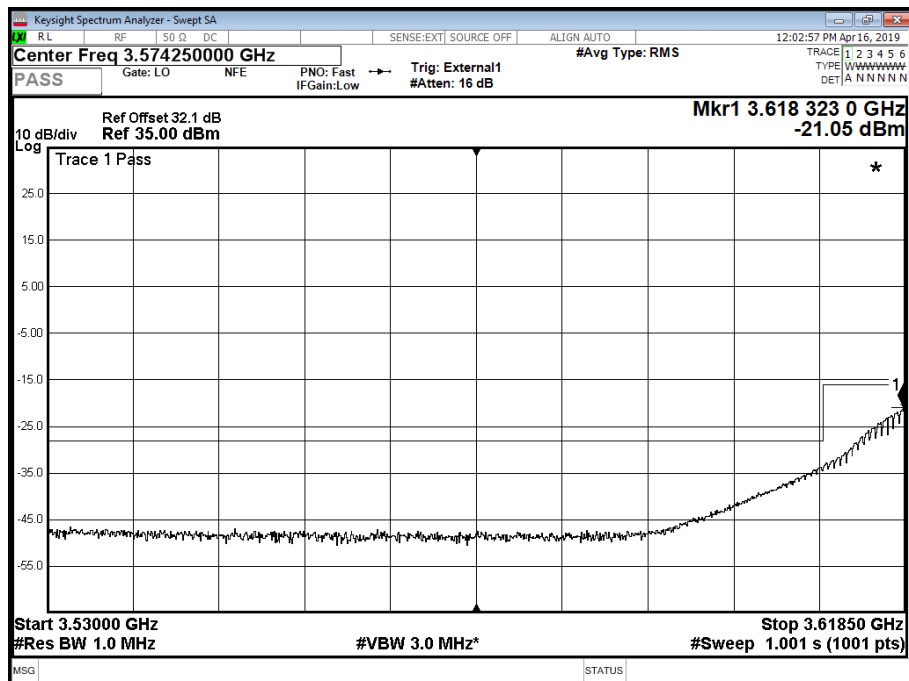




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band 1 - Range 0.009 to 3530 MHz

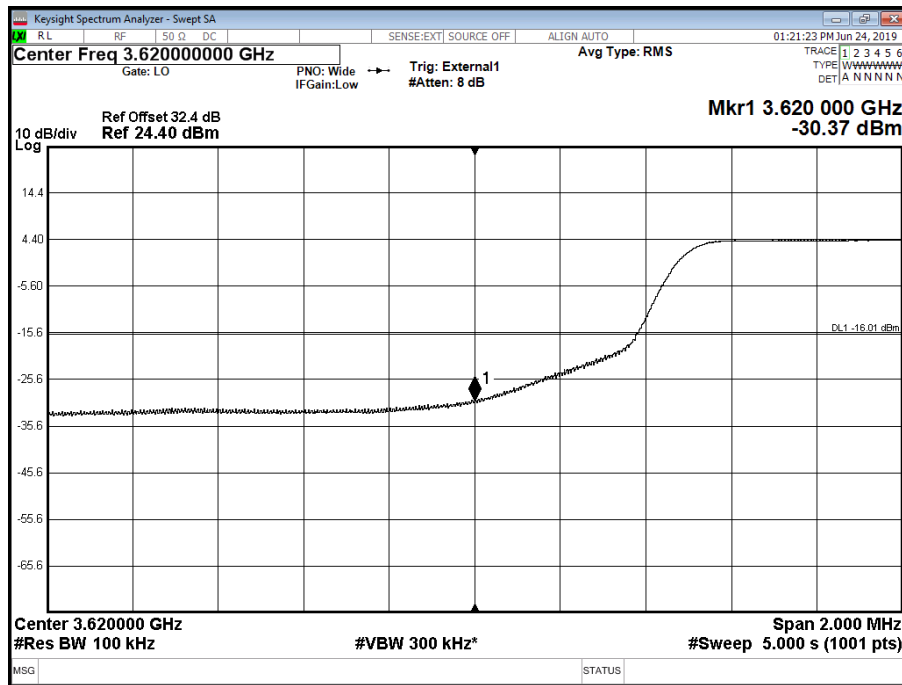


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band Mask Low 1 - Range Mask Low 1

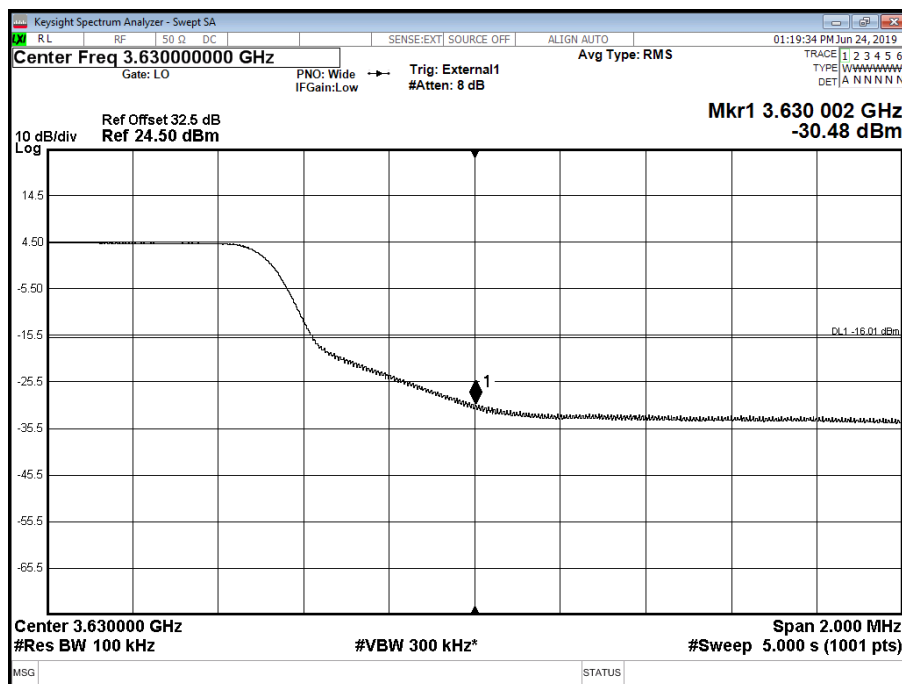




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band Mask Low 1 - Range Carrier Edge Low

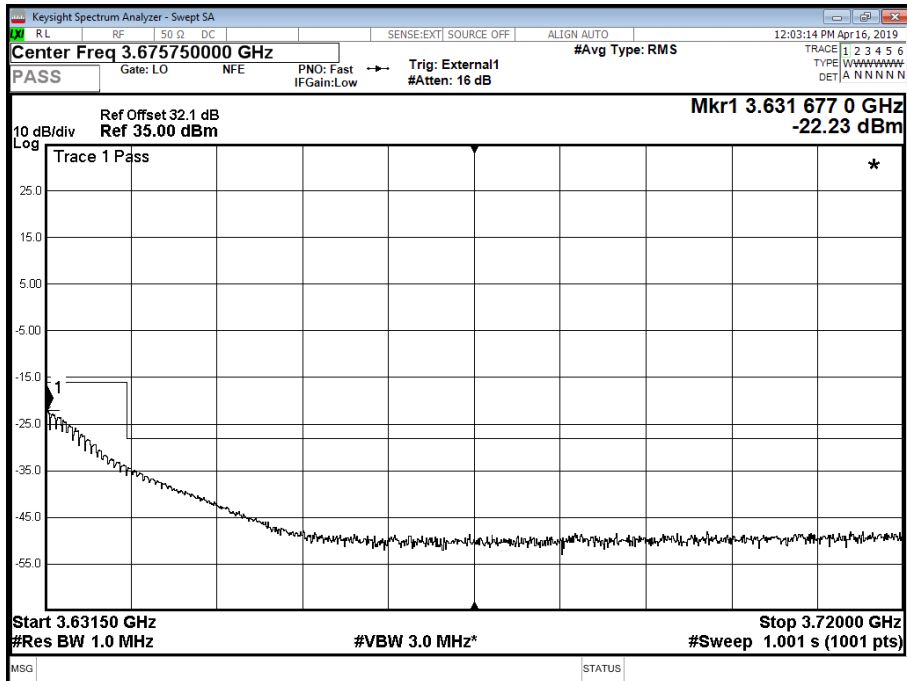


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band Mask Low 1 - Range Carrier Edge High

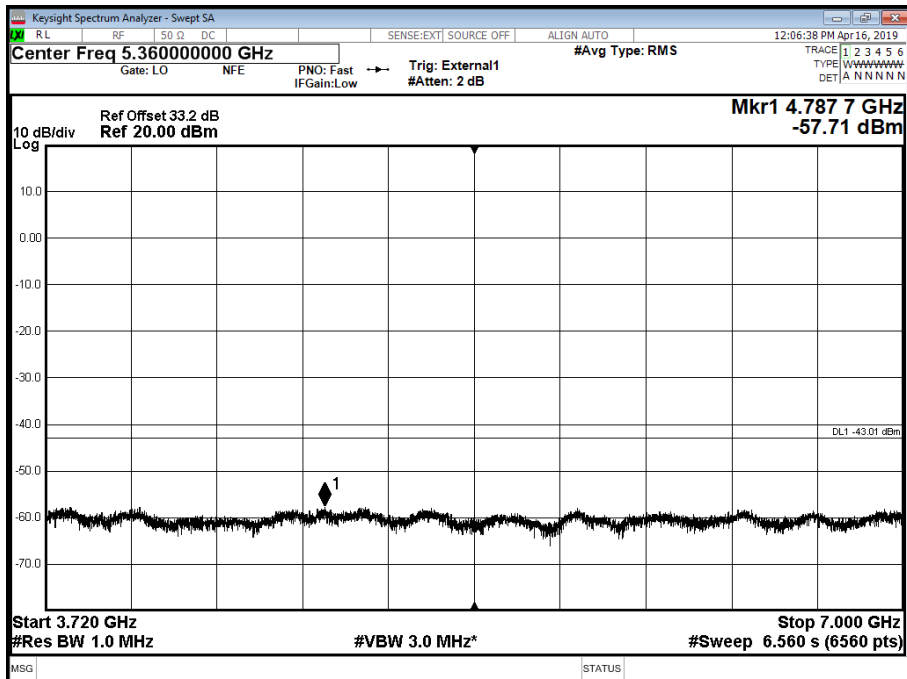




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band Mask High 1 - Range Mask High 1

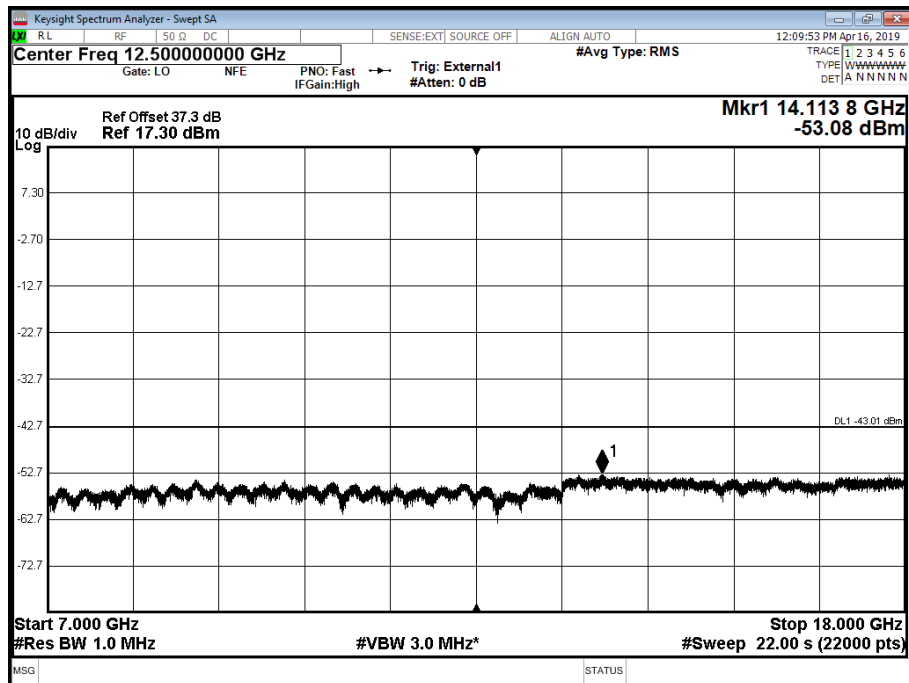


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band 2 - Range 3720 to 7000 MHz

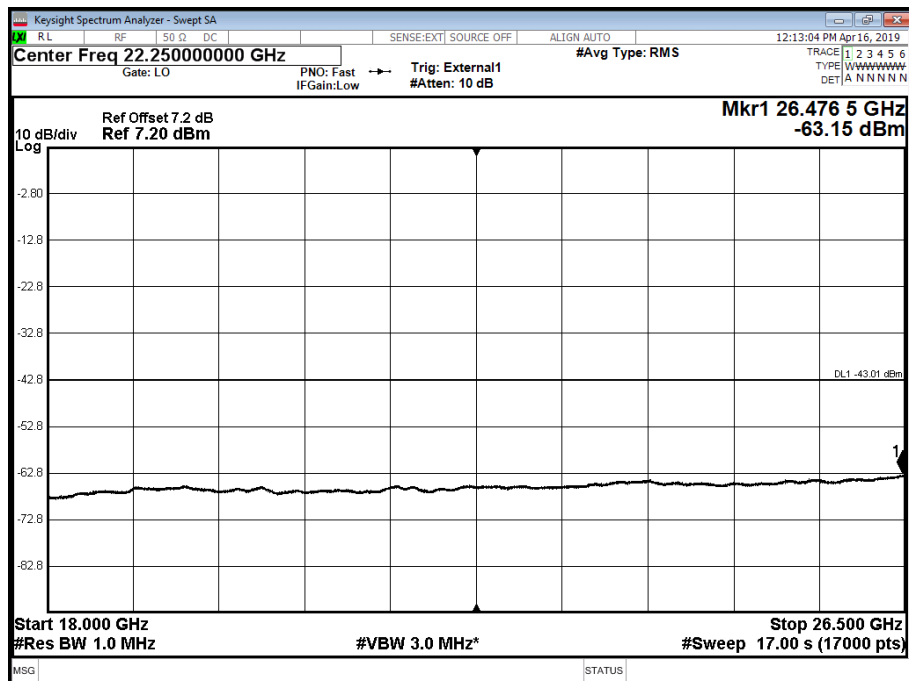




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band 3 - Range 7000 to 18000 MHz

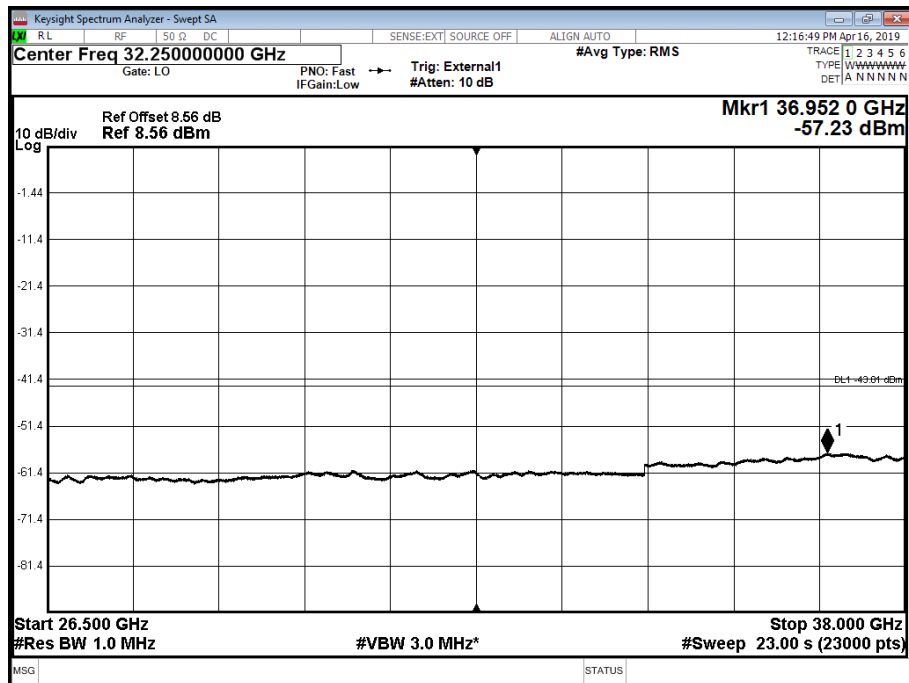


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band 4 - Range 18000 to 26500 MHz

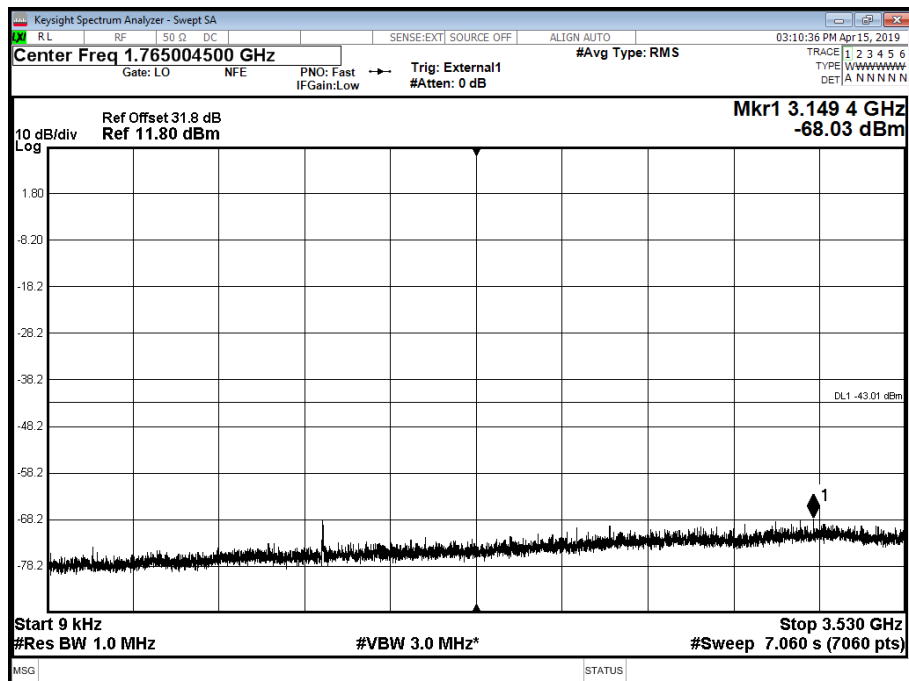




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M - Band 5 - Range 26500 to 38000 MHz

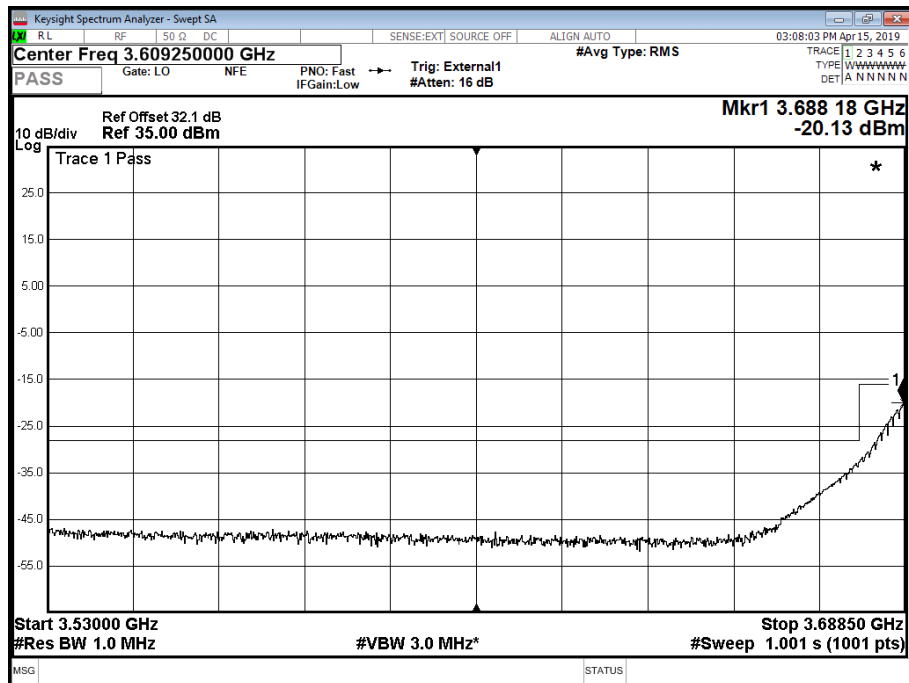


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 1 - Range 0.009 to 3530 MHz

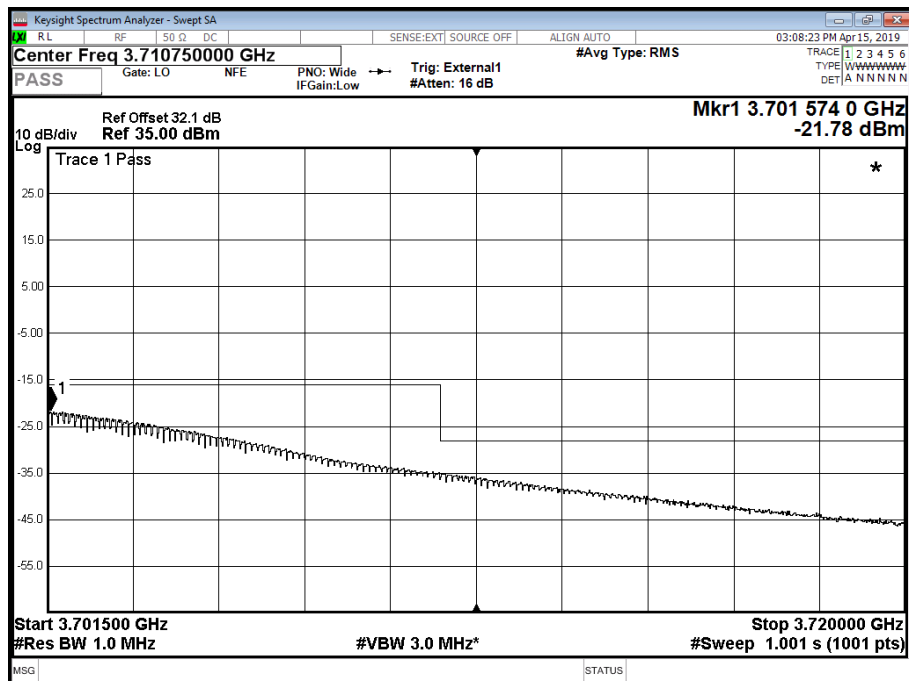




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T -
Band Mask Low 1 - Range Mask Low 1

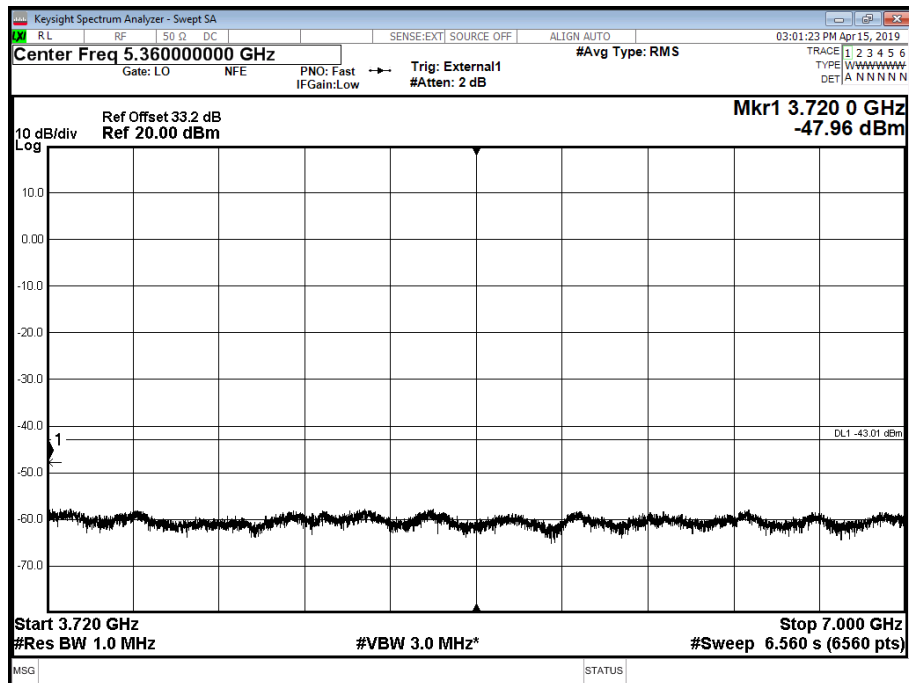


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T -
Band Mask High 1 - Range Mask High 1

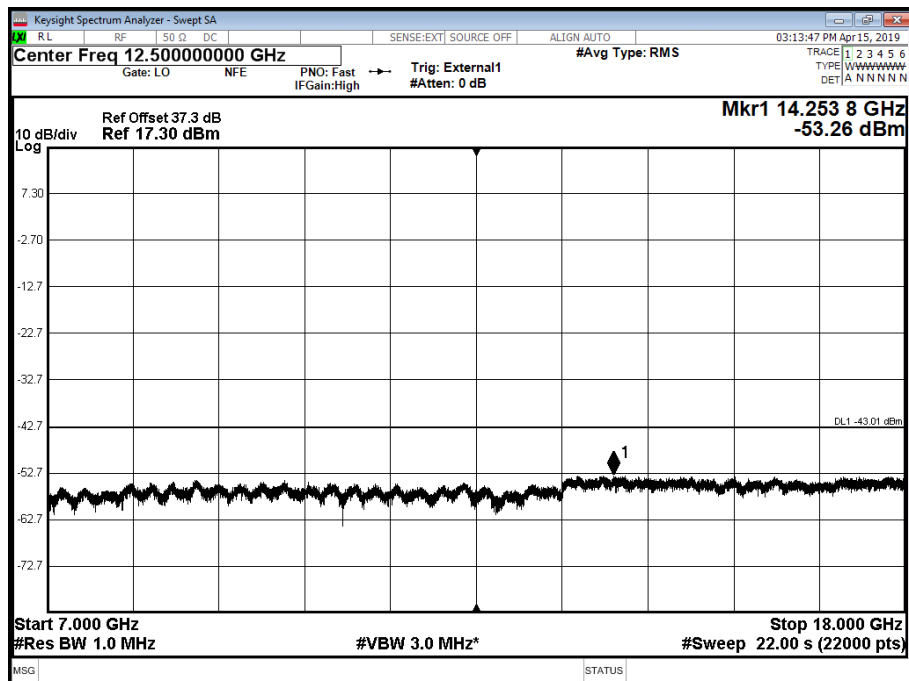




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 2 - Range 3720 to 7000 MHz

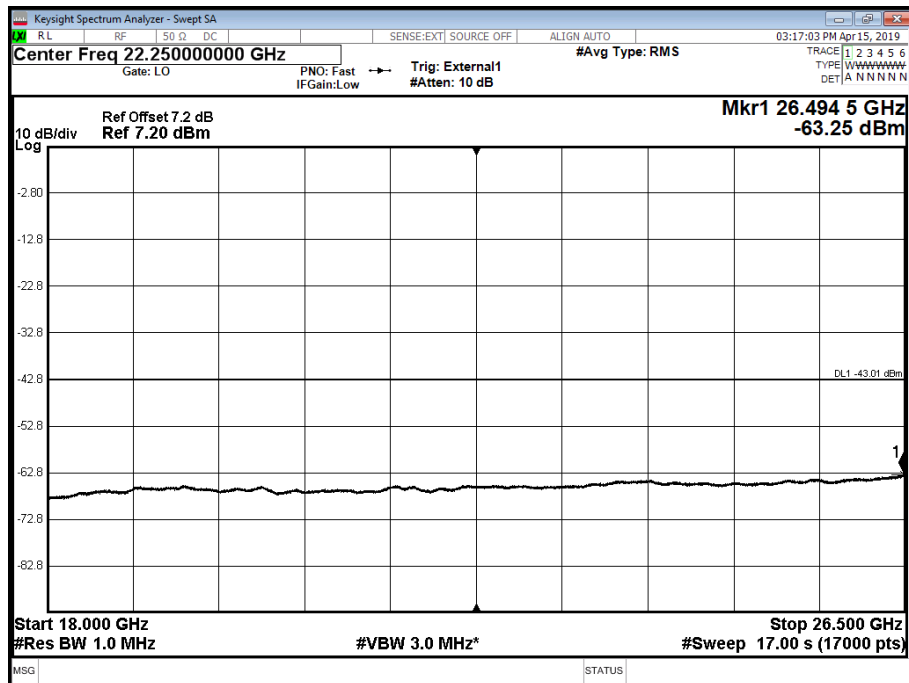


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 3 - Range 7000 to 18000 MHz

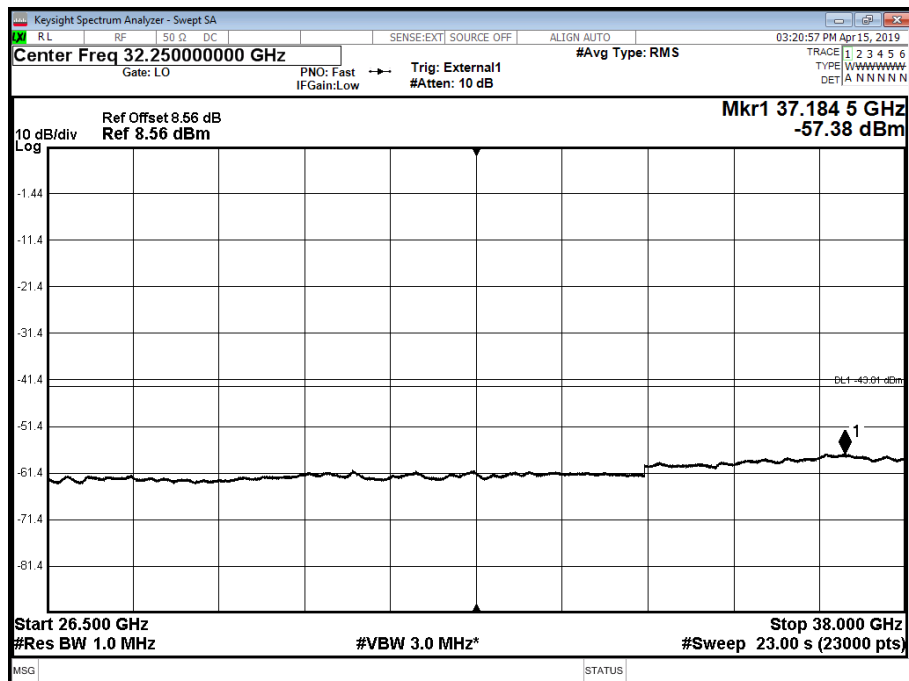




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 4 - Range 18000 to 26500 MHz

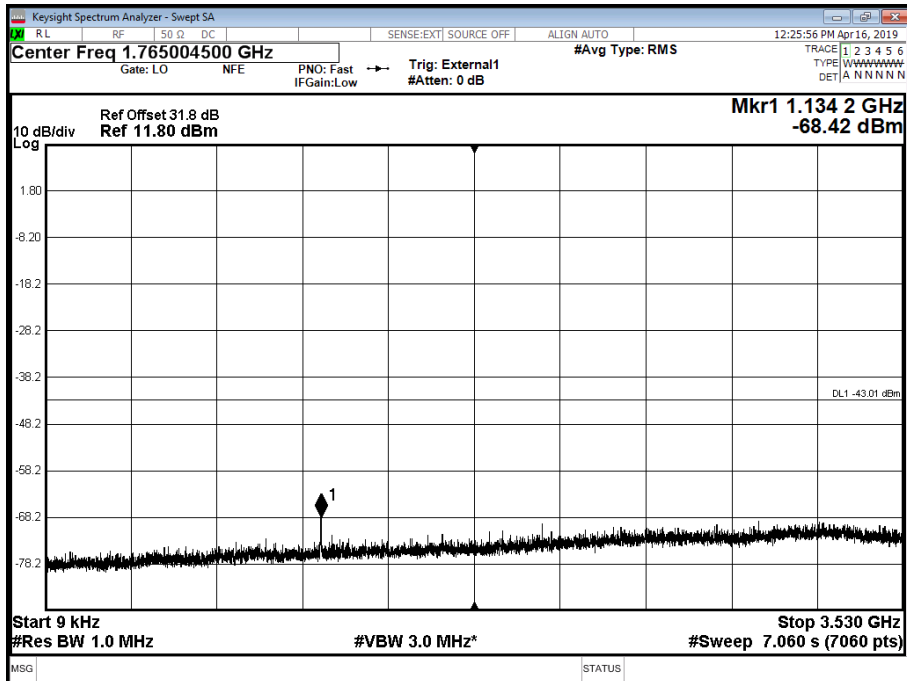


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 5 - Range 26500 to 38000 MHz

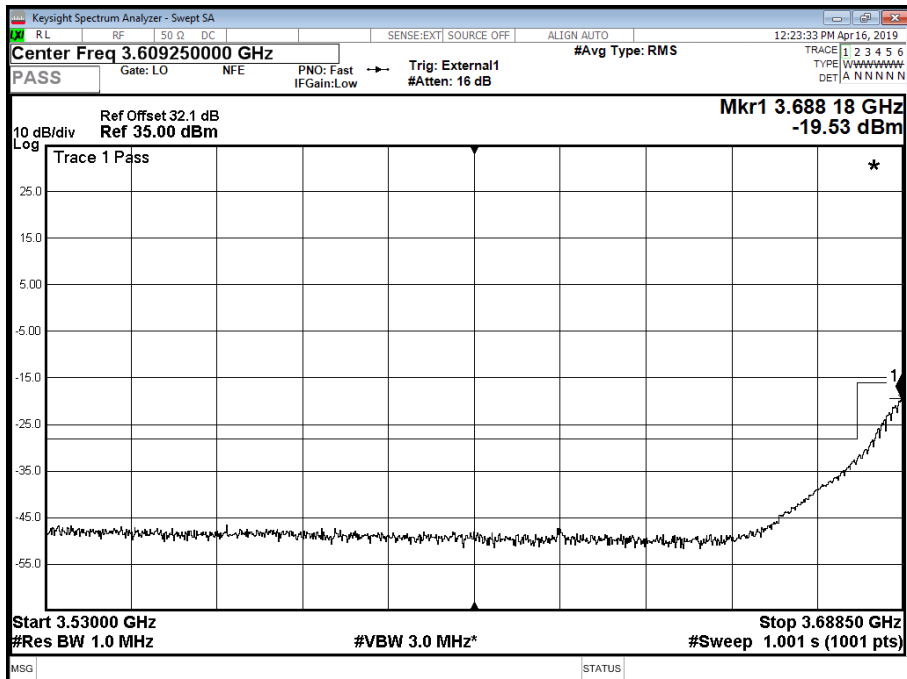




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 1 - Range 0.009 to 3530 MHz

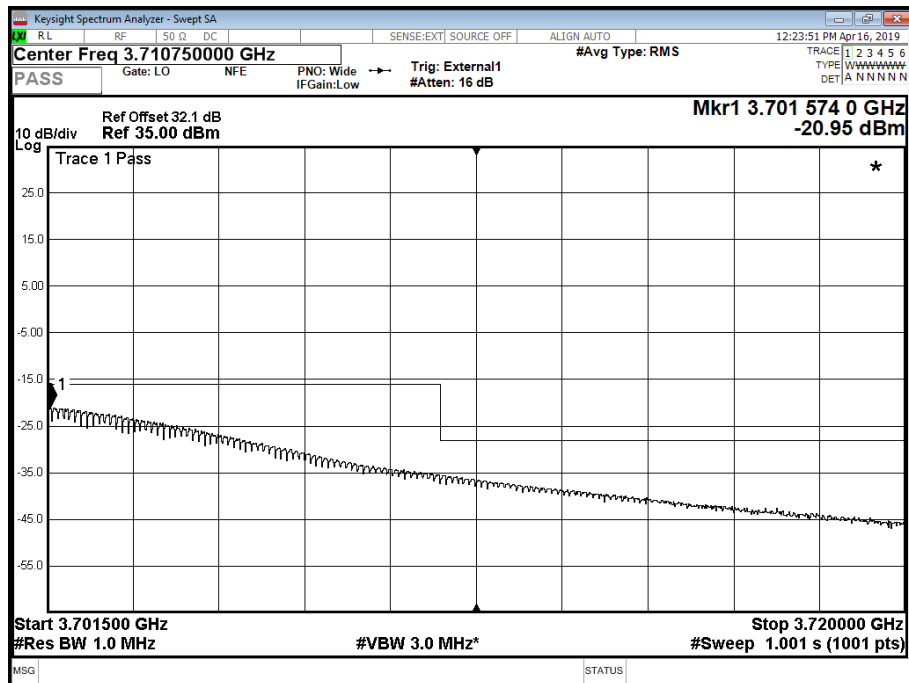


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band Mask Low 1 - Range Mask Low 1

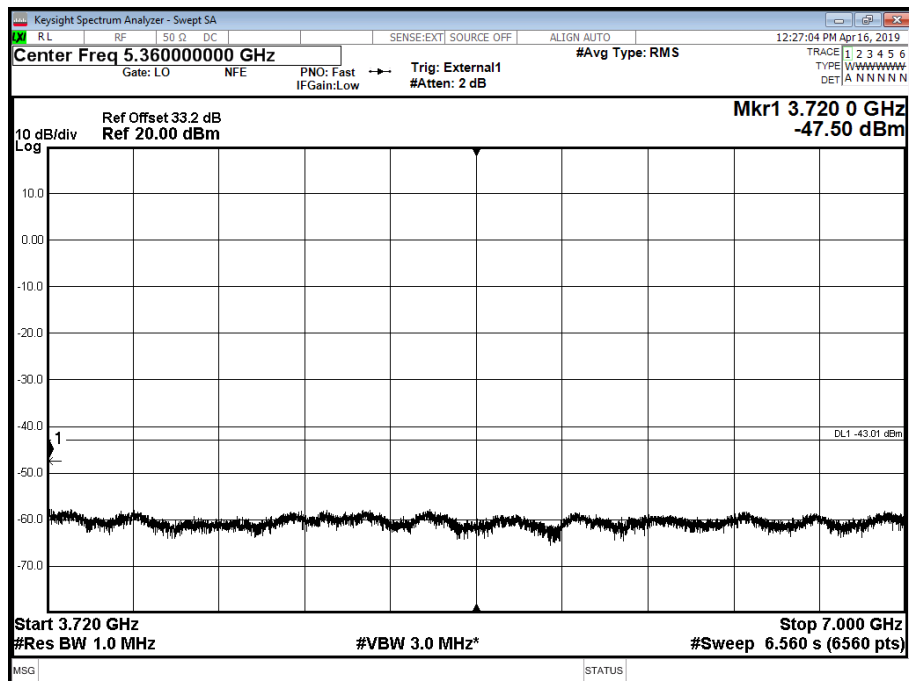




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T -
Band Mask High 1 - Range Mask High 1

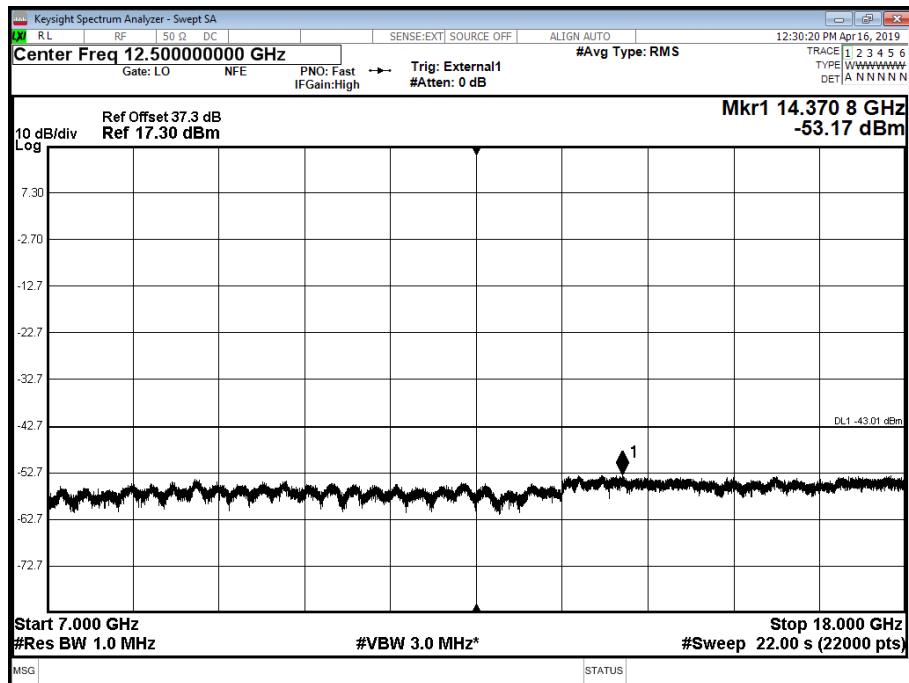


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T -
Band 2 - Range 3720 to 7000 MHz

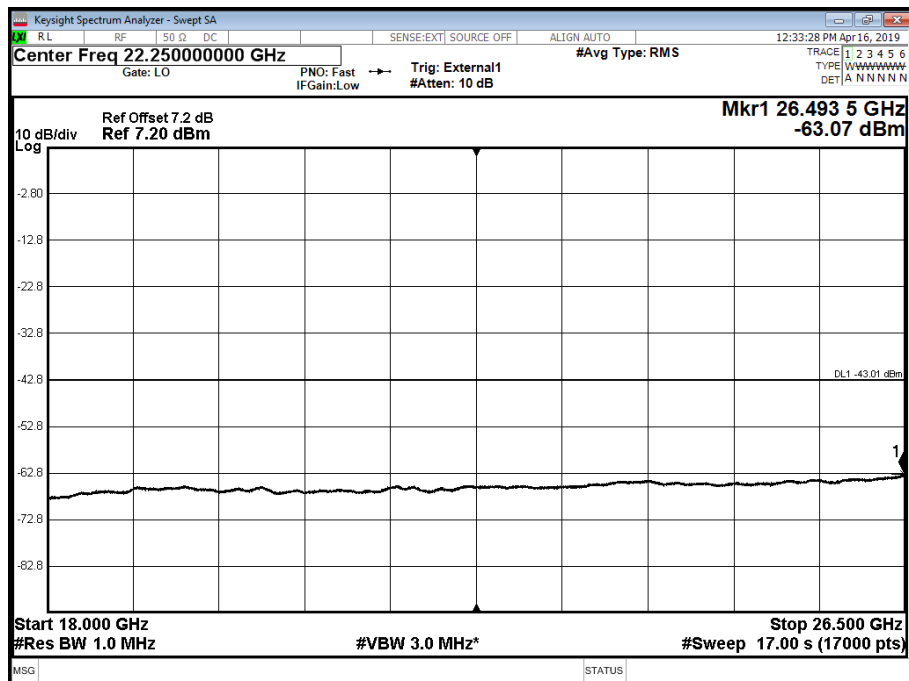




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 3 - Range 7000 to 18000 MHz

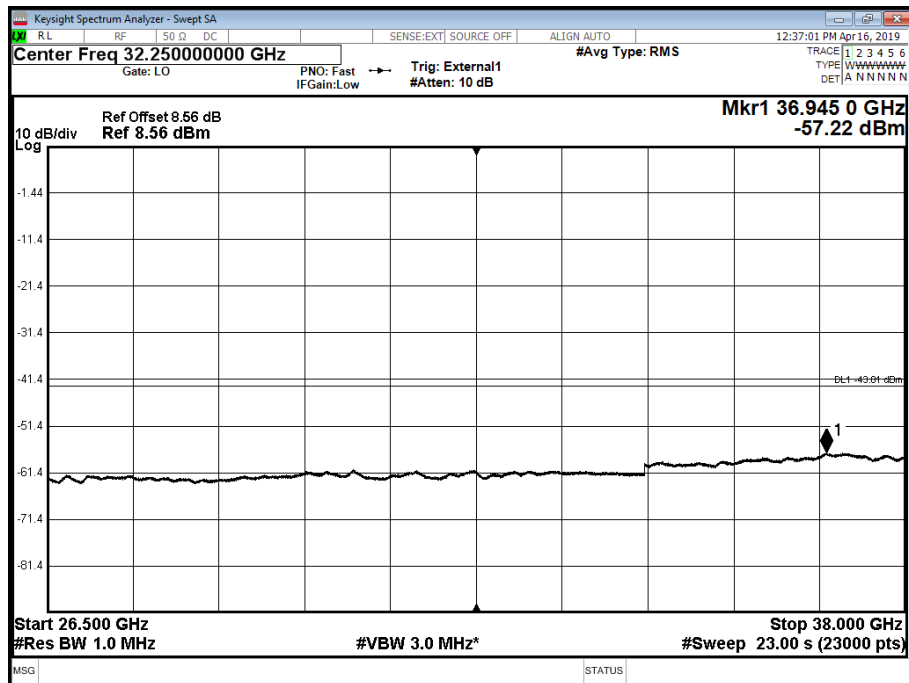


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 4 - Range 18000 to 26500 MHz

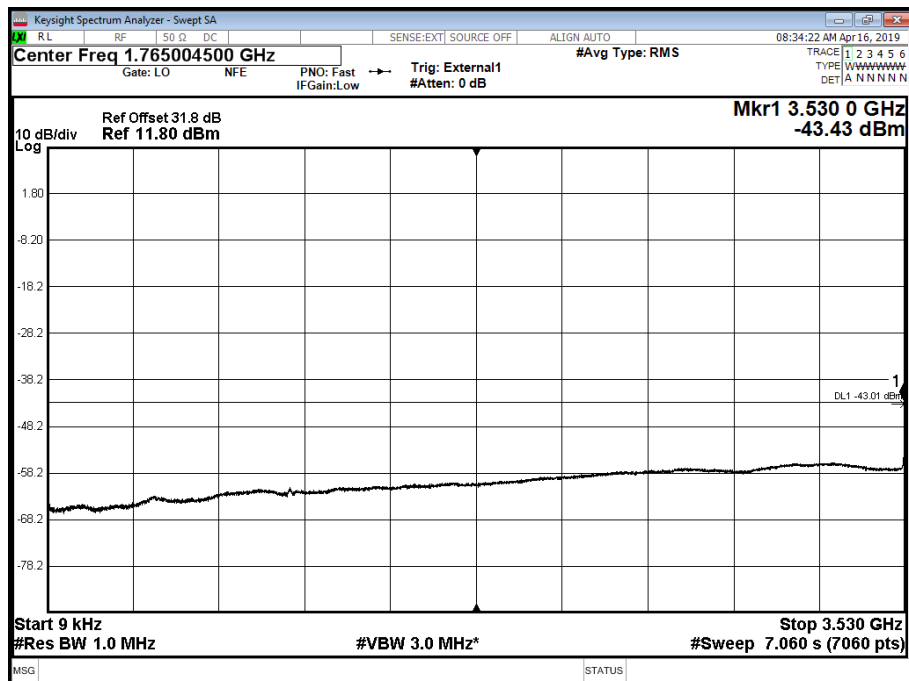




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T - Band 5 - Range 26500 to 38000 MHz

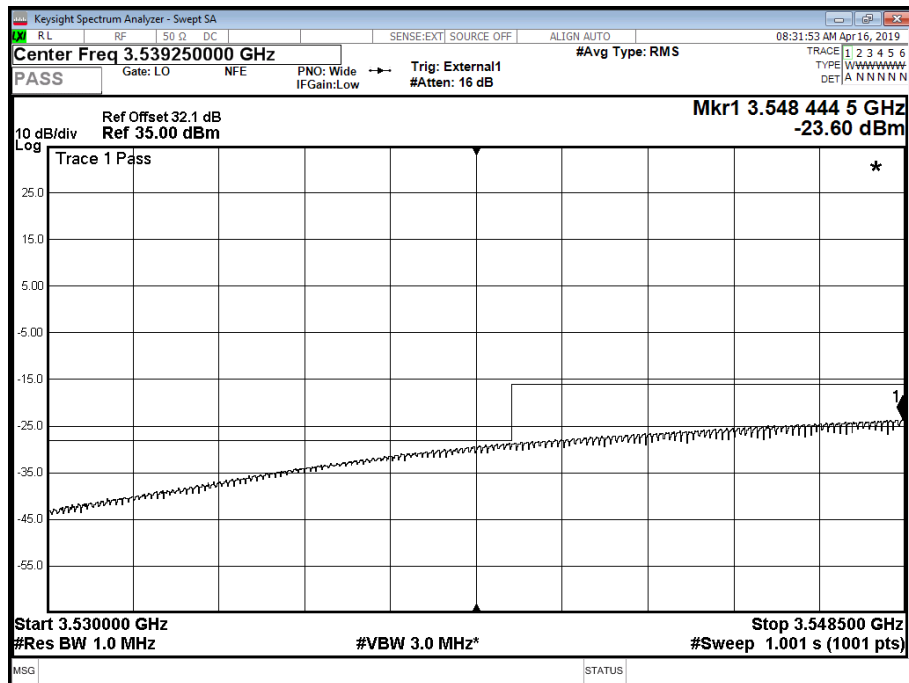


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B - Band 1 - Range 0.009 to 3530 MHz

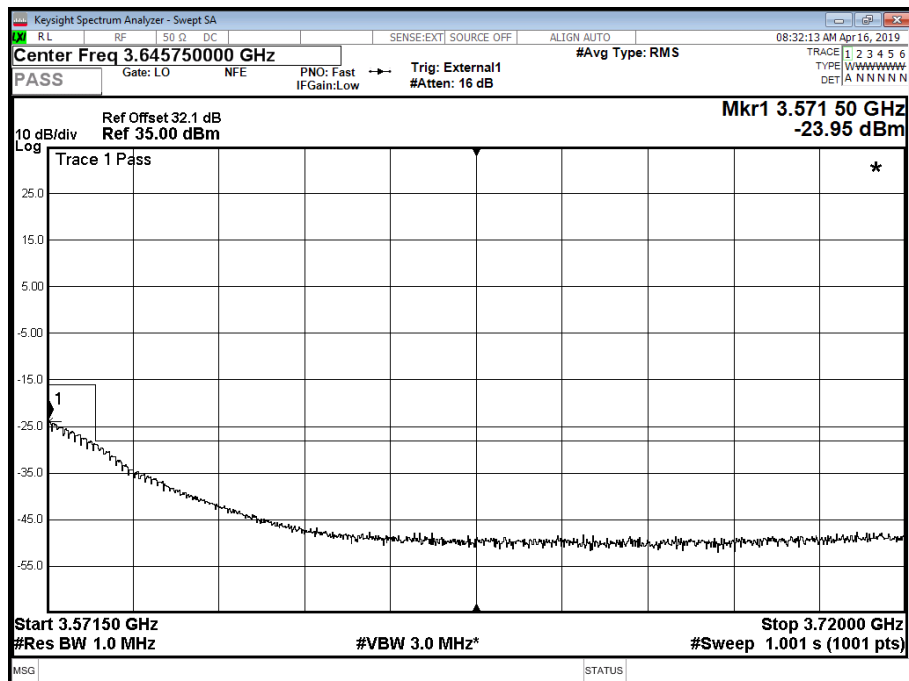




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B -
Band Mask Low 1 - Range Mask Low 1

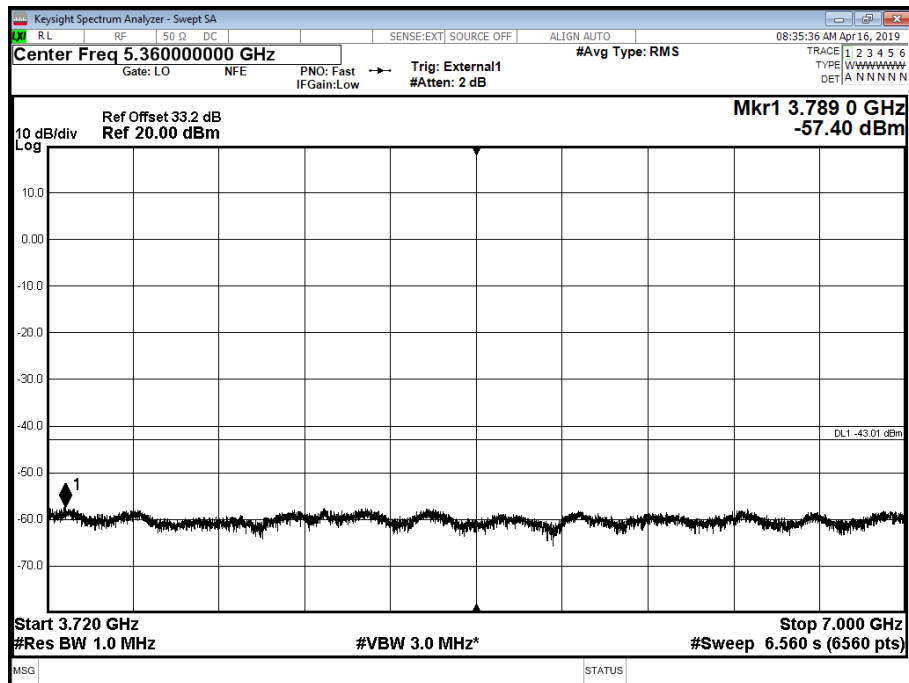


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B -
Band Mask High 1 - Range Mask High 1

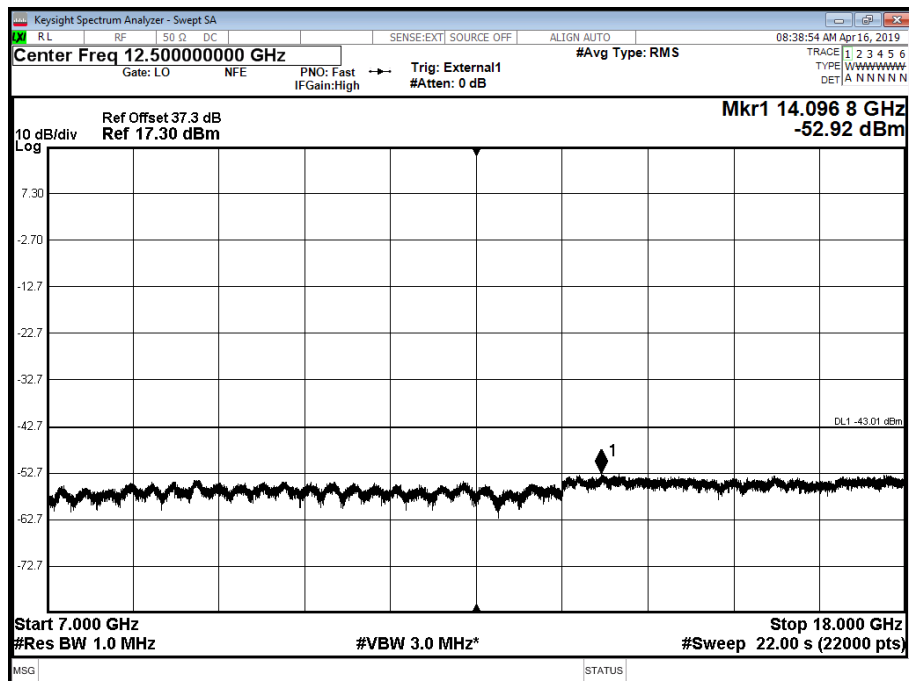




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B – Band 2 - Range 3720 to 7000 MHz

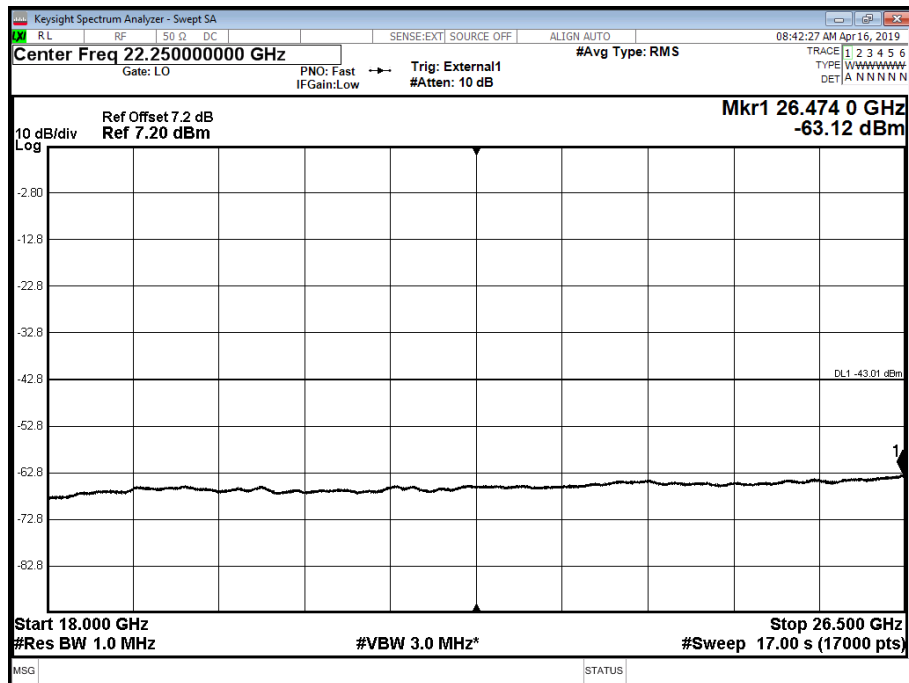


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B - Band 3 - Range 7000 to 18000 MHz

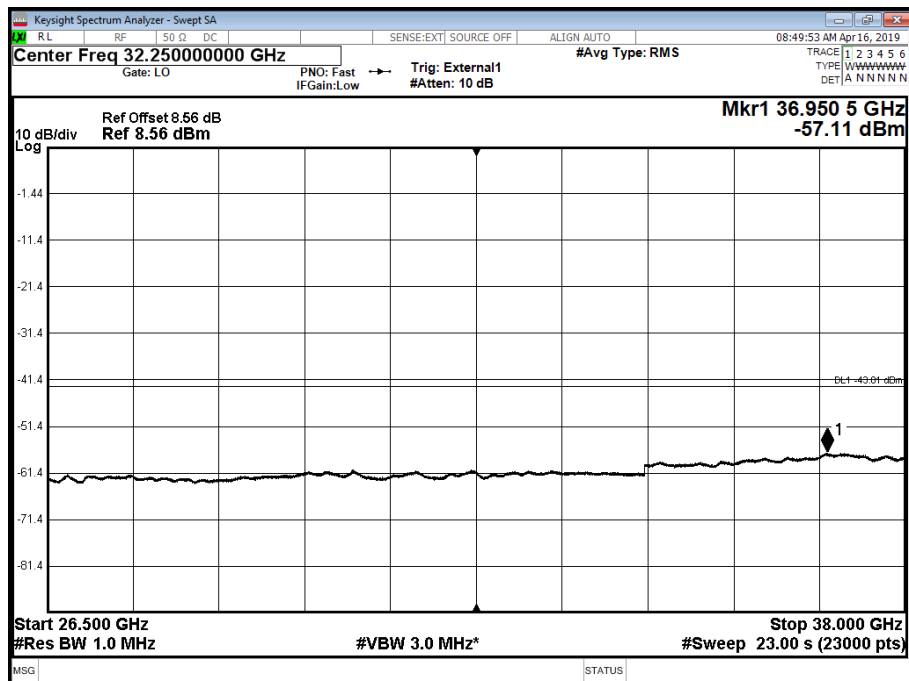




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B - Band 4 - Range 18000 to 26500 MHz

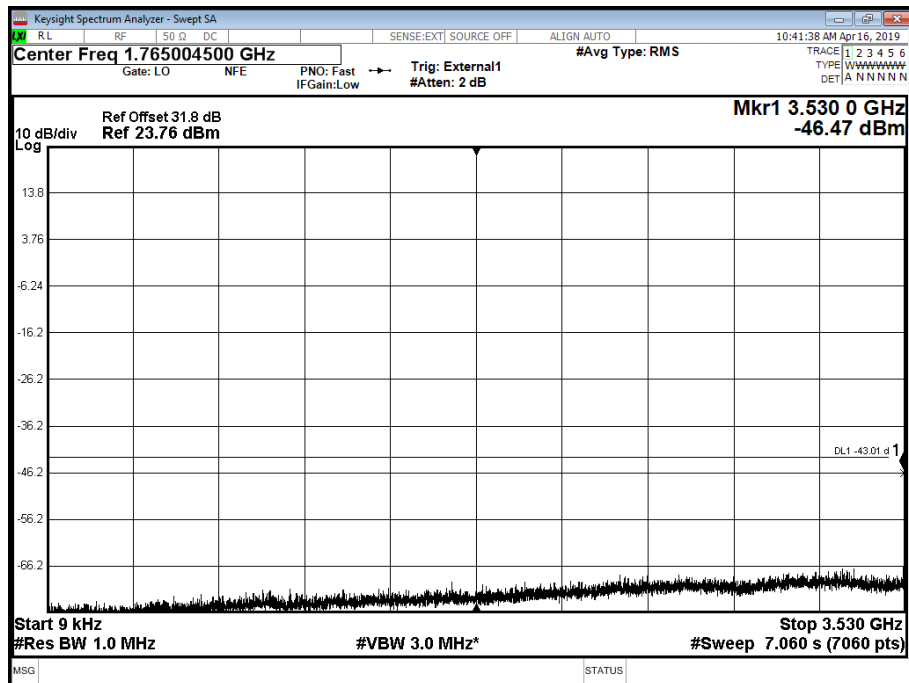


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B - Band 5 - Range 26500 to 38000 MHz

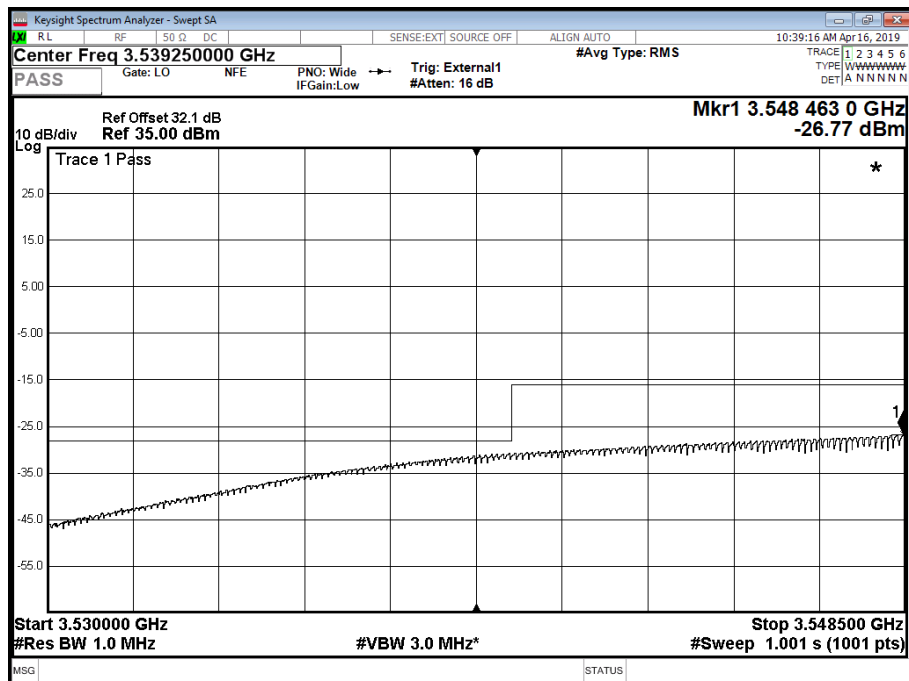




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B - Band 1 - Range 0.009 to 3530 MHz

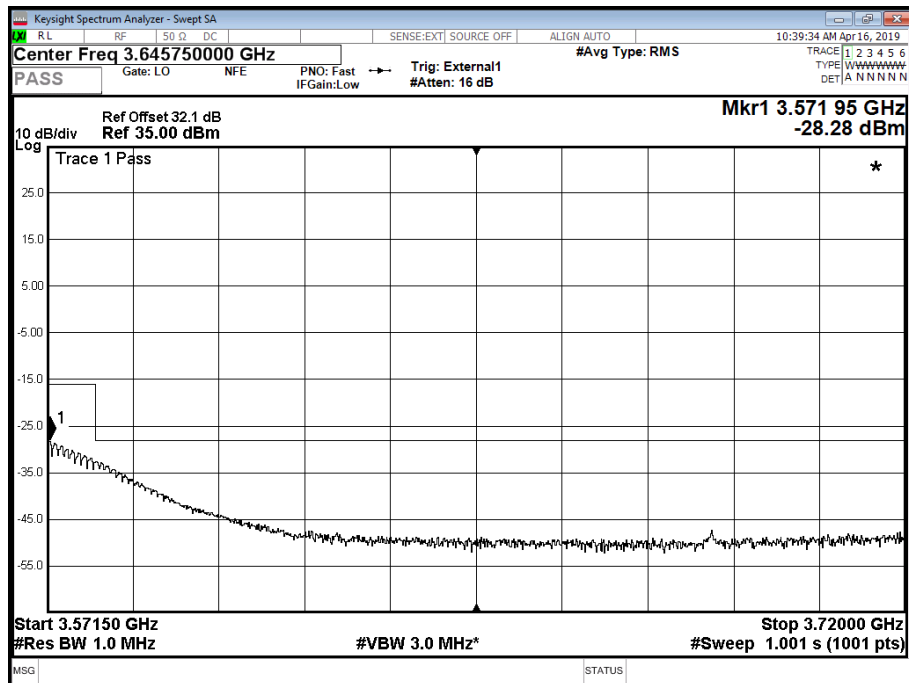


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B - Band Mask Low 1 - Range Mask Low 1

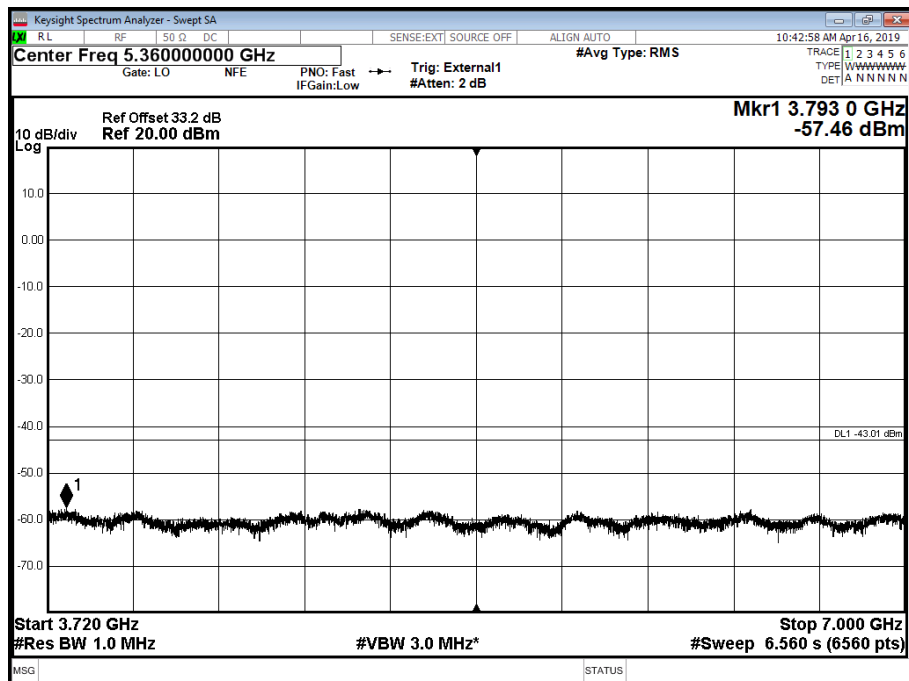




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B - Band Mask High 1 - Range Mask High 1

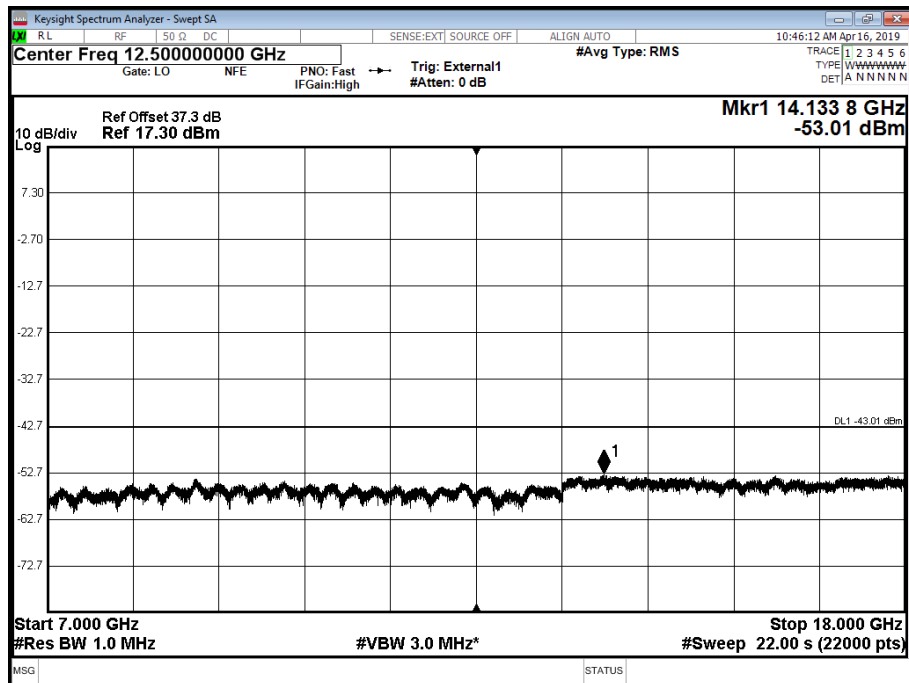


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B - Band 2 - Range 3720 to 7000 MHz

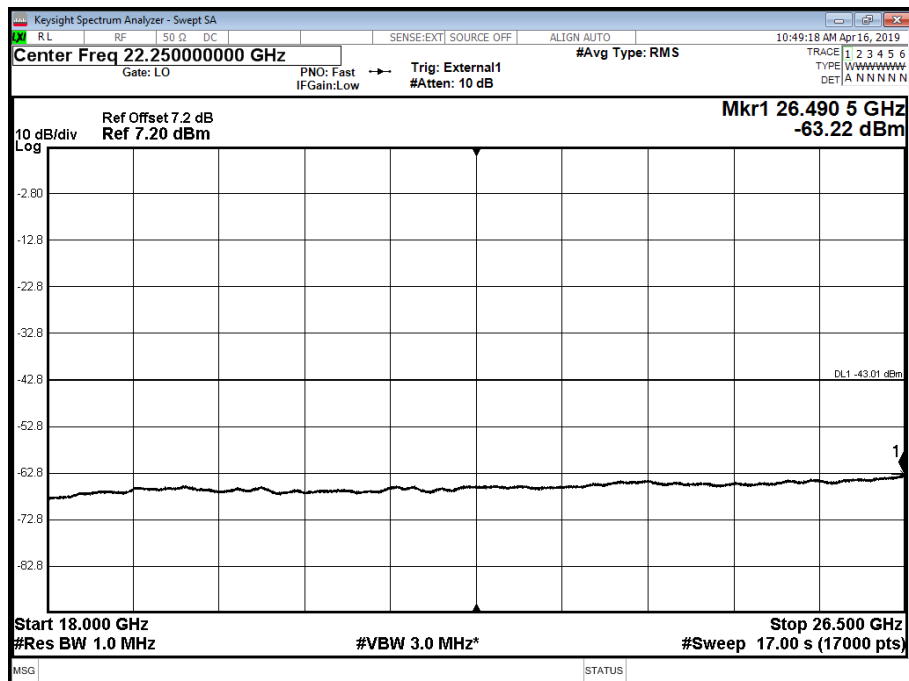




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B - Band 3 - Range 7000 to 18000 MHz

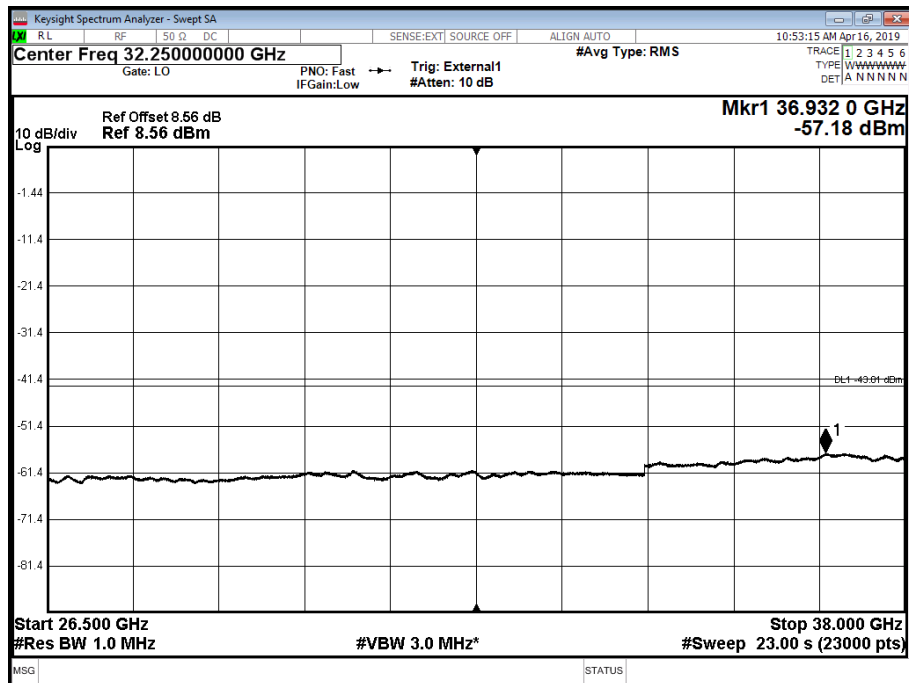


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B - Band 4 - Range 18000 to 26500 MHz

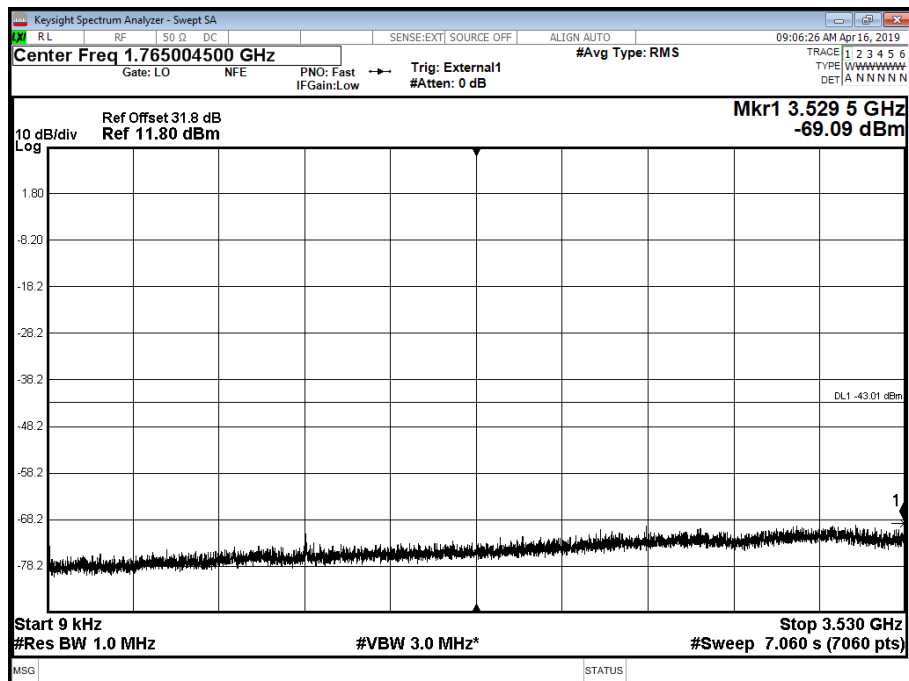




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B - Band 5 - Range 26500 to 38000 MHz

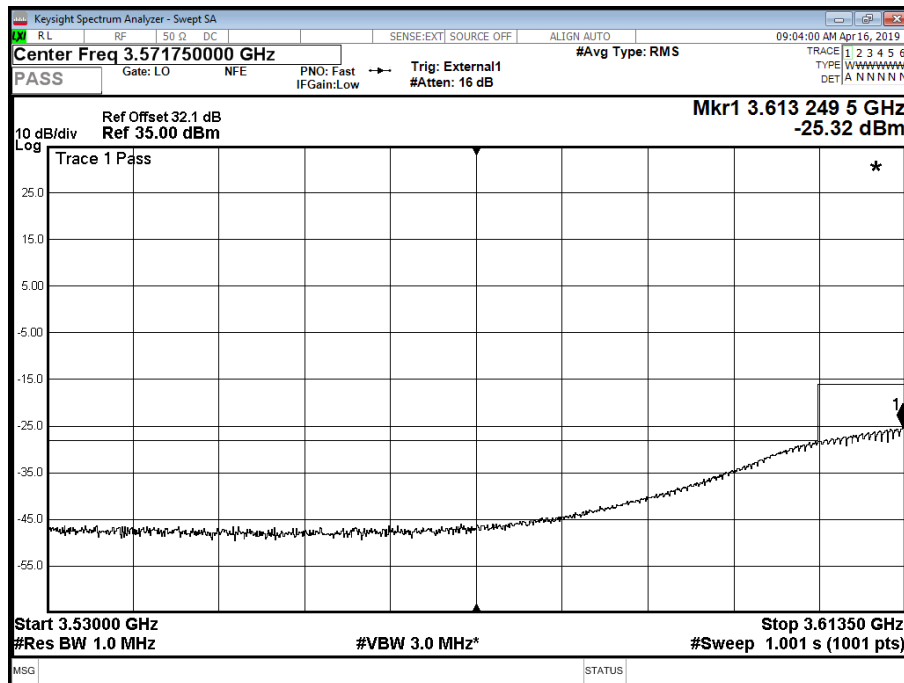


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Band 1 - Range 0.009 to 3530 MHz

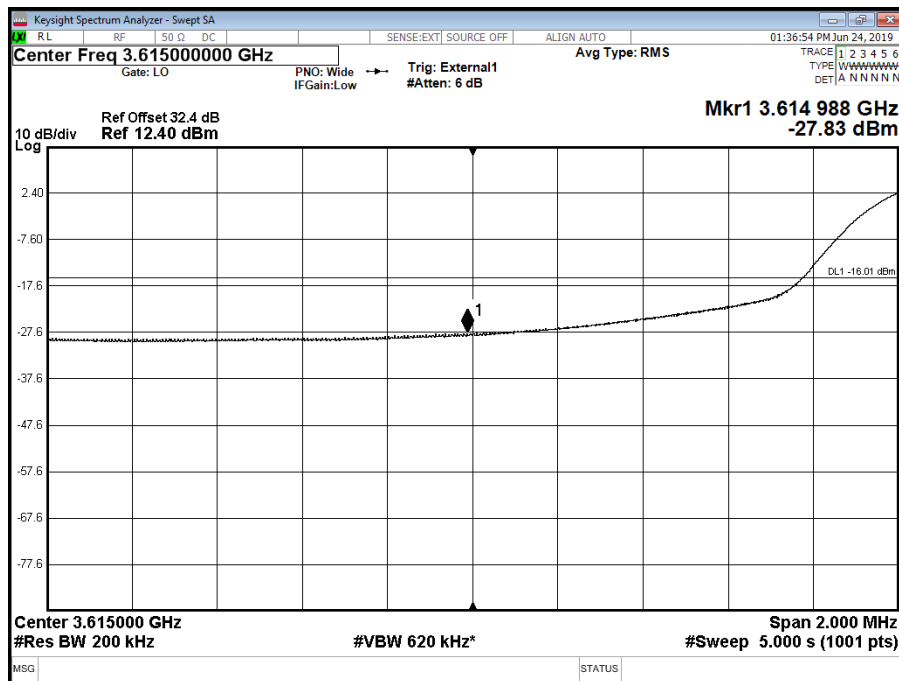




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M -
Band Mask Low 1 - Range Mask Low 1

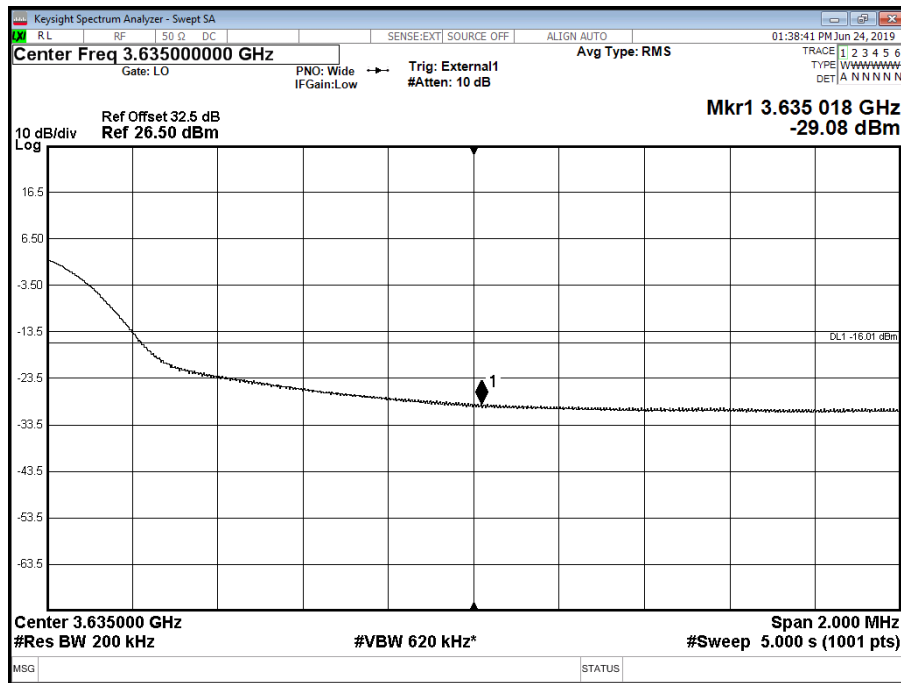


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M -
Band Mask Low 1 - Range Carrier Edge Low

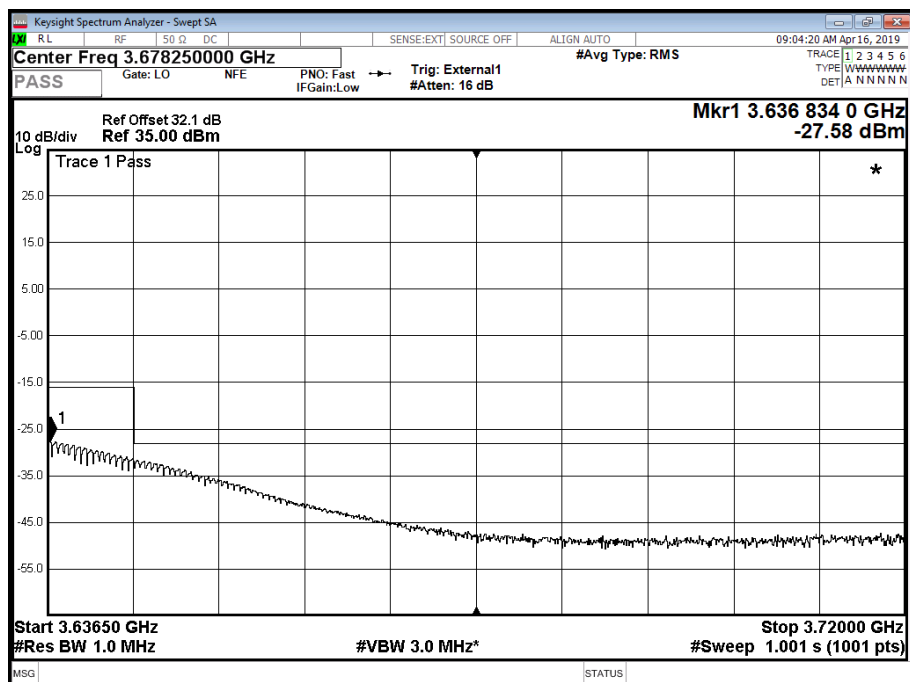




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Band Mask Low 1 - Range Carrier Edge High

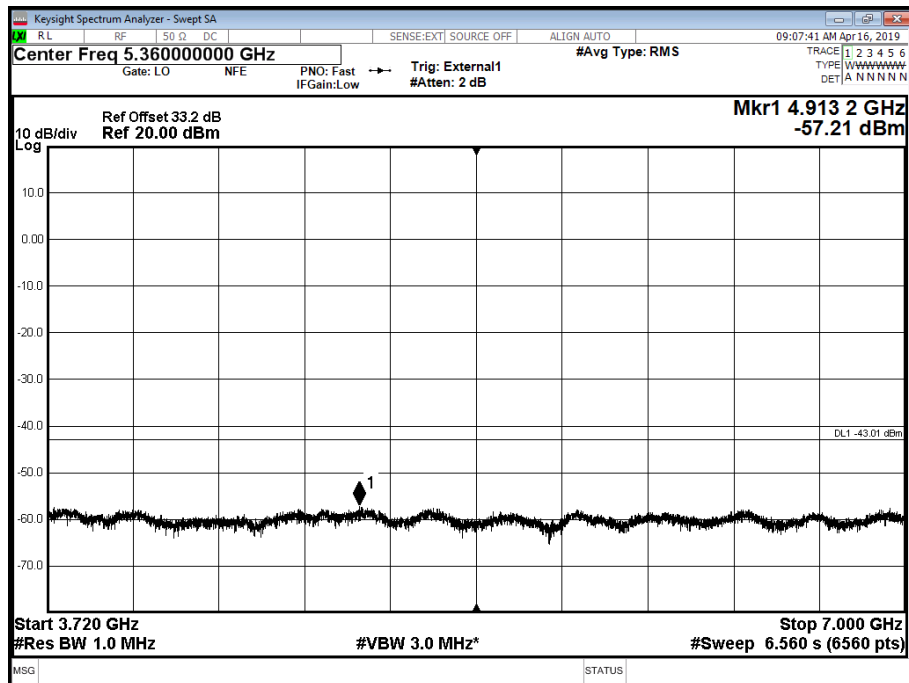


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Band Mask_High_1 - Range Mask_High_1

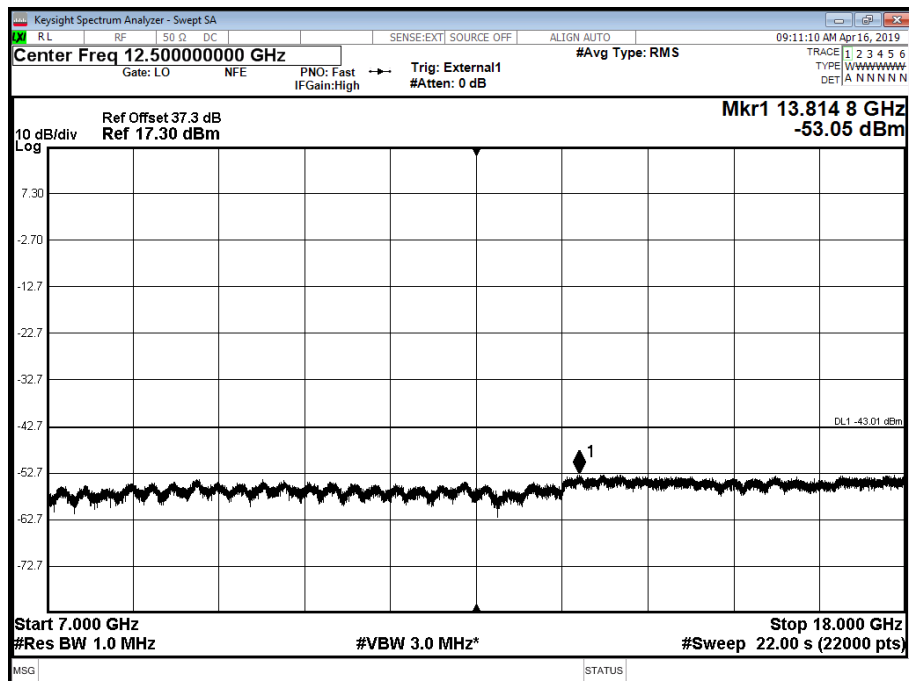




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Band 2 - Range 3720 to 7000 MHz

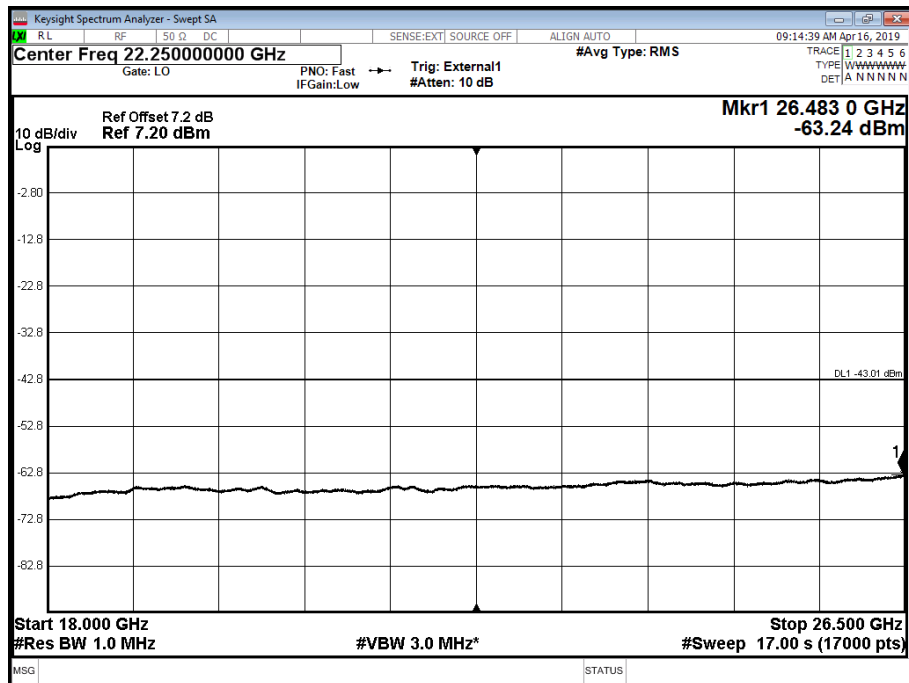


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Band 3 - Range 7000 to 18000 MHz

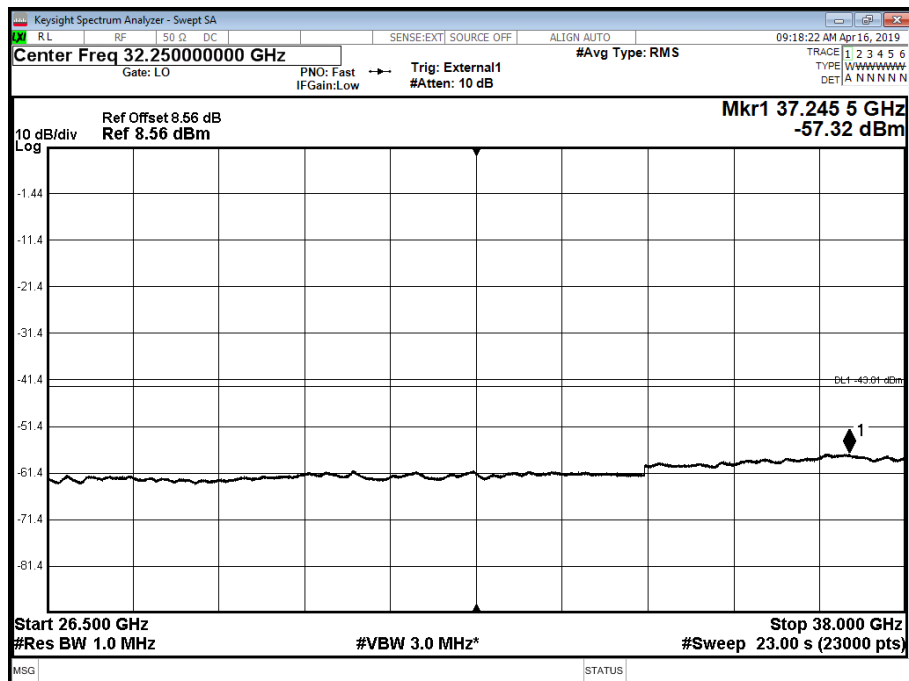




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Band 4 - Range 18000 to 26500 MHz

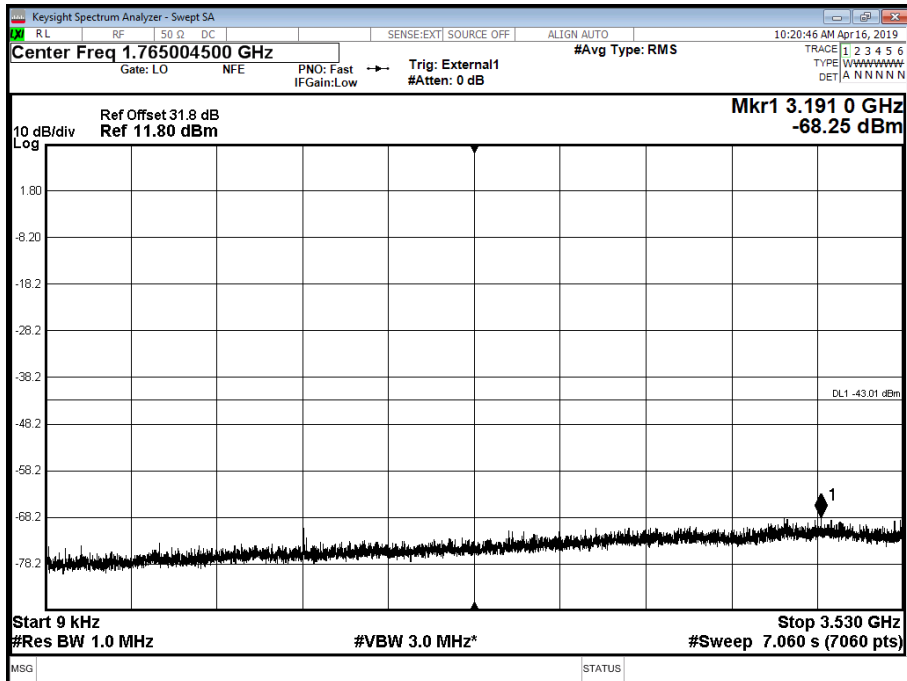


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Band 5 - Range 26500 to 38000 MHz

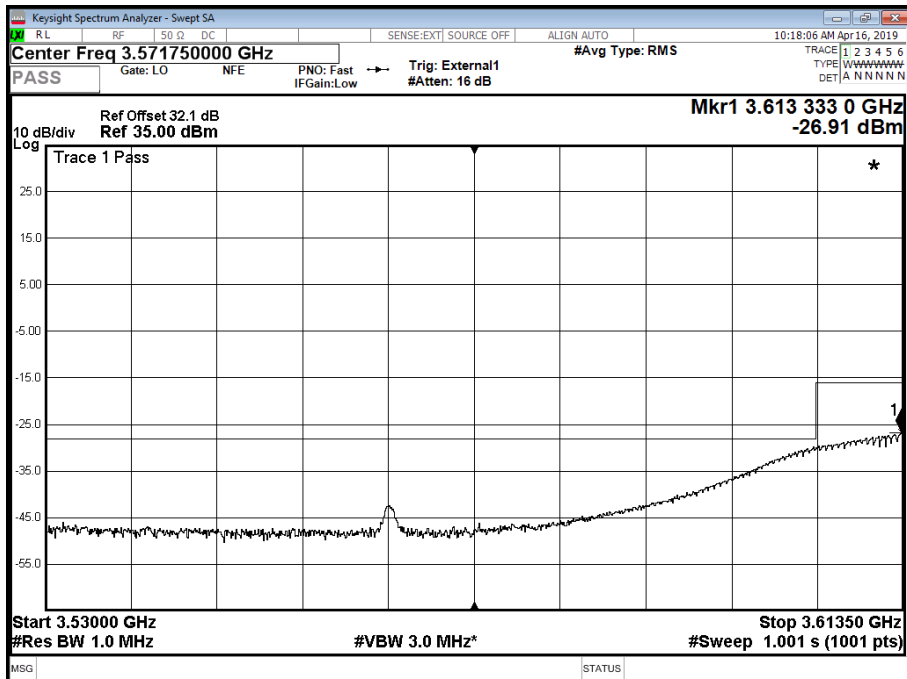




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Band 1 - Range 0.009 to 3530 MHz

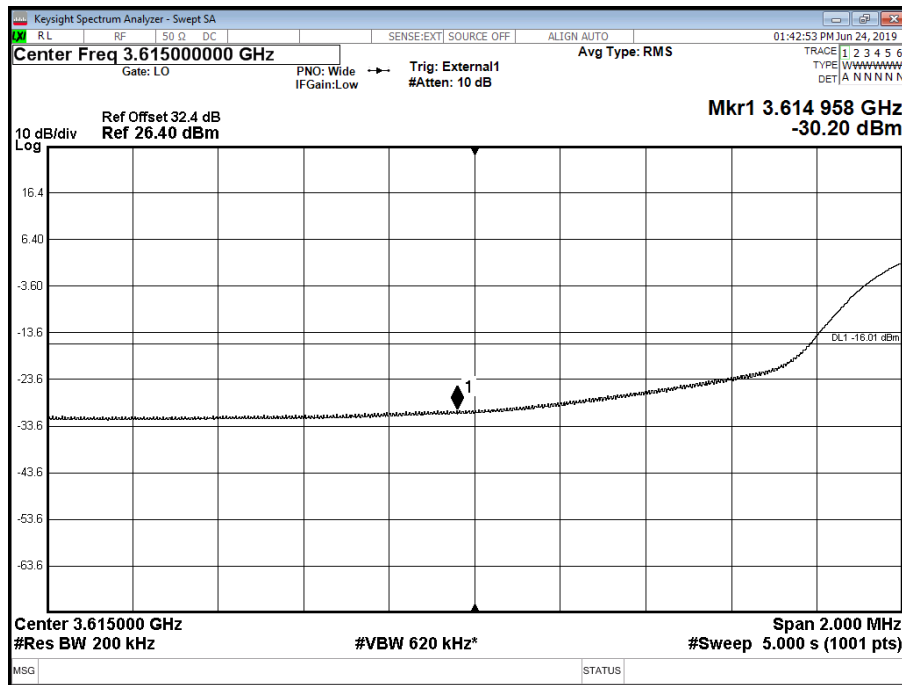


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Band Mask Low 1 - Range Mask Low 1

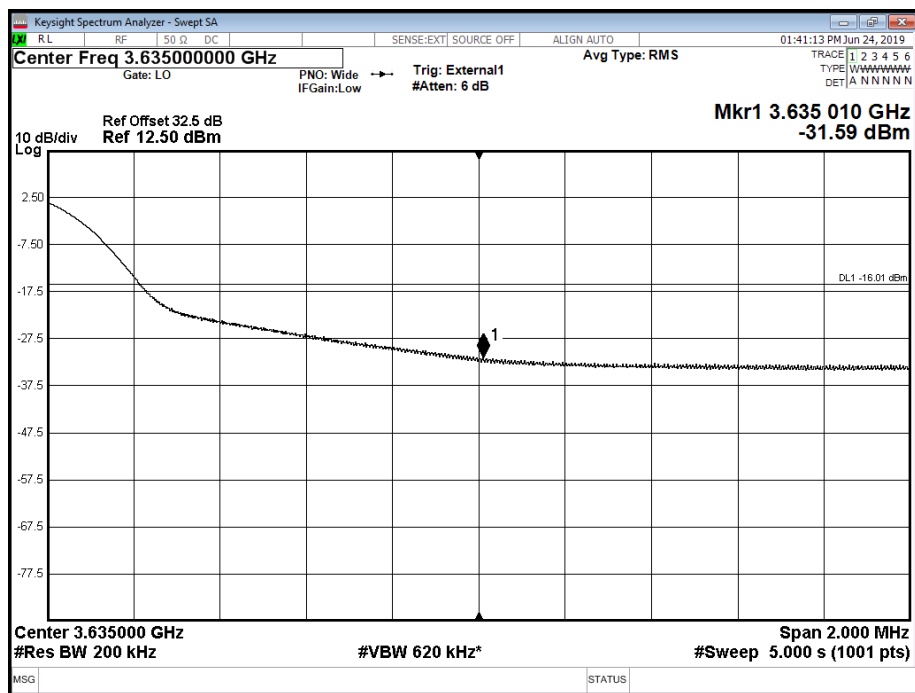




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M -
Band Mask Low 1 - Range Carrier Edge Low

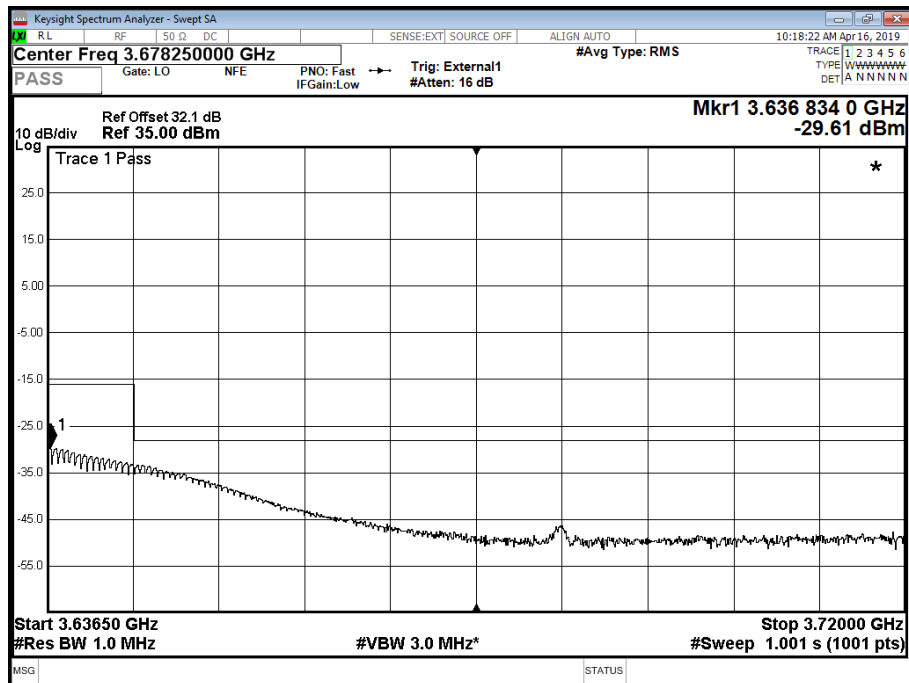


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M -
Band Mask Low 1 - Range Carrier Edge High

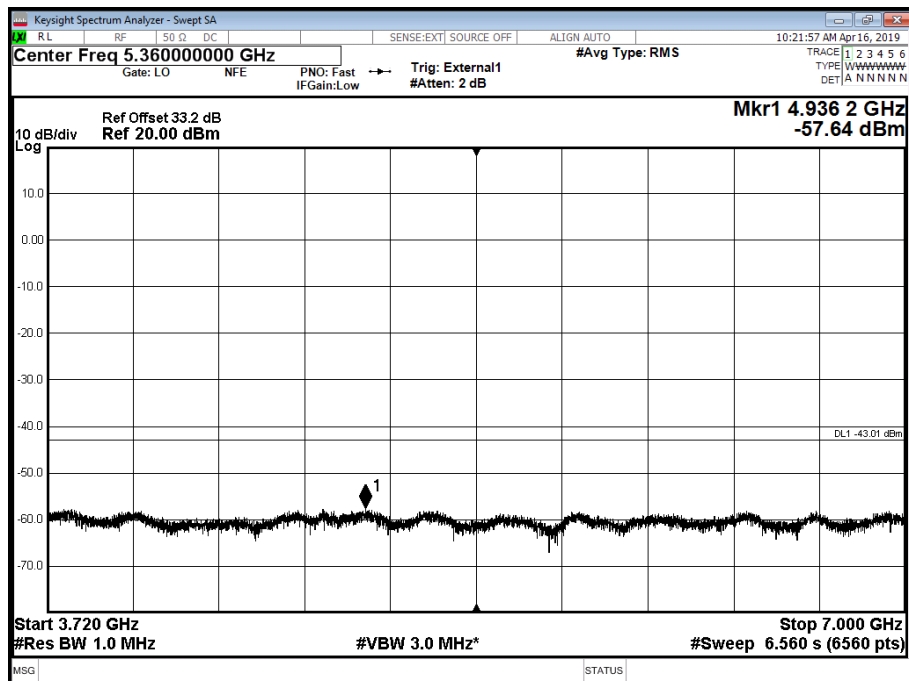




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M -
Band Mask High 1 - Range Mask High 1

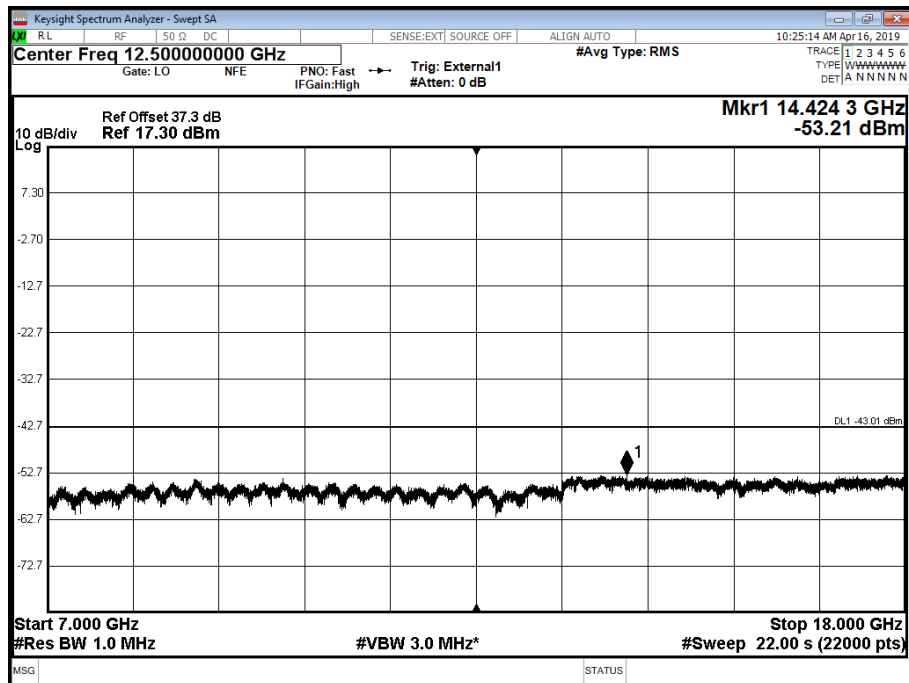


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M -
Band 2 - Range 3720 to 7000 MHz

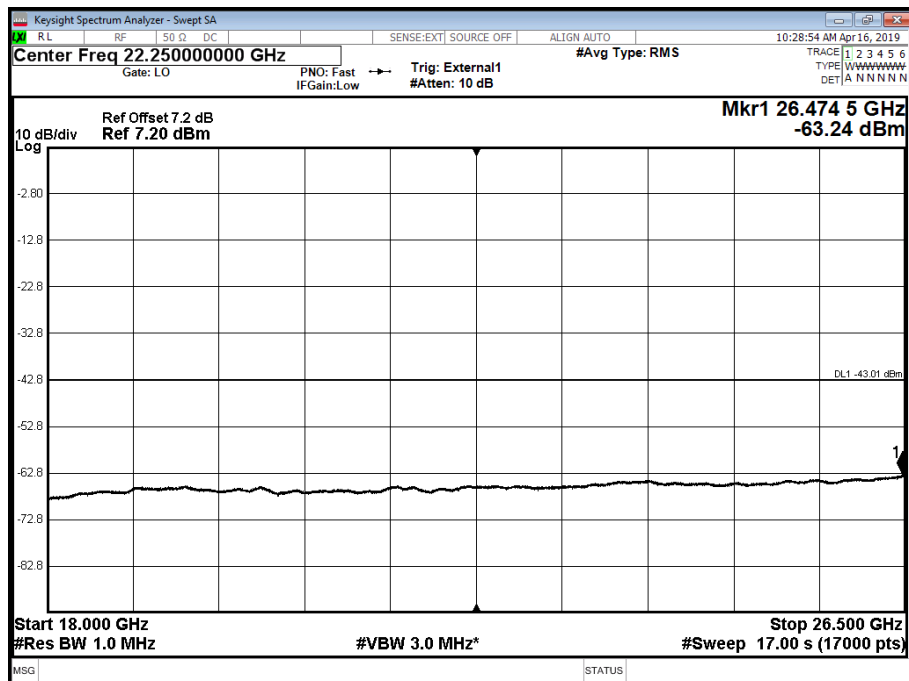




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Band 3 - Range 7000 to 18000 MHz

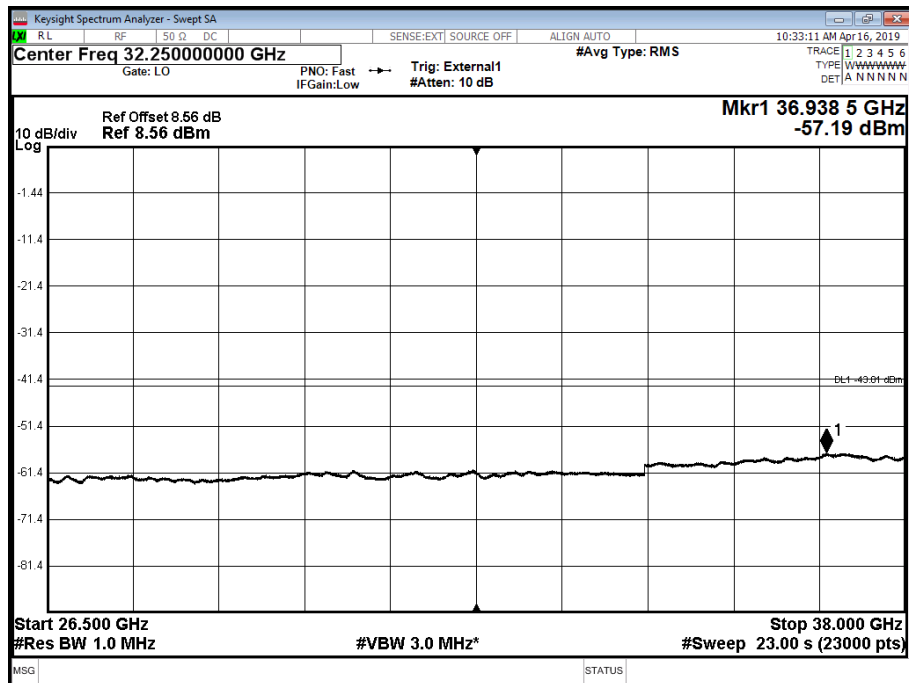


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Band 4 - Range 18000 to 26500 MHz

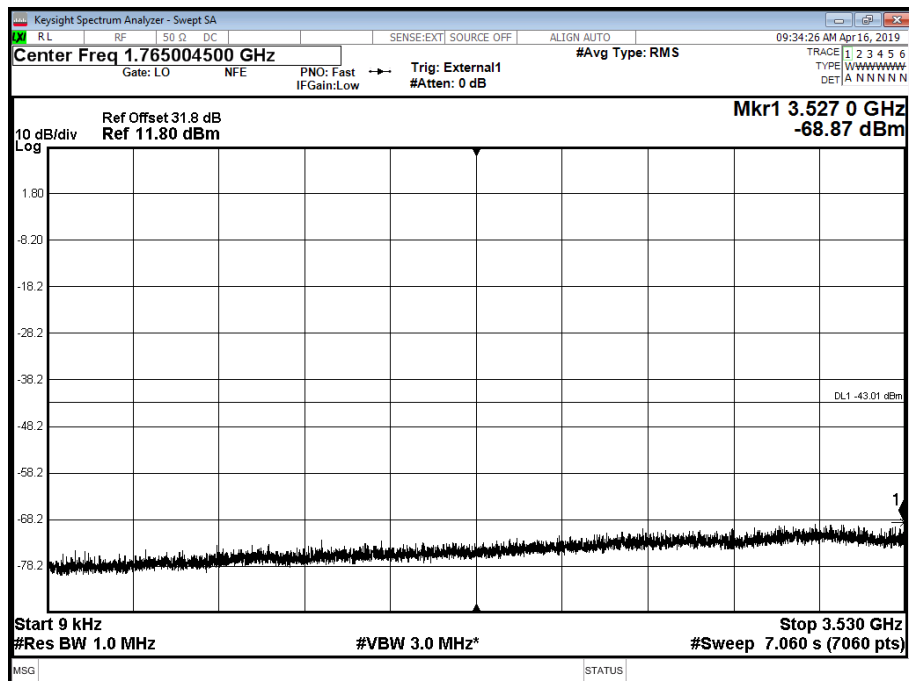




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M - Band 5 - Range 26500 to 38000 MHz

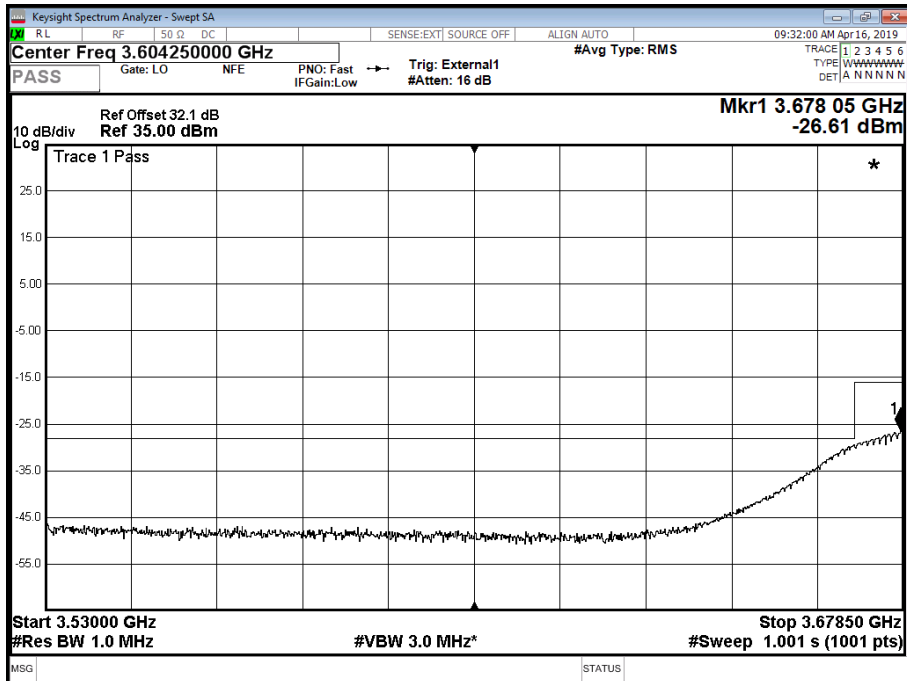


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Band 1 - Range 0.009 to 3530 MHz

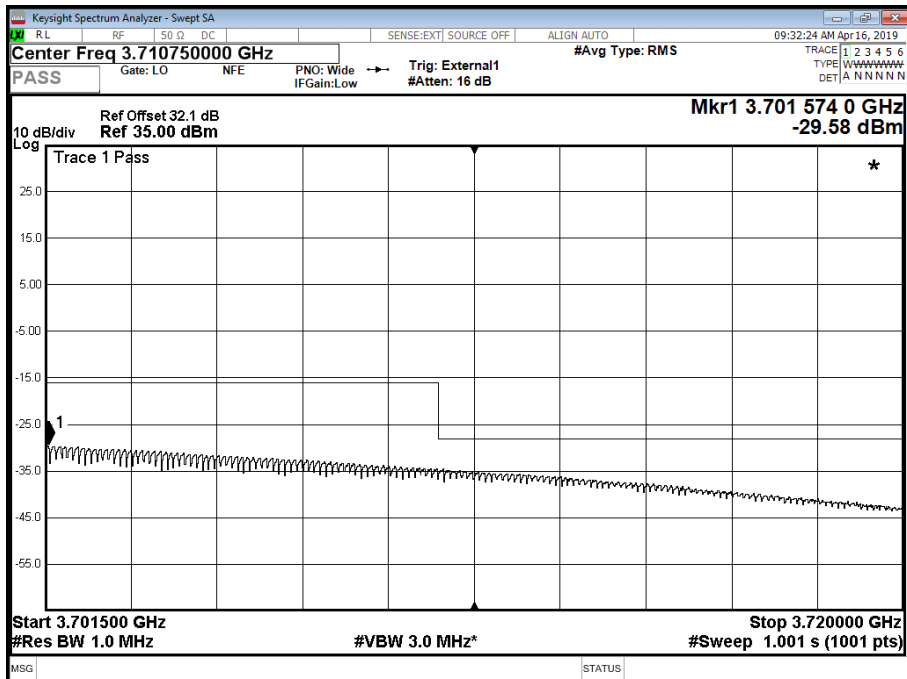




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T -
Band Mask Low 1 - Range Mask Low 1

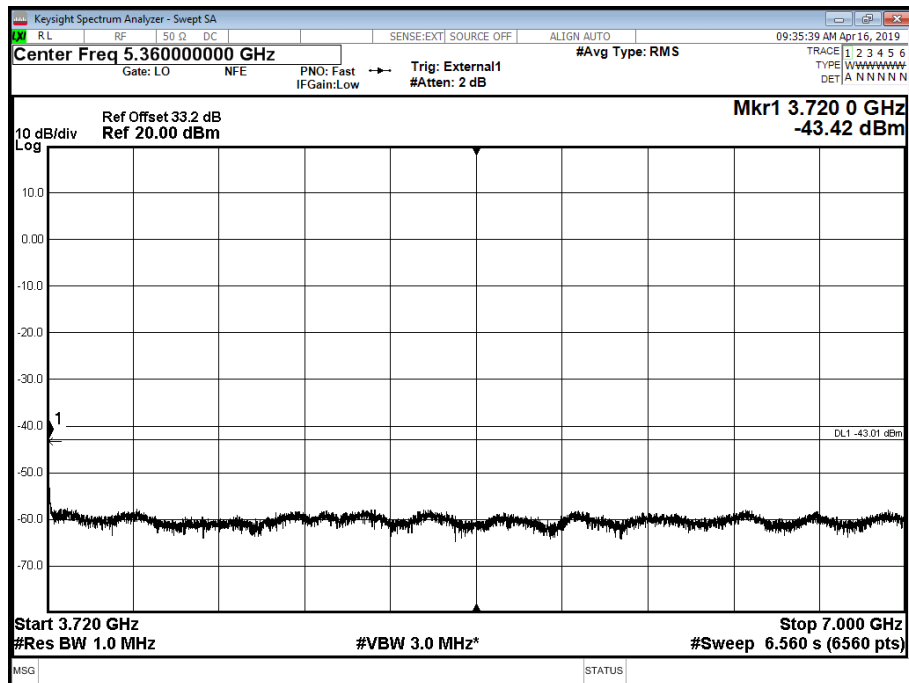


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T -
Band Mask High 1 - Range Mask High 1

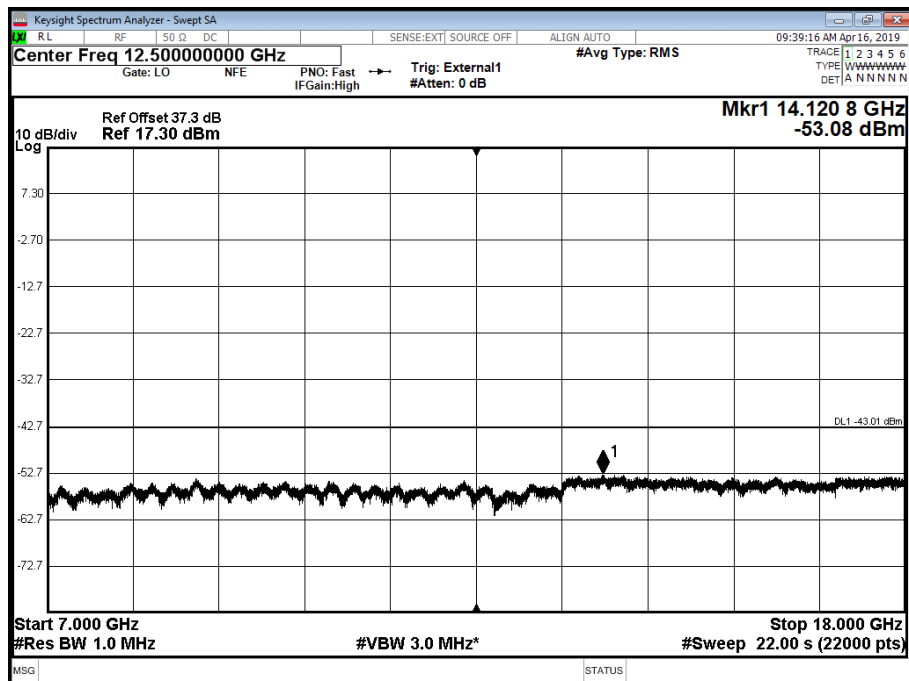




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Band 2 - Range 3720 to 7000 MHz

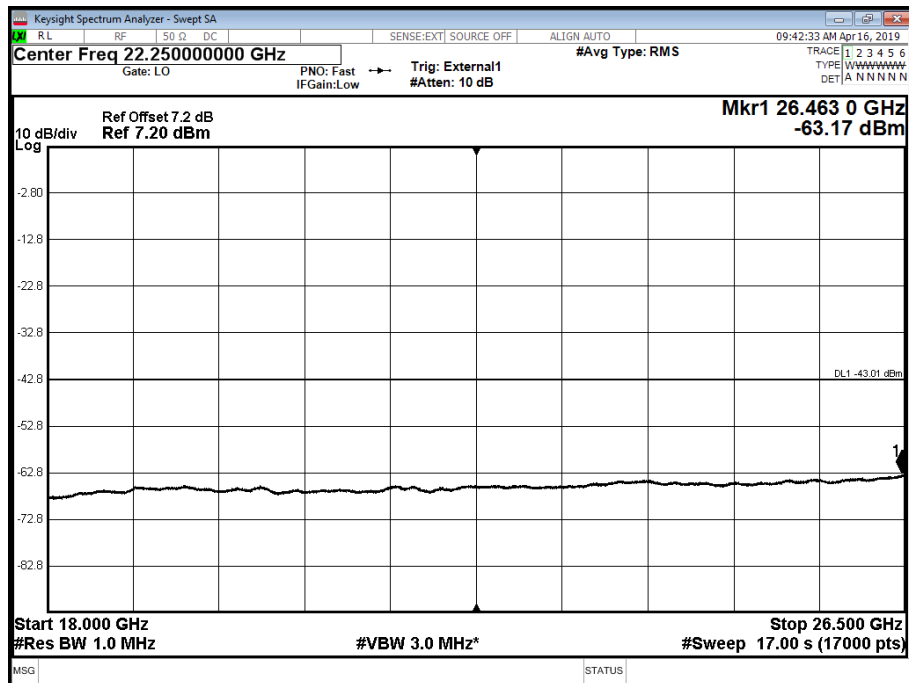


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Band 3 - Range 7000 to 18000 MHz

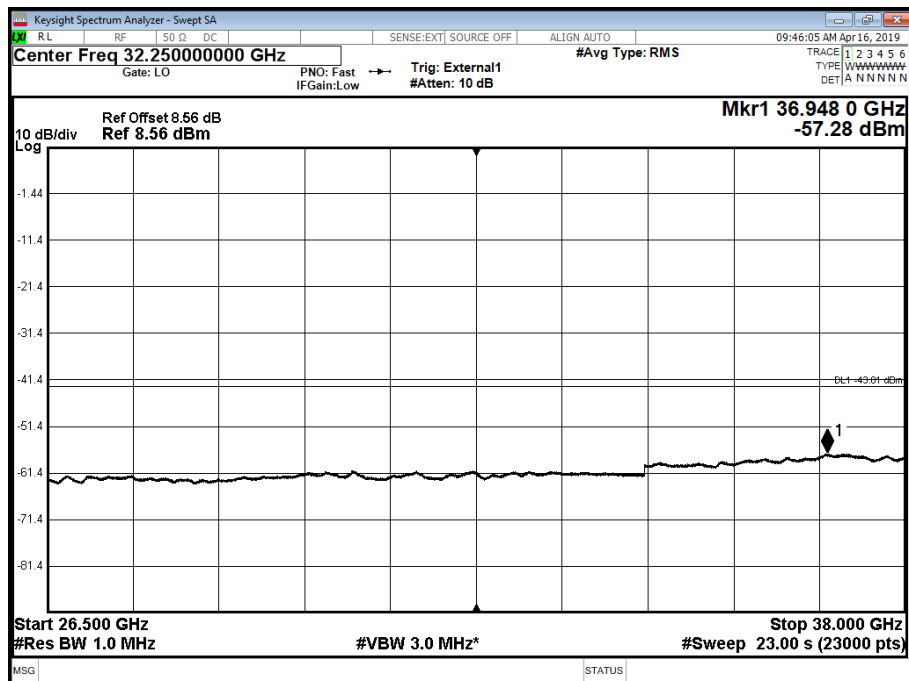




Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Band 4 - Range 18000 to 26500 MHz

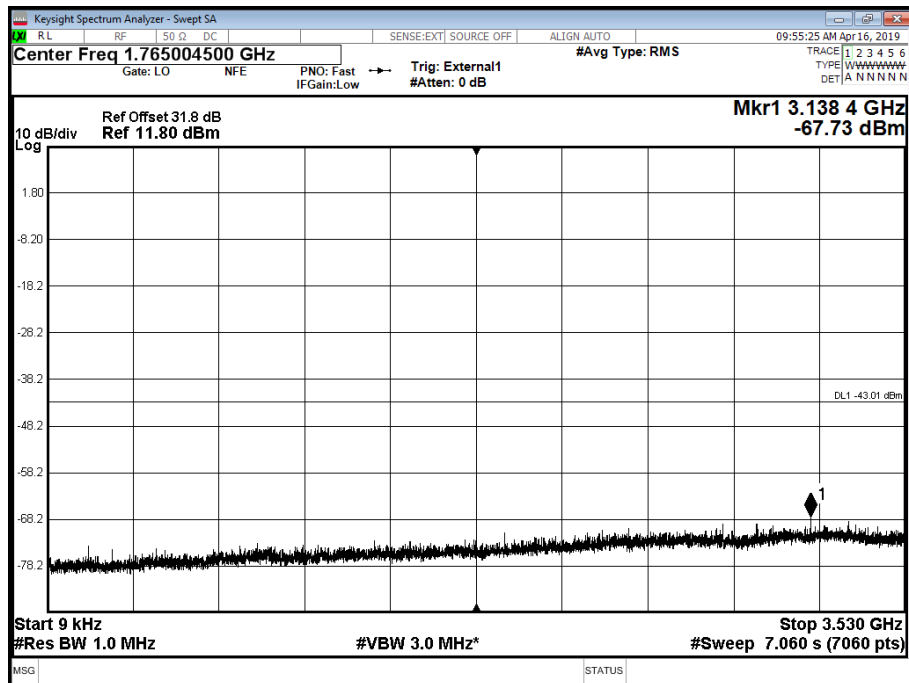


Antenna A - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Band 5 - Range 26500 to 38000 MHz

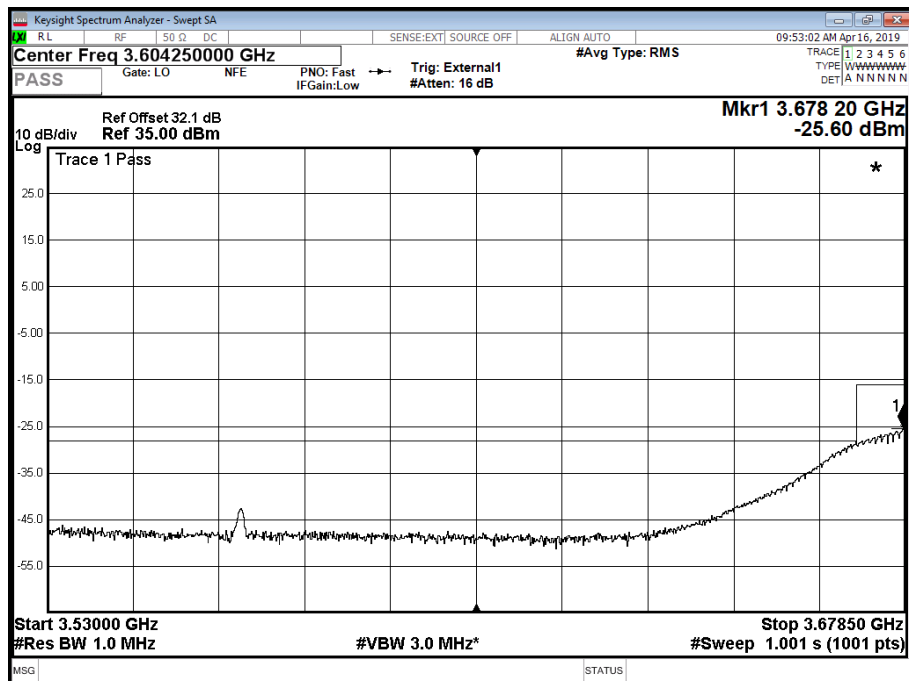




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Band 1 - Range 0.009 to 3530 MHz

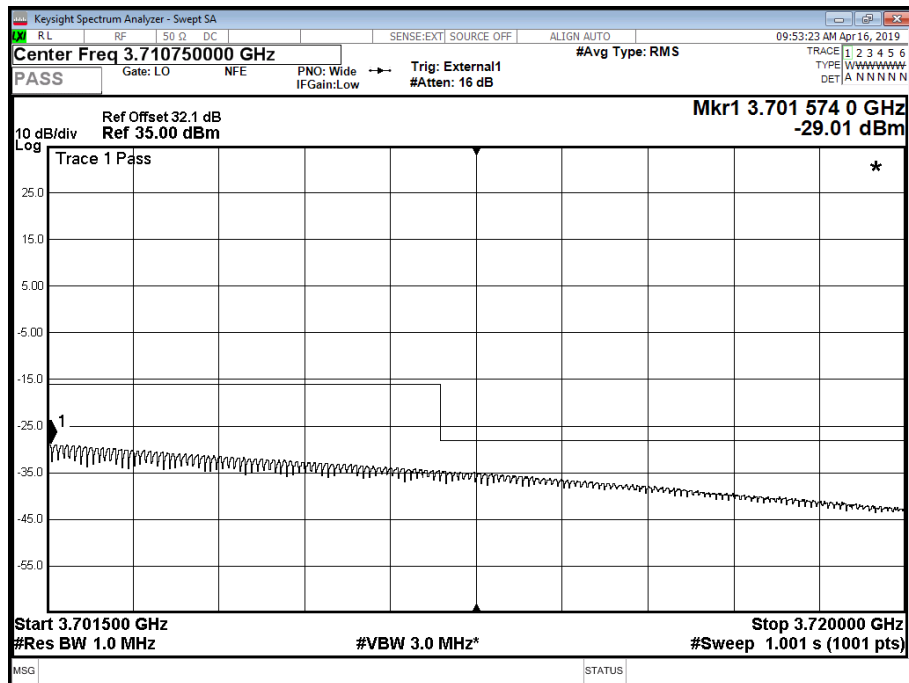


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Band Mask Low 1 - Range Mask Low 1

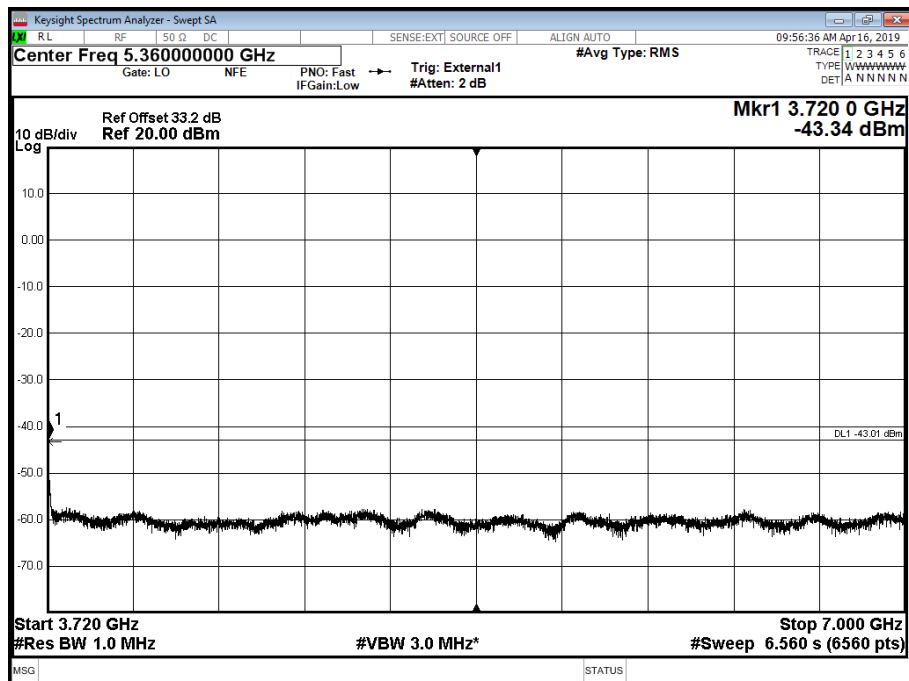




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Band Mask High 1 - Range Mask High 1

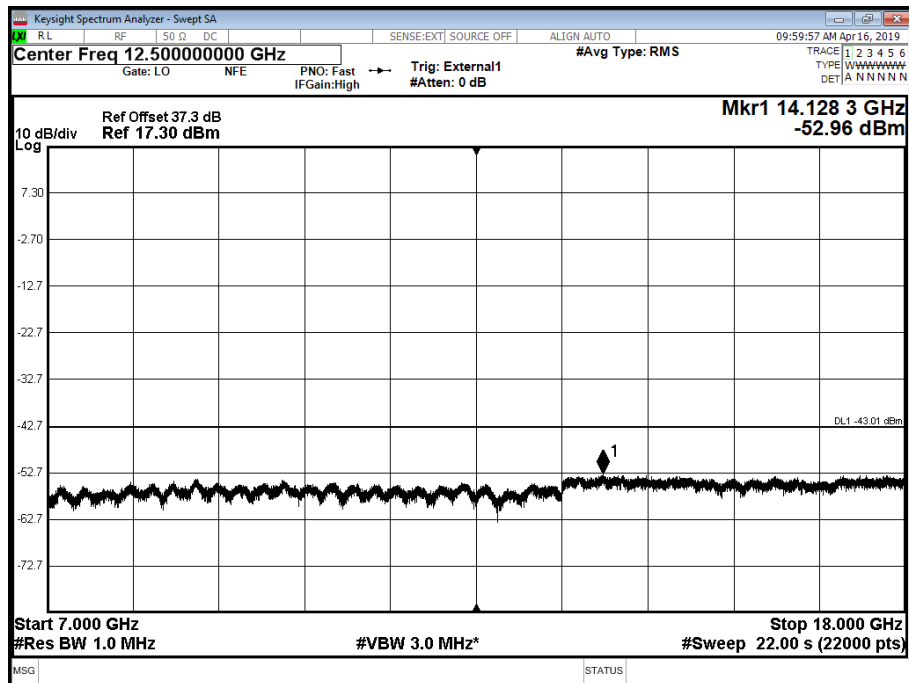


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Band 2 - Range 3720 to 7000 MHz

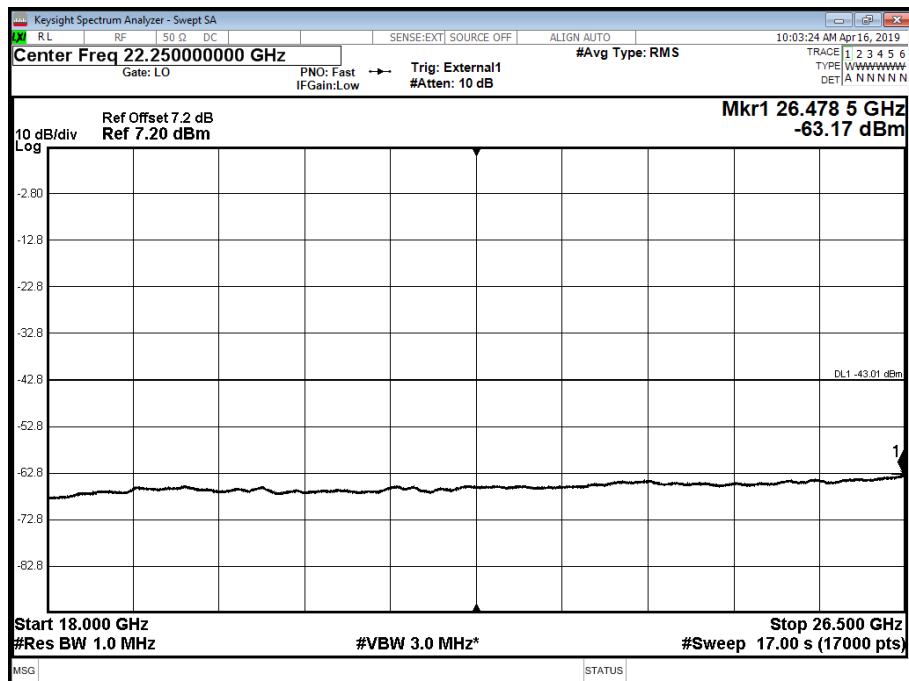




Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Band 3 - Range 7000 to 18000 MHz

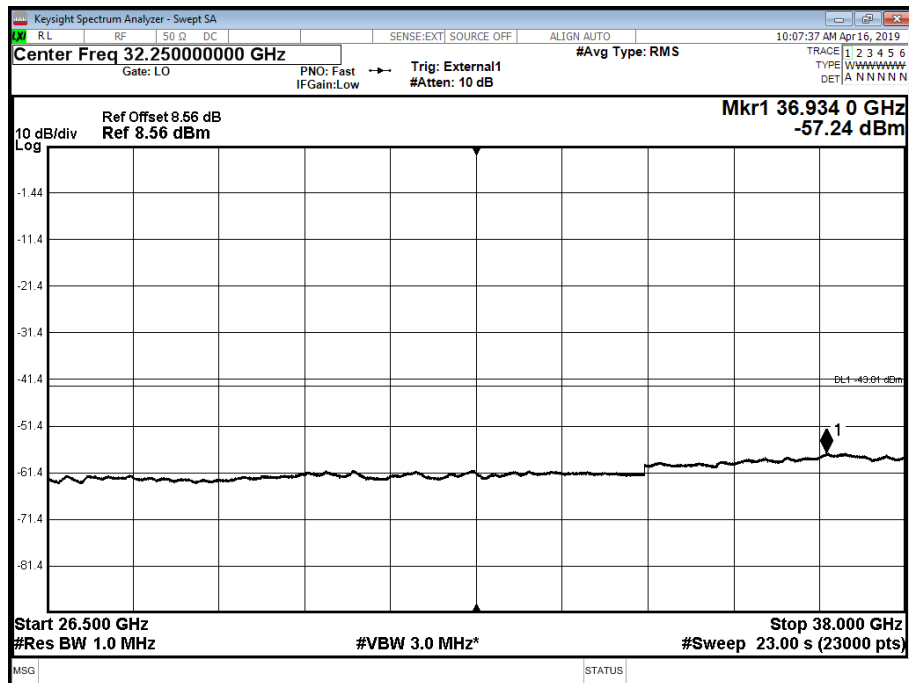


Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Band 4 - Range 18000 to 26500 MHz





Antenna B - LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T - Band 5 - Range 26500 to 38000 MHz



Limit	<3530 MHz and >3720 MHz: -40 dBm/MHz
	± 0 – 10 MHz Assigned Channel Edge: -13 dBm/MHz
	3530 MHz to -10 MHz Assigned Channel Edge: -25 dBm/MHz
	+10 MHz Assigned Channel Edge to 3720 MHz: -25 dBm/MHz
	Note: Limits shown in the test plots have been reduced by 10log(2) to account for 2 Port MIMO operation



2.5 FREQUENCY STABILITY

2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055

2.5.2 Date of Test and Modification State

18 April 2019 - Modification State 1

2.5.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.4 Environmental Conditions

Ambient Temperature	23.2°C
Relative Humidity	35.8%

2.5.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01.

The EUT was setup in a Climatic Chamber and connected to a Vector Signal Analyser via attenuators. The temperature was varied over the range -30°C to +50°C in 10°C steps. At each temperature interval, the EUT was left to stabilise.

The testing was performed using a 10 MHz channel bandwidth with QPSK modulation and all Resource Blocks active.

After this period of time, the maximum Frequency Error was measured and recorded on the Middle channel.

At 20°C, the voltage was varied between 85 % and 115 % of the nominal declared voltage for the POE AC power supply. At each extreme voltage, the maximum Frequency Error was measured and recorded.



2.5.6 Test Results

Configuration A1

Maximum Output Power 24 dBm per port

Temperature	Voltage	Frequency Error (Hz)
		Channel Position M
-30°C	120.0 V AC	104.80 *
-20°C	120.0 V AC	94.80 *
-10°C	120.0 V AC	83.68 *
0°C	120.0 V AC	84.88 *
+10°C	120.0 V AC	73.70
+20°C	102.0 V AC	67.62
+20°C	120.0 V AC	70.52
+20°C	138.0 V AC	70.42
+30°C	120.0 V AC	59.11
+40°C	120.0 V AC	48.13
+50°C	120.0 V AC	41.64

Remarks

* measured at reduced power as setting to max power reset EUT

Limit	The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorised bands of operation.
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2.6 RADIATED EMISSIONS

2.6.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1053
FCC CFR 47 Part 96, Clause 96.41(e)(1)(2)

2.6.2 Date of Test and Modification State

06-May-2019 - Modification State 1

2.6.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.4 Environmental Conditions

Ambient Temperature	16.6-20.0°C
Relative Humidity	37.6-41.3%

2.6.5 Test Method

Testing was performed in accordance with ANSI C63.26, clause 5.5

Prescans and final measurements were performed using the direct field strength method. The limit line shown on the prescan plots was calculated from equation c) in ANSI C63.26 clause 5.2.7.

Equation c):

$$E \text{ (dBuV/m)} = \text{EIRP (dBm)} - 20 \log (D) + 104.8$$

Where D is the measurement distance and EIRP is the Relevant Rule Part Limit.

Where D = 3m and the Rule Part Limit = -40dBm

$$E \text{ (dBuV/m)} = -40 - 20\log (3) + 104.8 = 55.26 \text{ dBuV/m}$$

Where D = 1m and the Rule Part Limit = -40dBm

$$E \text{ (dBuV/m)} = -40 - 20\log (1) + 104.8 = 64.80 \text{ dBuV/m}$$

2.6.6 Test Results

Configuration A1

Product classification – Class B

Maximum Output Power 24 dBm per port, 10.0 MHz bandwidth

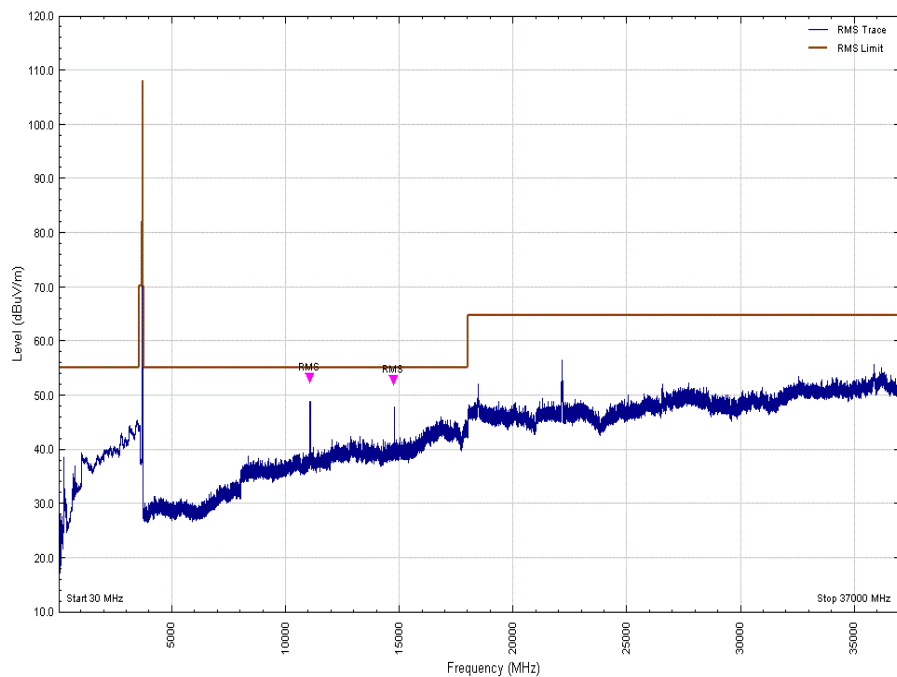
Maximum Output Power 23 dBm per port, 20.0 MHz bandwidth



LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B

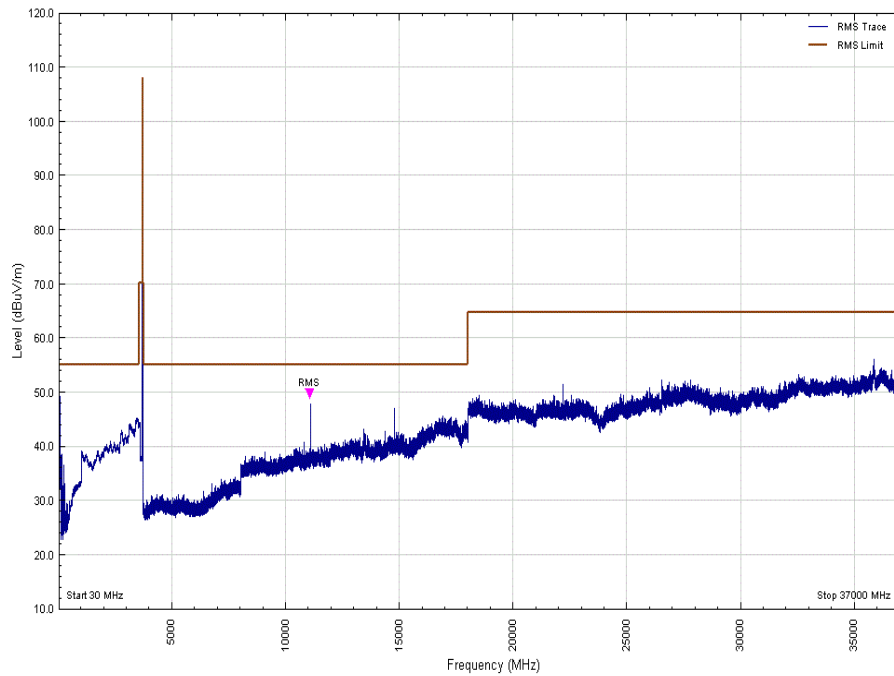
Frequency (MHz)	Peak (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dBuV/m)	Angle(Deg)	Height(m)	Polarity
10664.875	50.3	55.3	-5.0	214	100	Vertical
10665.615	49.5	55.3	-5.8	184	100	Horizontal
14219.985	48.3	55.3	-6.9	228	100	Vertical
14220.065	50.4	55.3	-4.9	198	100	Horizontal

LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B – Horizontal Polarisation





LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position B – Vertical Polarisation

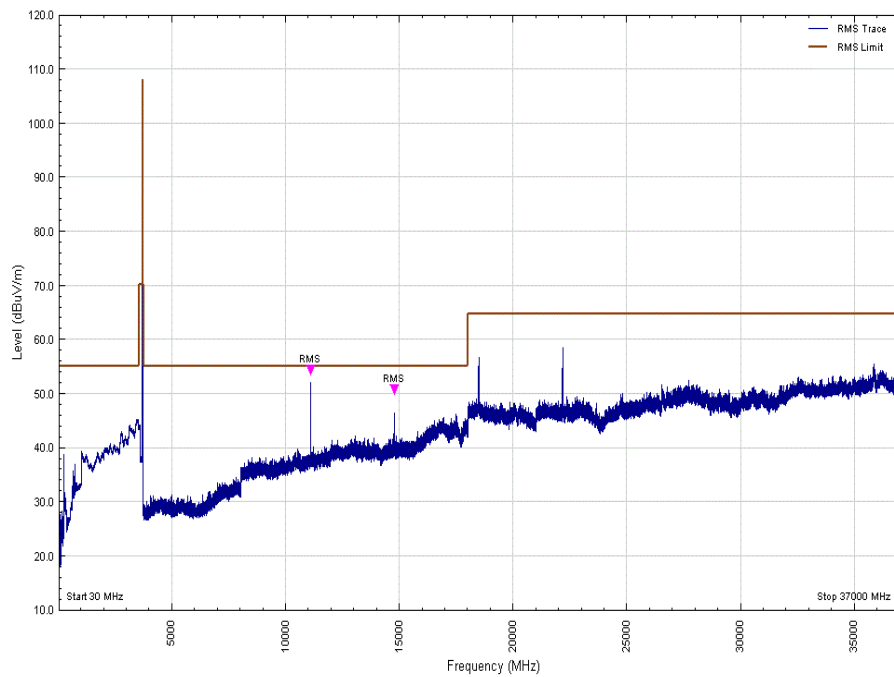




LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B

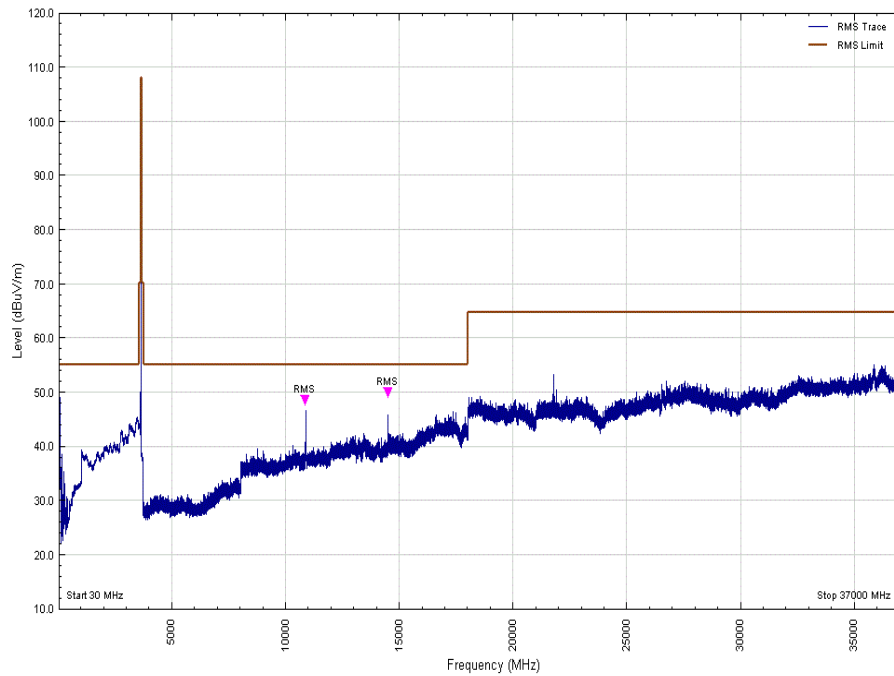
Frequency (MHz)	Peak (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dBuV/m)	Angle(Deg)	HeigMCS(m)	Polarity
14240.000	51.6	55.3	-3.7	194	114	Horizontal

LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B – Horizontal Polarisation





LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position B – Vertical Polarisation

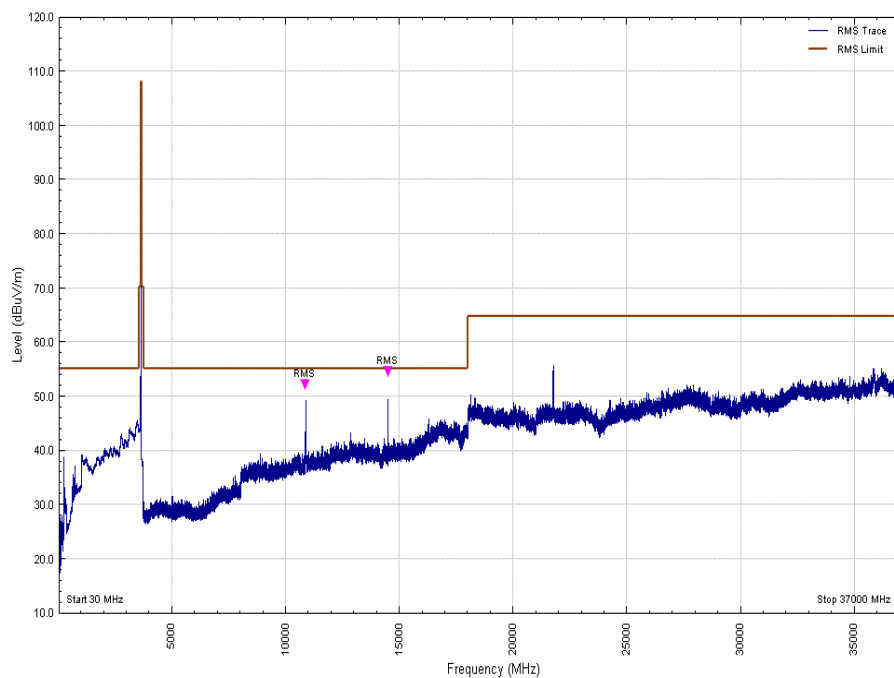




LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M

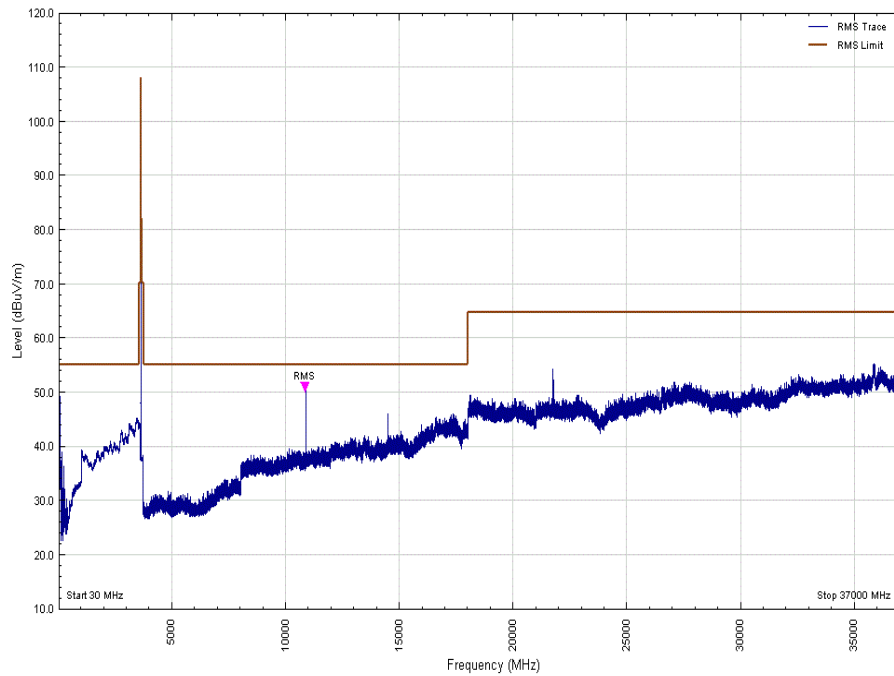
Frequency (MHz)	Peak (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dBuV/m)	Angle(Deg)	HeigMCS(m)	Polarity
10875.875	49.5	55.3	-5.8	197	103	Vertical
14500.040	52.5	55.3	-2.8	217	170	Horizontal

LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M – Horizontal Polarisation





LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position M –Vertical Polarisation

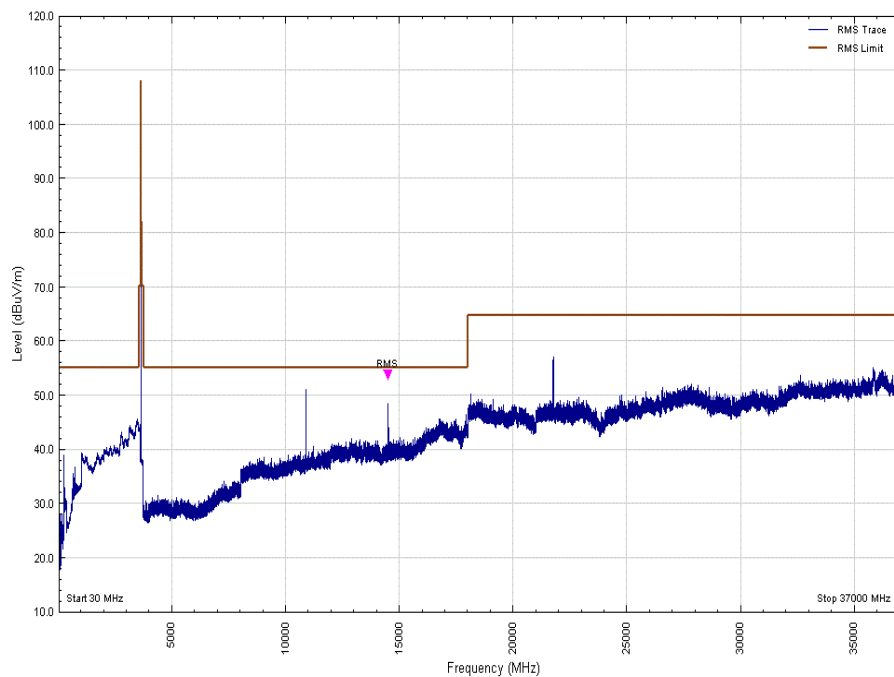




LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M

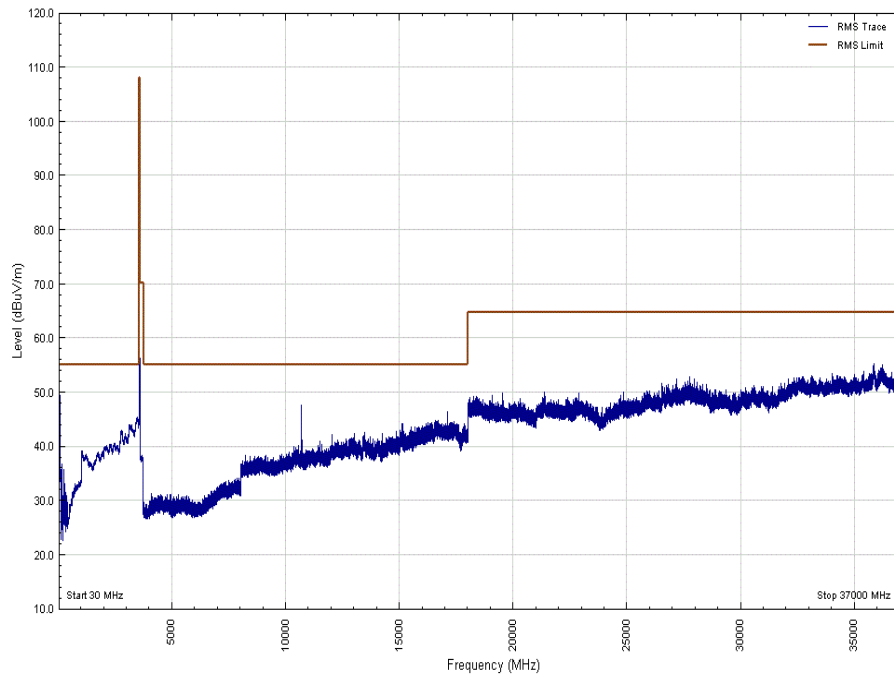
Frequency (MHz)	Peak (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dBuV/m)	Angle(Deg)	HeigMCS(m)	Polarity
10875.860	50.8	55.3	-4.4	23	267	Horizontal
10876.445	47.1	55.3	-8.2	197	100	Vertical
14500.005	53.2	55.3	-2.1	216	158	Horizontal
14500.040	48.6	55.3	-6.6	200	100	Vertical

LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M – Horizontal Polarisation





LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position M –Vertical Polarisation

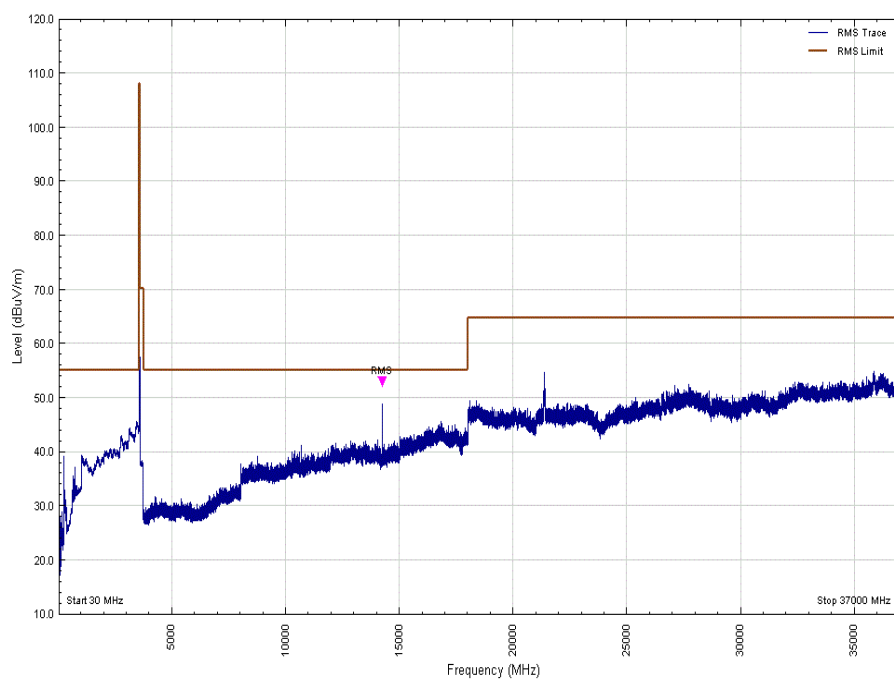




LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T

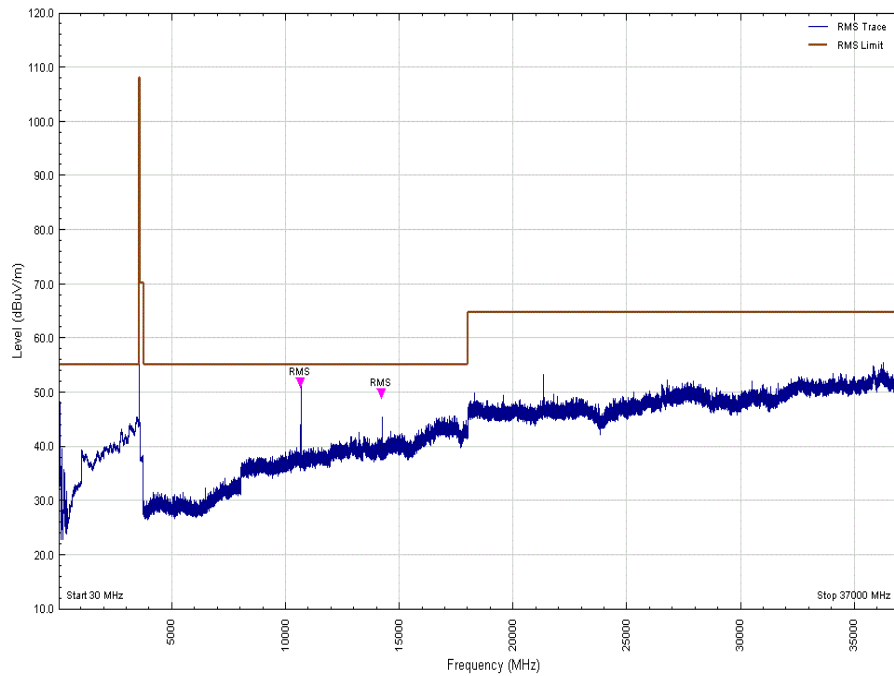
Frequency (MHz)	Peak (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dBuV/m)	Angle(Deg)	HeigMCS(m)	Polarity
11083.560	48.5	55.3	-6.8	196	102	Vertical
11085.330	53.1	55.3	-2.2	24	136	Horizontal
14779.955	49.3	55.3	-5.9	168	153	Horizontal

LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T – Horizontal Polarisation





LTE Modulation QPSK - LTE Carrier Bandwidth 10.0 MHz - Channel Position T – Vertical Polarisation

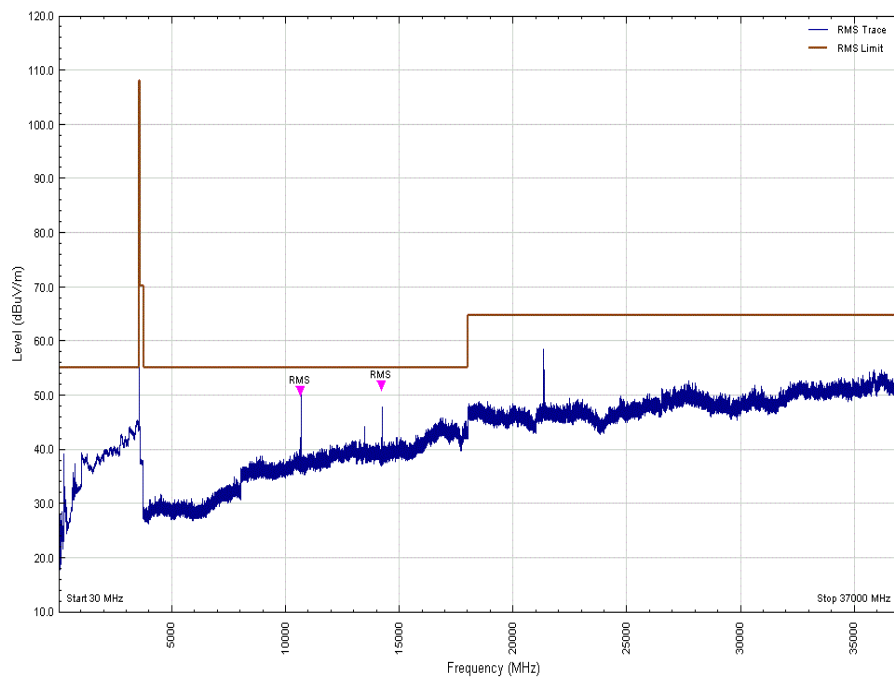




LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T

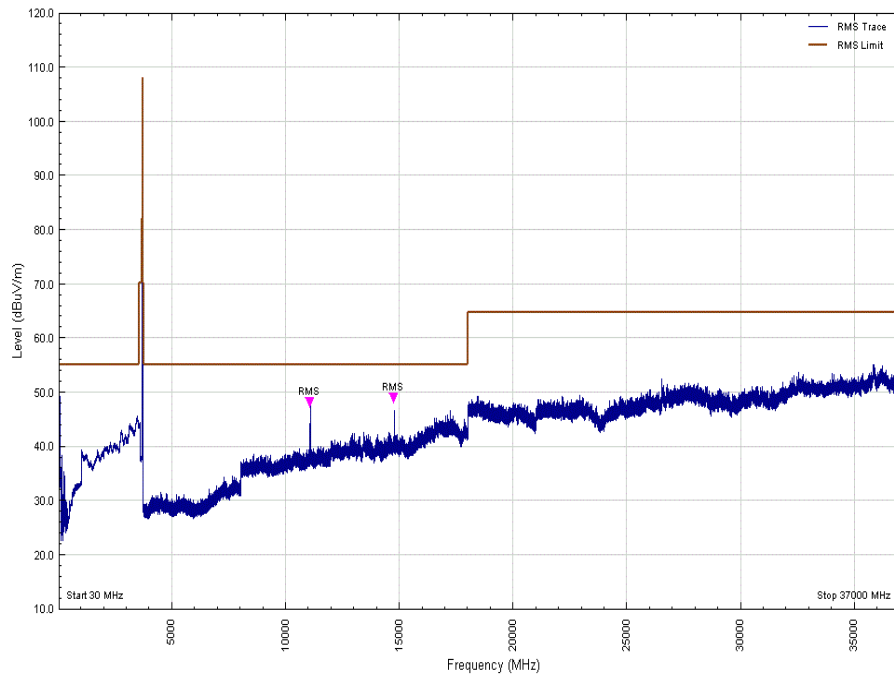
Frequency (MHz)	Peak (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dBuV/m)	Angle(Deg)	HeigMCS(m)	Polarity
11067.350	46.8	55.3	-8.5	192	102	Vertical
11067.960	51.8	55.3	-3.5	27	155	Horizontal
14759.995	51.4	55.3	-3.9	66	100	Horizontal
14760.035	47.6	55.3	-7.7	200	224	Vertical

LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T – Horizontal Polarisation





LTE Modulation QPSK - LTE Carrier Bandwidth 20.0 MHz - Channel Position T –Vertical Polarisation



Limit	<3530 MHz and >3720 MHz: -40 dBm/MHz ± 0 – 10 MHz Assigned Channel Edge: -13 dBm/MHz 3530 MHz to -10 MHz Assigned Channel Edge: -25 dBm/MHz +10 MHz Assigned Channel Edge to 3720 MHz: -25 dBm/MHz
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2.7 MODULATION CHARACTERISTICS

2.7.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1047

2.7.2 Date of Test and Modification State

18 April 2019 - Modification State 1

2.7.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.4 Environmental Conditions

Ambient Temperature 23.2°C
Relative Humidity 35.8%

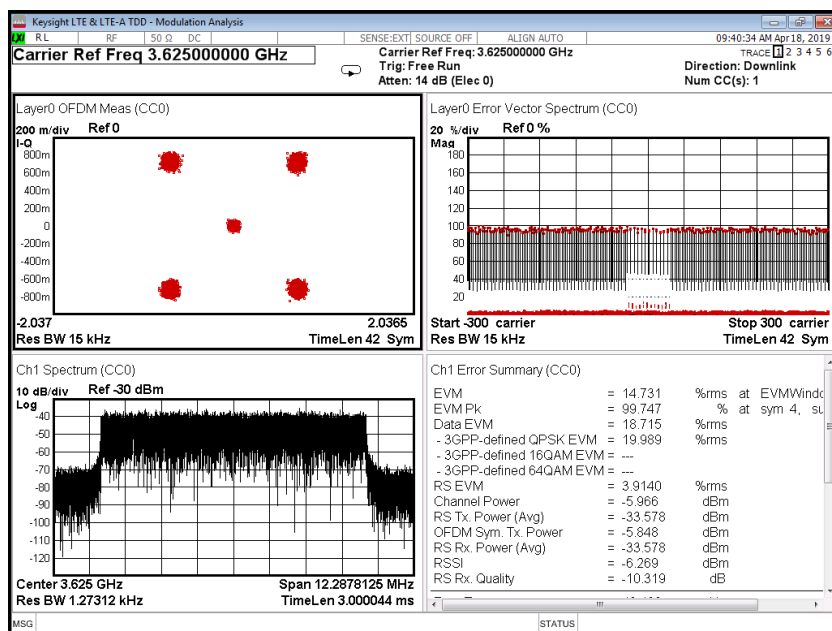
2.7.5 Test Method

The EUT was connected to a spectrum analyser with an LTE TDD analysis mode and the supported modulation schemes measured at maximum power, middle channel, 10.0 MHz carrier bandwidth.

2.7.6 Test Results

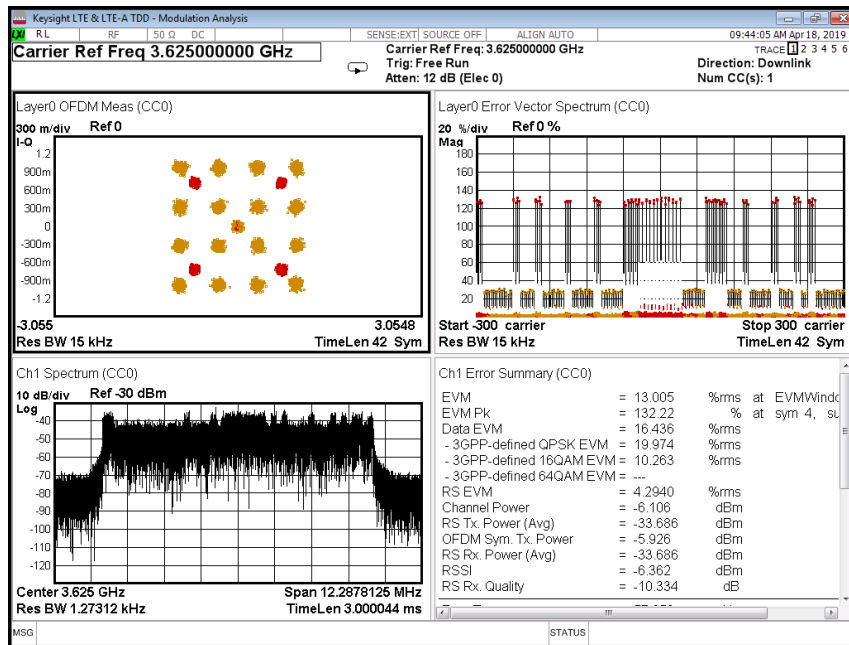
Maximum Output Power 24 dBm per port

QPSK modulation

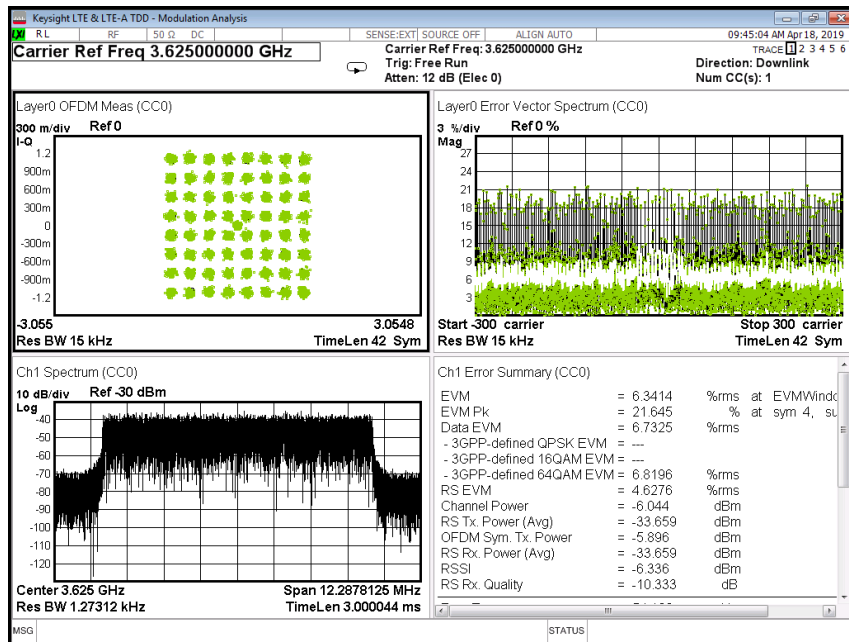




16QAM modulation



64QAM modulation





SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Output Power and Peak to Average Ratio - Conducted					
Hygrometer	Rotronic	HP21	4740	12	17-Jan-2020
Frequency standard	Spectracom	SecureSync 1200-0408-0601	4393	12	16-Apr-2019
Rubidium Standard	Rohde & Schwarz	XSRM	1316	12	16-Apr-2019
Network analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Oct-2019
Calibration unit	Rohde & Schwarz	ZV Z54	4368	12	22-Oct-2019
Spectrum Analyser	Keysight	N9030A	4653	12	06-Feb-2020
Attenuator	Weinschel	48-30-43LM	5135	12	07-Nov-2019
AC power source	ITECH	IT7324	5227	-	O/P Mon
DMM	Fluke	79	0611	12	07-Sep-2019
Occupied Bandwidth					
Hygrometer	Rotronic	HP21	4740	12	17-Jan-2020
Frequency standard	Spectracom	SecureSync 1200-0408-0601	4393	12	16-Apr-2019
Rubidium Standard	Rohde & Schwarz	XSRM	1316	12	16-Apr-2019
Network analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Oct-2019
Calibration unit	Rohde & Schwarz	ZV Z54	4368	12	22-Oct-2019
Spectrum Analyser	Keysight	N9030A	4653	12	06-Feb-2020
Attenuator	Weinschel	48-30-43LM	5135	12	07-Nov-2019
AC power source	ITECH	IT7324	5227	-	O/P Mon
DMM	Fluke	79	0611	12	07-Sep-2019
Band Edge					
Hygrometer	Rotronic	HP21	4740	12	17-Jan-2020
Frequency standard	Spectracom	SecureSync 1200-0408-0601	4393	12	16-Apr-2019
Rubidium Standard	Rohde & Schwarz	XSRM	1316	12	16-Apr-2019
Network analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Oct-2019
Calibration unit	Rohde & Schwarz	ZV Z54	4368	12	22-Oct-2019
Spectrum Analyser	Keysight	N9030A	4653	12	06-Feb-2020
Attenuator	Weinschel	48-30-43LM	5135	12	07-Nov-2019
AC power source	ITECH	IT7324	5227	-	O/P Mon
DMM	Fluke	79	0611	12	07-Sep-2019
Spurious Emissions at Antenna Terminals					
Hygrometer	Rotronic	HP21	4740	12	17-Jan-2020
Frequency standard	Spectracom	SecureSync 1200-0408-0601	4393	12	16-Apr-2019
Rubidium Standard	Rohde & Schwarz	XSRM	1316	12	16-Apr-2019
Network analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Oct-2019
Calibration unit	Rohde & Schwarz	ZV Z54	4368	12	22-Oct-2019
Spectrum Analyser	Keysight	N9030A	4653	12	06-Feb-2020
Attenuator	Weinschel	48-30-43LM	5135	12	07-Nov-2019
AC power source	ITECH	IT7324	5227	-	OP/MON
DMM	Fluke	79	0611	12	07-Sep-2019
HPF	K&L	11SH10-4000/X18000-0/0	4599	12	04-Sep-2019
WG	FMI	18-25G	-	-	OP/Mon
WG	FMI	25-40G	-	-	OP/Mon



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Frequency Stability					
Hygrometer	Rotronic	HP21	4740	12	17-Jan-2020
Frequency standard	Spectracom	SecureSync 1200-0408-0601	4393	12	16-Apr-2019
Rubidium Standard	Rohde & Schwarz	XSRM	1316	12	16-Apr-2019
Spectrum Analyser	Keysight	N9030A	4654	12	08-Oct-2019
Attenuator	Weinschel	48-30-43LM	5135	12	07-Nov-2019
AC power source	ITECH	IT7324	5227	-	OP/MON
DMM	Fluke	79	0611	12	07-Sep-2019
Thermometer	Fluke	51	3174	12	07-Feb-2020
Climatic chamber	Aralab	FitoTerm 300E45	4823	-	OP/Mon
Radiated Emissions					
Antenna 18-40GHz (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	2-May-2020
Filter (High Pass)	Lorch	SHP7-7000-SR	566	12	10-May-2019
Pre-Amplifier	Phase One	PS04-0086	1533	12	8-Feb-2020
18GHz - 40GHz Pre-Amplifier	Phase One	PSO4-0087	1534	12	5-Feb-2020
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygrometer	Rotronic	A1	2677	12	20-Feb-2020
Digital Multimeter	Iso-tech	IDM-101	2895	12	4-Oct-2019
Antenna with permanent attenuator (Bilog)	Chase	CBL6143	2904	24	8-Aug-2019
Comb Generator	Schaffner	RSG1000	3034	-	TU
Cable 1503 2M 2.92(P)m 2.92(P)m	Rhophase	KPS-1503A-2000-KPS	4293	12	26-Oct-2019
1GHz to 8GHz Low Noise Amplifier	Wright Technologies	APS04-0085	4365	12	25-Oct-2019
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	-	OP/Mon
1 - 18GHz DRG Antenna	ETS-Lindgren	3117	4738	12	5-Mar-2020
Mast Controller	Maturo GmbH	NCD	4810	-	TU
Tilt Antenna Mast	Maturo GmbH	TAM 4.0-P	4811	-	TU
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	11-Mar-2020
4dB Attenuator	Pasternack	PE7047-4	4935	24	28-Nov-2019
8m N-Type RF Cable	Teledyne	PR90-088-8MTR	5093	12	4-Oct-2019
EmX Software	TUV SUD	EmX V.1.4.6	5125	-	N/A - Software
1.5m 40GHz RF Cable	Scott Cables	KPS-1501-2000-KPS	5127	-	OP/Mon
Modulation Characteristics					
Hygrometer	Rotronic	HP21	4740	12	17-Jan-2020
Frequency standard	Spectracom	SecureSync 1200-0408-0601	4393	12	16-Apr-2019
Rubidium Standard	Rohde & Schwarz	XSRM	1316	12	16-Apr-2019
Network analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Oct-2019
Calibration unit	Rohde & Schwarz	ZV Z54	4368	12	22-Oct-2019
Spectrum Analyser	Keysight	N9030A	4654	12	08-Oct-2019
Attenuator	Weinschel	48-30-43LM	5135	12	07-Nov-2019
AC power source	ITECH	IT7324	5227	-	O/P Mon
DMM	Fluke	79	0611	12	07-Sep-2019

O/P Mon – Output Monitored with Calibrated Equipment
 TU - Traceability Unscheduled



3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Discipline	Frequency / Parameter	MU
Conducted Maximum Peak Output Power	30 MHz to 20 GHz Amplitude	± 2.3 dB
Occupied Bandwidth	Up to 20 MHz Bandwidth	± 46.2 kHz
Band Edge	30 MHz to 20 GHz Amplitude	± 2.3 dB
Conducted Emissions	9 kHz to 3.53 GHz	± 0.8 dB
	3.5 GHz to 7 GHz	± 2.1 dB
	7 GHz to 18 GHz	± 2.6 dB
	18 GHz to 38 GHz	± 3.2 dB
Frequency Stability	30 MHz to 2 GHz	± 5.0 Hz
Radiated Emissions	30 MHz to 1 GHz Amplitude	± 5.2 dB
	1 GHz to 40 GHz Amplitude	± 6.3 dB



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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ANNEX A

MODULE LIST



Configuration A		
Product	Product No	Serial No
E61 B48	495X	000295-0100008307 (75945166-TSR0014)
Software Version: 6014		