

SPURIOUS CONDUCTED EMISSIONS



XMIT 2019.09.05

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

The spurious RF conducted emissions were measured with the EUT set to the middle channel. The EUT was transmitting at the data rate(s) and bandwidths listed in the datasheet. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

All limits were adjusted by a factor of $[-10 \cdot \log(N)]$ dB to account for the device operation as a N port MIMO transmitter, as per FCC KDB 622911.

For Bands 12 and 14, the limit adjustment is $-10 \cdot \log(4) = -6$ dB.

For Band 29, the limit adjustment is $-10 \cdot \log(2) = -3$ dB.

Over the frequency range of 150kHz-20MHz, a RBW of 10 kHz was used; therefore, an additional limit adjustment factor of 10 dB was applied $[10 \cdot \log(10/1)]$.

The limit for the 9kHz to 150kHz frequency range was adjusted to -39dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 100kHz [i.e.: $-39\text{dBm} = -19\text{dBm} - 10\log(100\text{kHz}/1\text{kHz})$]. The limit for the 150kHz to 20MHz frequency range was adjusted to -29dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 100kHz [i.e.: $-29\text{dBm} = -19\text{dBm} - 10\log(100\text{kHz}/10\text{kHz})$].

Per FCC section 27.53(g), the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm $[-13 \text{ dBm} - 10 \log(4)]$ per FCC KDB 662911D01 v02r01 because the RRH may operate as a 4 port MIMO transmitter for Band 12. FCC 27.53(g) requires a >100 kHz measurement bandwidth for emissions 100 kHz outside of the RRH operating frequency range.

SPURIOUS CONDUCTED EMISSIONS



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EUT: AHLBBA RRH		Work Order: NOKI0004	
Serial Number: K9193514835		Date: 19-Nov-19	
Customer: Nokia Solutions and Networks		Temperature: 23 °C	
Attendees: John Rattanavong		Humidity: 30.7% RH	
Project: None		Barometric Pres.: 1017 mbar	
Tested by: Jonathan Kiefer		Power: 54VDC	Job Site: TX09
TEST SPECIFICATIONS		Test Method	
FCC 27:2019		ANSI C63.26:2015	
COMMENTS			
Band 12 conducted spurious emissions for four modulation types. Tested on highest power antenna port (Port 1). EUT is operated at 100% duty cycle.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2,4,5	Signature 	
		Value (dBm)	Limit (dBm) Result
Band 12			
QPSK Modulation			
LTE5 Bandwidth			
9kHz-150kHz		-57.862	-39 Pass
150kHz-20MHz		-55.749	-29 Pass
20MHz-600MHz		-32.238	-19 Pass
600MHz-800MHz		-35.537	-19 Pass
800MHz-1.2GHz		-33.562	-19 Pass
1.2GHz-8GHz		-33.498	-19 Pass
LTE10 Bandwidth			
9kHz-150kHz		-58.109	-39 Pass
150kHz-20MHz		-56.315	-29 Pass
20MHz-600MHz		-32.331	-19 Pass
600MHz-800MHz		-36.063	-19 Pass
800MHz-1.2GHz		-32.705	-19 Pass
1.2GHz-8GHz		-34.119	-19 Pass
16QAM Modulation			
LTE5 Bandwidth			
9kHz-150kHz		-58.302	-39 Pass
150kHz-20MHz		-55.852	-29 Pass
20MHz-600MHz		-32.536	-19 Pass
600MHz-800MHz		-36.475	-19 Pass
800MHz-1.2GHz		-33.409	-19 Pass
1.2GHz-8GHz		-34.069	-19 Pass
LTE10 Bandwidth			
9kHz-150kHz		-58.322	-39 Pass
150kHz-20MHz		-56.143	-29 Pass
20MHz-600MHz		-32.428	-19 Pass
600MHz-800MHz		-36.086	-19 Pass
800MHz-1.2GHz		-33.685	-19 Pass
1.2GHz-8GHz		-34.22	-19 Pass
64QAM Modulation			
LTE5 Bandwidth			
9kHz-150kHz		-58.303	-39 Pass
150kHz-20MHz		-55.895	-29 Pass
20MHz-600MHz		-32.719	-19 Pass
600MHz-800MHz		-35.463	-19 Pass
800MHz-1.2GHz		-33.228	-19 Pass
1.2GHz-8GHz		-34.214	-19 Pass
LTE10 Bandwidth			
9kHz-150kHz		-57.864	-39 Pass
150kHz-20MHz		-56.299	-29 Pass
20MHz-600MHz		-32.989	-19 Pass
600MHz-800MHz		-35.533	-19 Pass
800MHz-1.2GHz		-33.403	-19 Pass
1.2GHz-8GHz		-34.145	-19 Pass
256QAM Modulation			
LTE5 Bandwidth			
9kHz-150kHz		-58.25	-39 Pass
150kHz-20MHz		-56.144	-29 Pass
20MHz-600MHz		-31.973	-19 Pass
600MHz-800MHz		-36.1	-19 Pass
800MHz-1.2GHz		-32.824	-19 Pass
1.2GHz-8GHz		-34.568	-19 Pass
LTE10 Bandwidth			
9kHz-150kHz		-58.33	-39 Pass
150kHz-20MHz		-56.262	-29 Pass
20MHz-600MHz		-32.644	-19 Pass
600MHz-800MHz		-35.962	-19 Pass
800MHz-1.2GHz		-32.675	-19 Pass
1.2GHz-8GHz		-34.087	-19 Pass

Keysight Spectrum Analyzer - Element Materials Technology

07:21:24 PM Nov 18, 2019

RL RF 50 Ω DC SENSE:INT ALIGN OFF

PNO: Wide IF Gain: Low Trig: Free Run Atten: 6 dB Avg Type: RMS Avg Hold: 200/200

TRACE 1 3450 TYPE A WWWWWW DET A NNNNN

Ref Offset 27.8 dB Ref 10.90 dBm

Mkr1 9.000 kHz -57.862 dBm

10 dB/div Log

0.900 -9.10 -19.1 -29.1 -39.1 -49.1 -59.1 -69.1 -79.1

-39.00 dBm

Start 9.00 kHz #Res BW 1.0 kHz #VBW 3.0 kHz* Stop 150.00 kHz Sweep 174.4 ms (8001 pts)

MSG STATUS DC Coupled

Keysight Spectrum Analyzer - Element Materials Technology

RL RF 50 Ω DC SENSE:INT ALIGN OFF 07:22:40 PM Nov 18, 2019

PNO: Fast IFGain:Low Trig: Free Run #Atten: 10 dB Avg Type: RMS Avg/Hold: 200/200

TRACE 1 2 3 4 5 6 TYPE A W W W W W W W W DET A H H H H H H H H

Ref Offset 27.9 dB Ref -9.00 dBm Mkr1 150.0 kHz -55.749 dBm

10 dB/div Log

-19.0
-29.0
-39.0
-49.0
-59.0
-69.0
-79.0
-89.0
-99.0

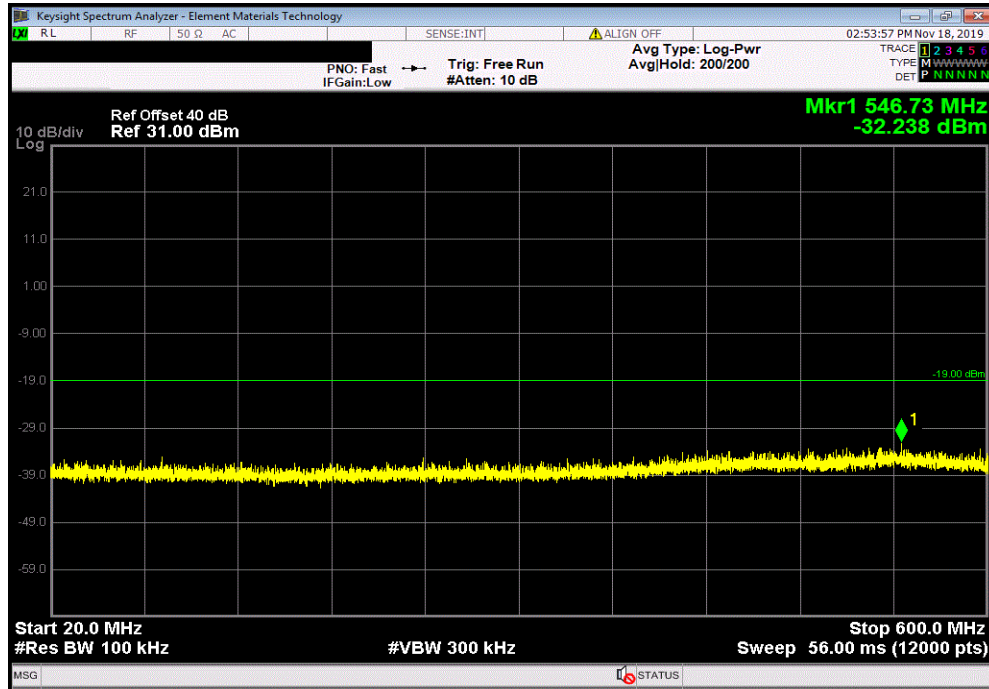
-29.00 dBm

Start 0.150 MHz #Res BW 10 kHz #VBW 30 kHz* Stop 20.000 MHz Sweep 245.3 ms (8001 pts)

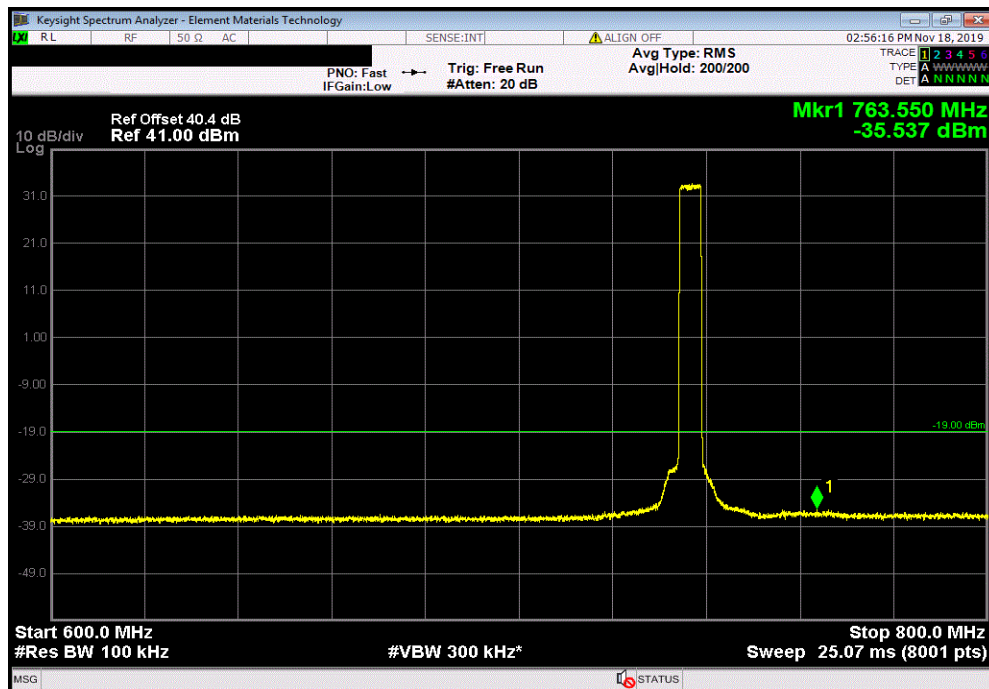
MSG STATUS DC Coupled

SPURIOUS CONDUCTED EMISSIONS

Band 12, QPSK Modulation, LTE5 Bandwidth, 20MHz-600MHz						
				Value (dBm)	Limit (dBm)	Result
				-32.238	-19	Pass

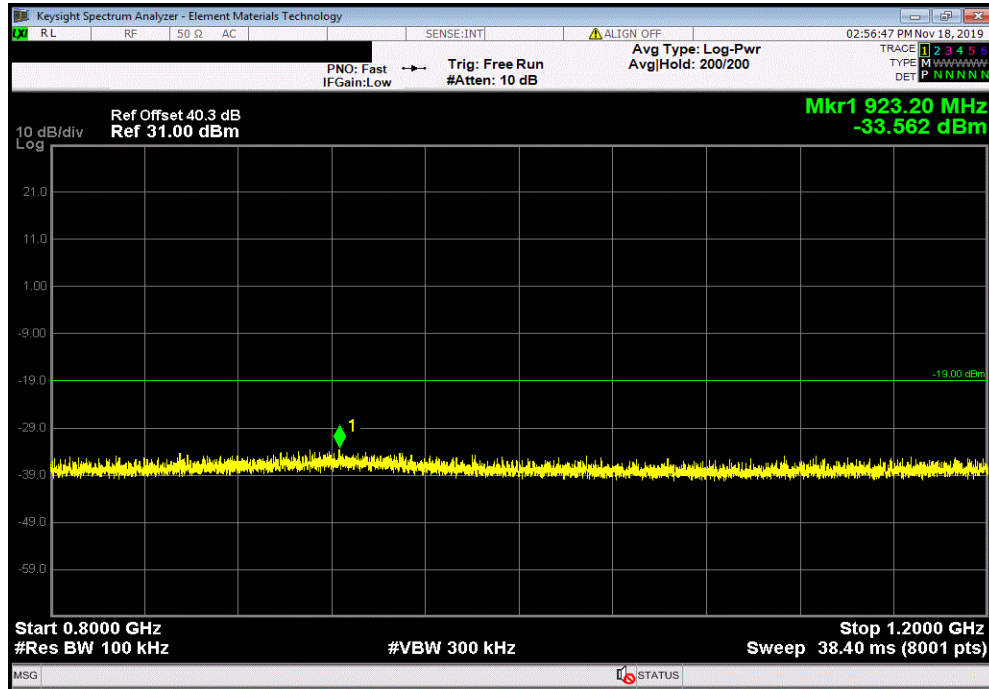


Band 12, QPSK Modulation, LTE5 Bandwidth, 600MHz-800MHz						
				Value (dBm)	Limit (dBm)	Result
				-35.537	-19	Pass

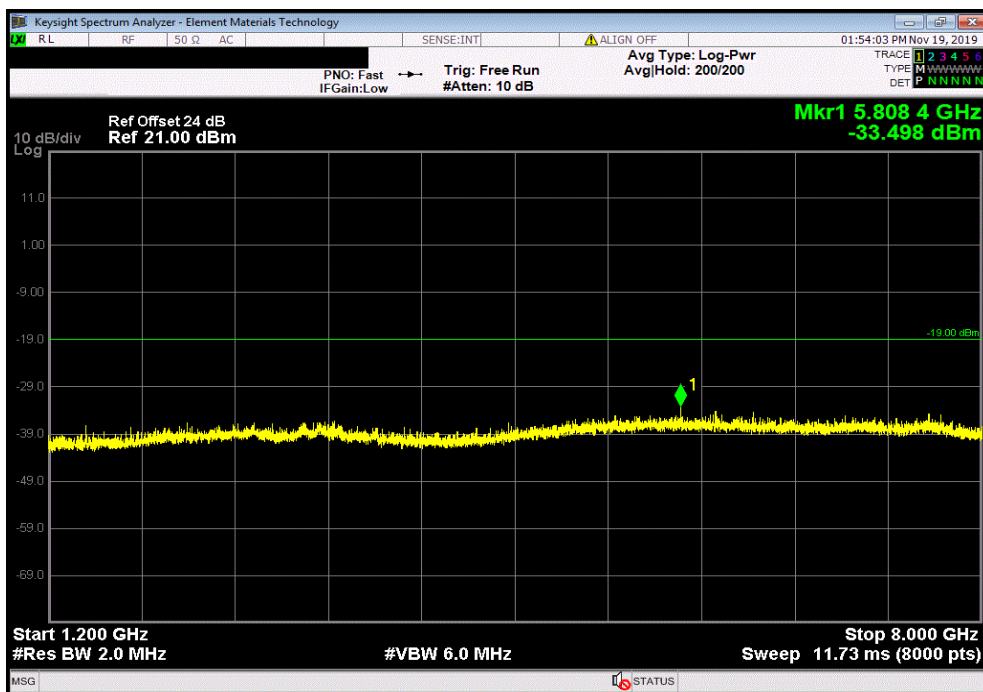


SPURIOUS CONDUCTED EMISSIONS

Band 12, QPSK Modulation, LTE5 Bandwidth, 800MHz-1.2GHz						
				Value (dBm)	Limit (dBm)	Result
				-33.562	-19	Pass

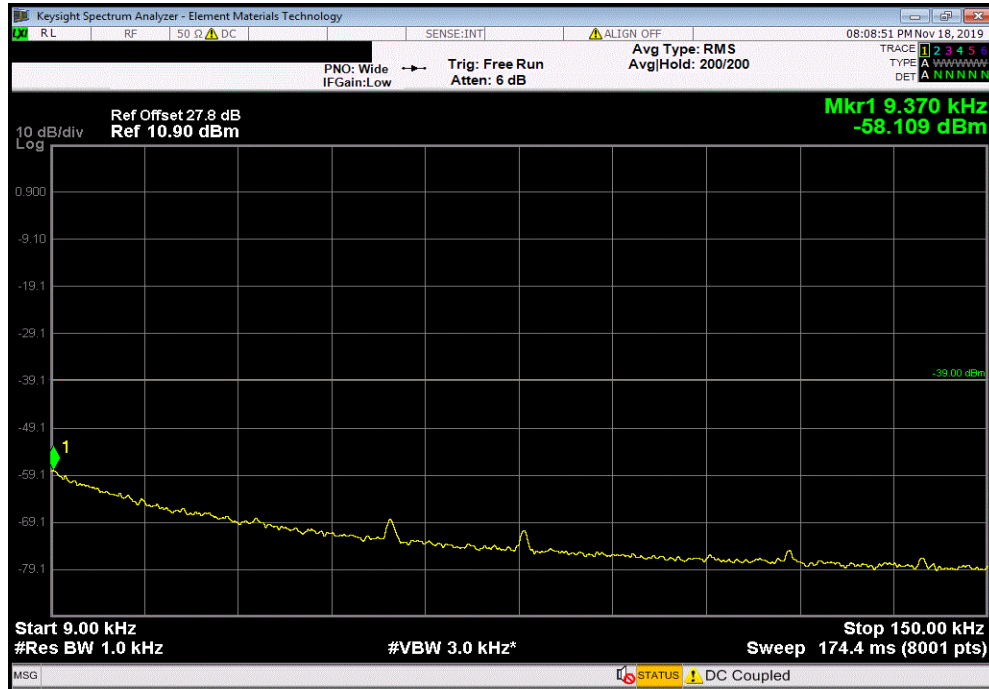


Band 12, QPSK Modulation, LTE5 Bandwidth, 1.2GHz-8GHz						
				Value (dBm)	Limit (dBm)	Result
				-33.498	-19	Pass

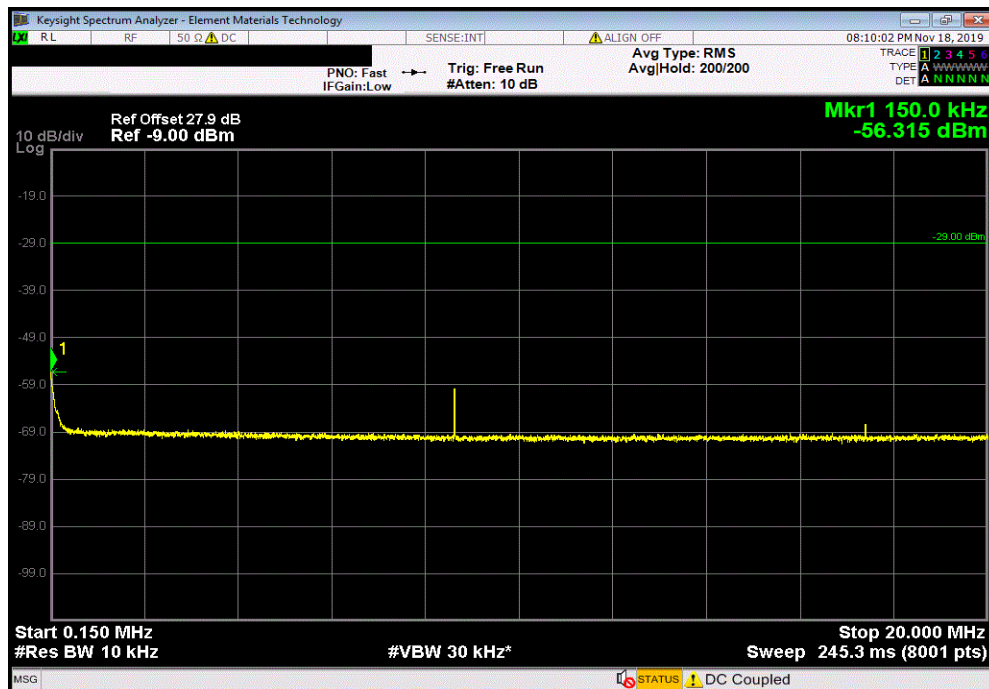


SPURIOUS CONDUCTED EMISSIONS

Band 12, QPSK Modulation, LTE10 Bandwidth, 9kHz-150kHz						
				Value (dBm)	Limit (dBm)	Result
				-58.109	-39	Pass

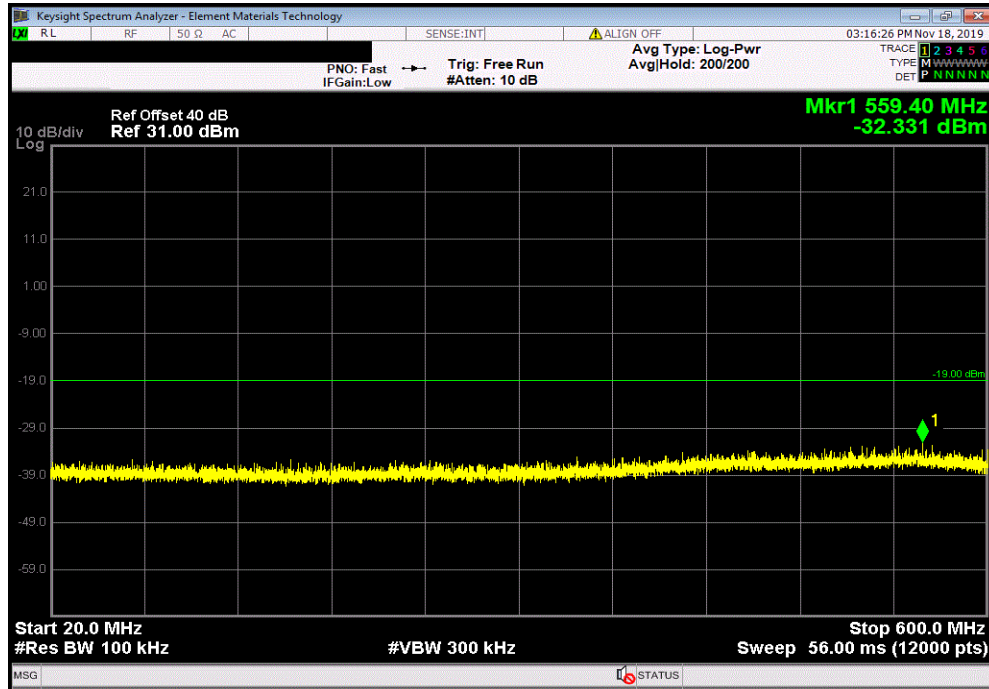


Band 12, QPSK Modulation, LTE10 Bandwidth, 150kHz-20MHz						
				Value (dBm)	Limit (dBm)	Result
				-56.315	-29	Pass

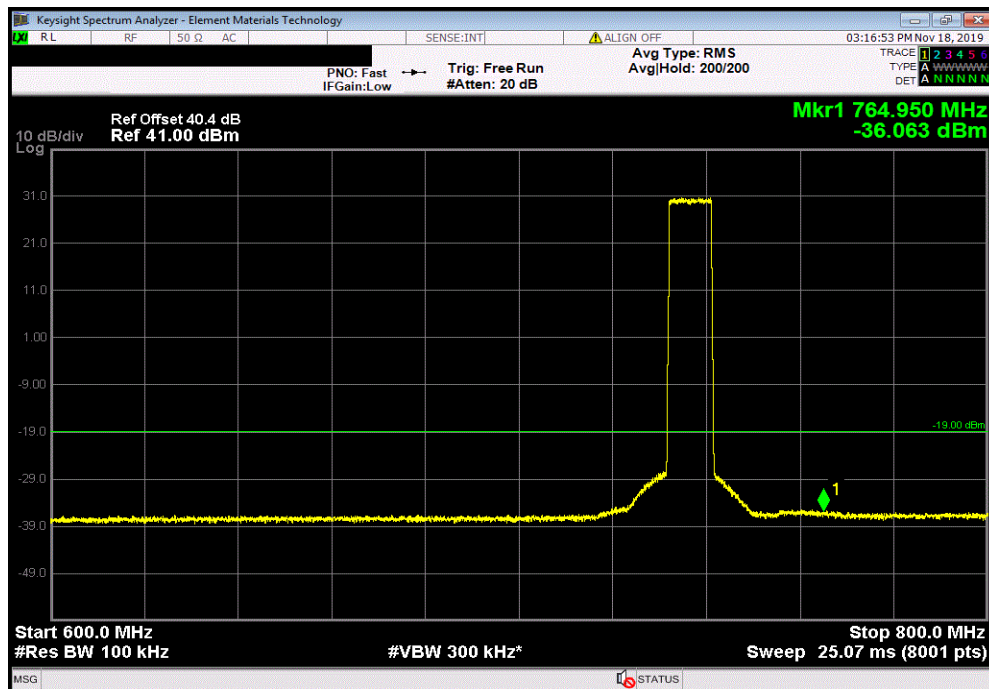


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Band 12, QPSK Modulation, LTE10 Bandwidth, 20MHz-600MHz						
				Value (dBm)	Limit (dBm)	Result
				-32.331	-19	Pass



Band 12, QPSK Modulation, LTE10 Bandwidth, 600MHz-800MHz						
				Value (dBm)	Limit (dBm)	Result
				-36.063	-19	Pass

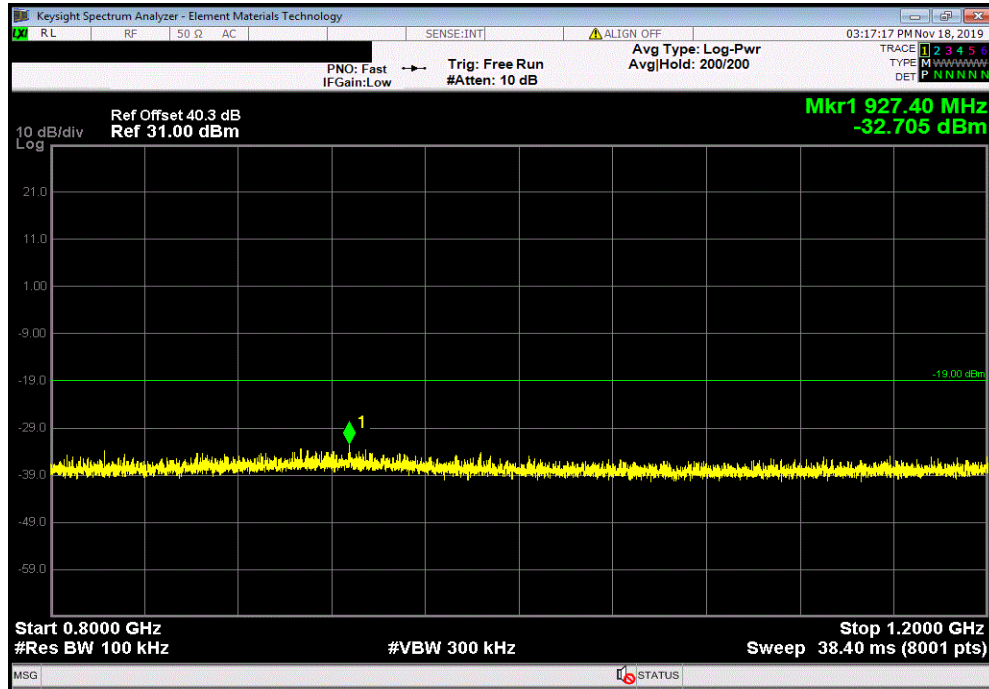


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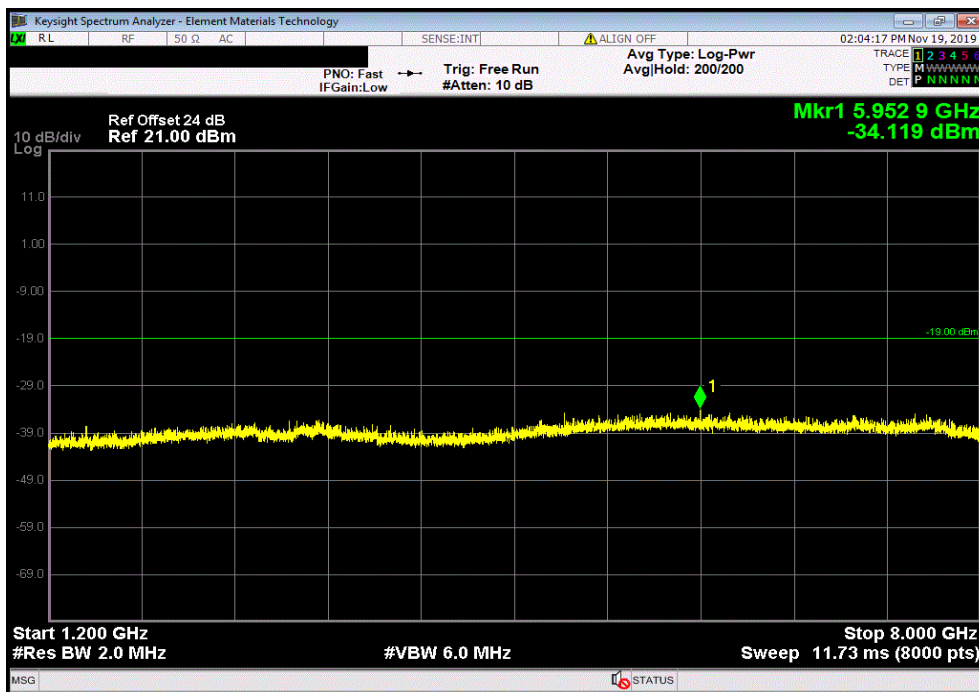


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Band 12, QPSK Modulation, LTE10 Bandwidth, 800MHz-1.2GHz						
				Value (dBm)	Limit (dBm)	Result
				-32.705	-19	Pass



Band 12, QPSK Modulation, LTE10 Bandwidth, 1.2GHz-8GHz						
				Value (dBm)	Limit (dBm)	Result
				-34.119	-19	Pass

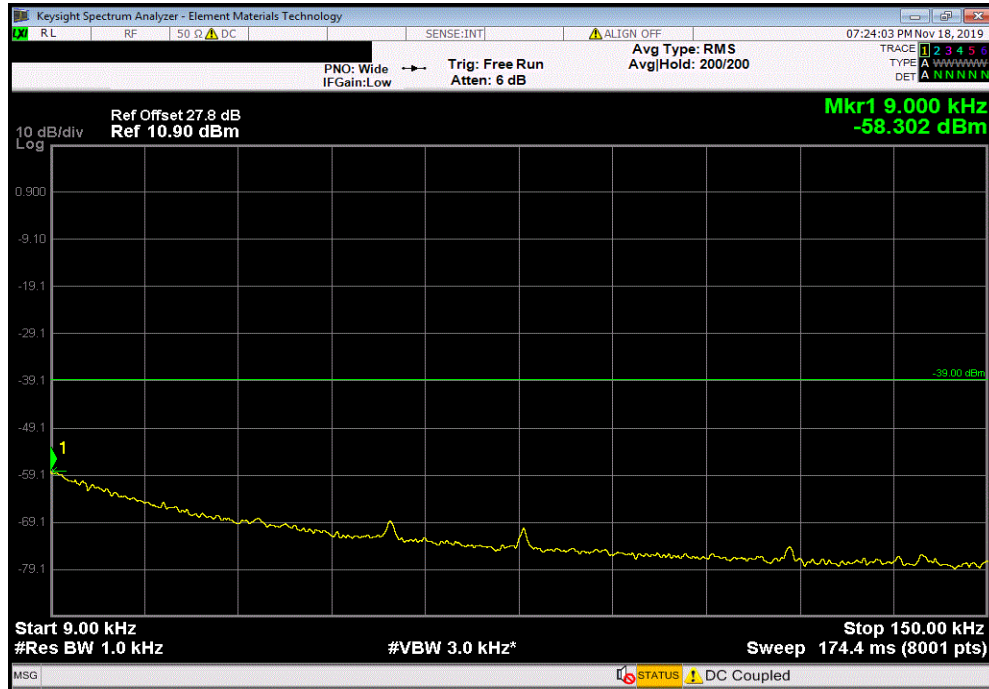


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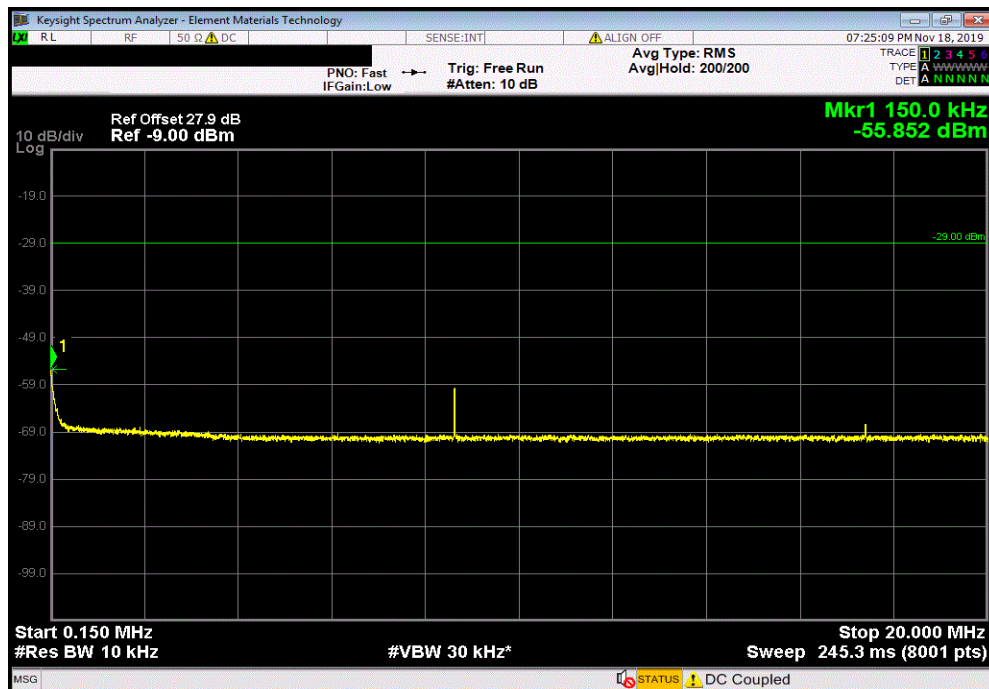


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Band 12, 16QAM Modulation, LTE5 Bandwidth, 9kHz-150kHz						
				Value (dBm)	Limit (dBm)	Result
				-58.302	-39	Pass

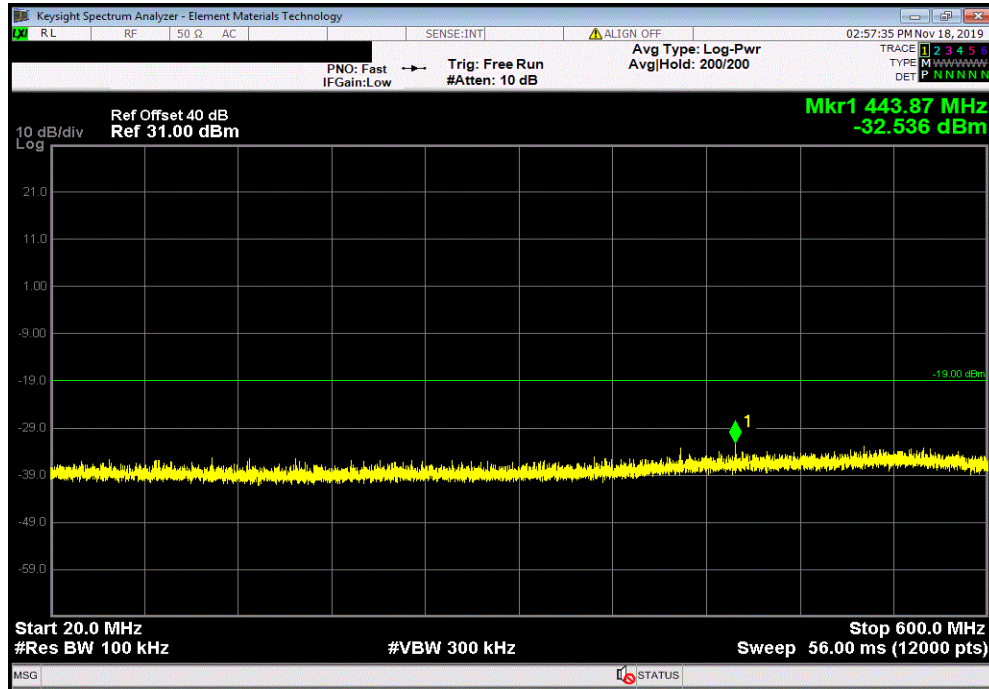


Band 12, 16QAM Modulation, LTE5 Bandwidth, 150kHz-20MHz						
				Value (dBm)	Limit (dBm)	Result
				-55.852	-29	Pass

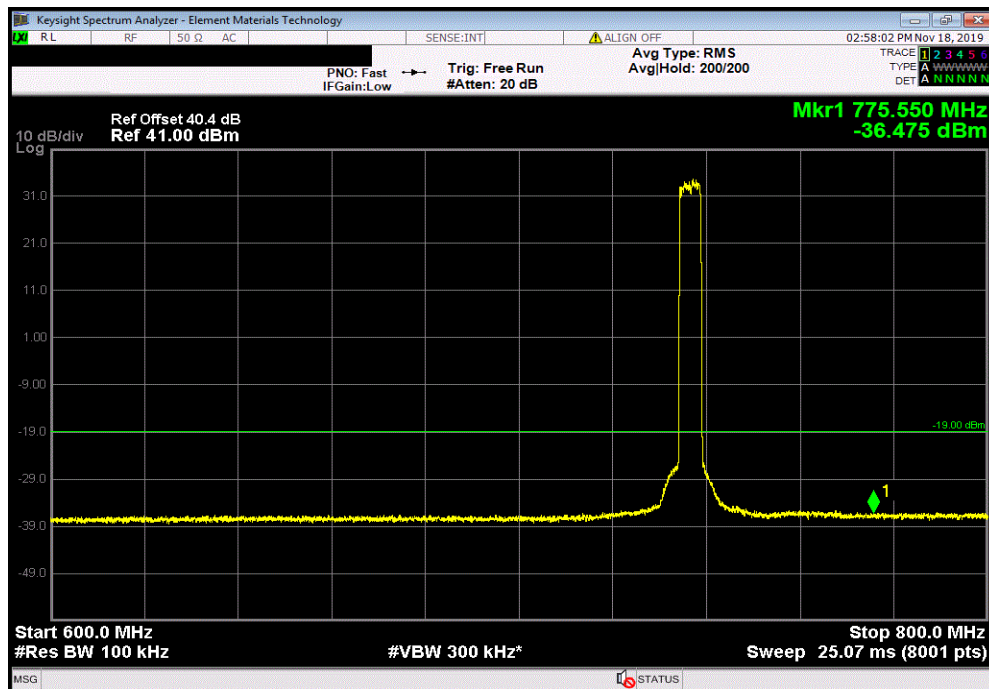


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Band 12, 16QAM Modulation, LTE5 Bandwidth, 20MHz-600MHz						
				Value (dBm)	Limit (dBm)	Result
				-32.536	-19	Pass



Band 12, 16QAM Modulation, LTE5 Bandwidth, 600MHz-800MHz						
				Value (dBm)	Limit (dBm)	Result
				-36.475	-19	Pass

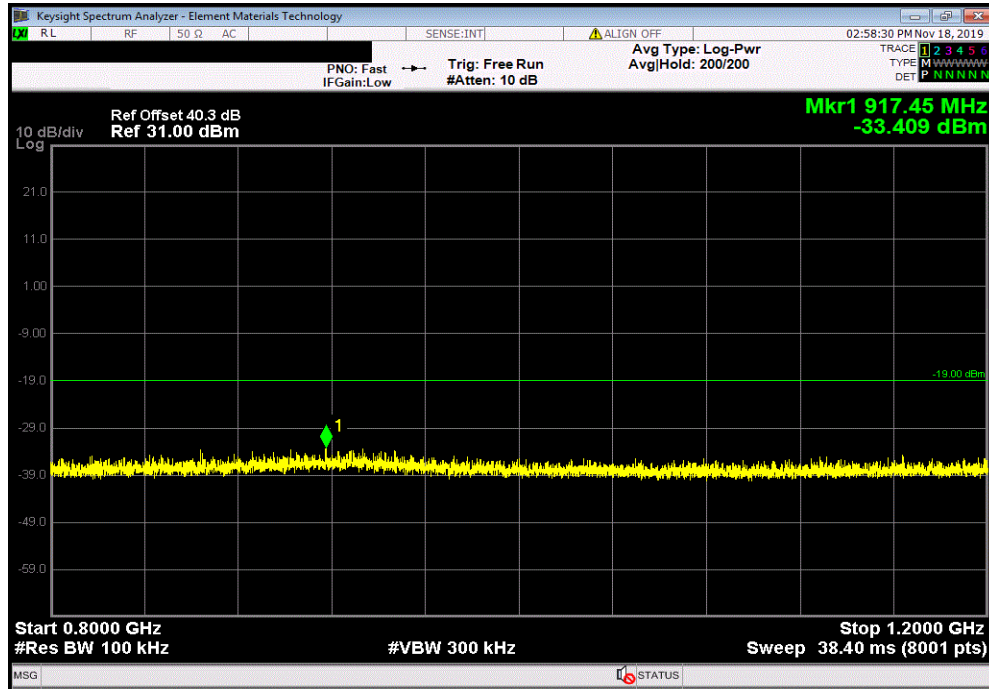


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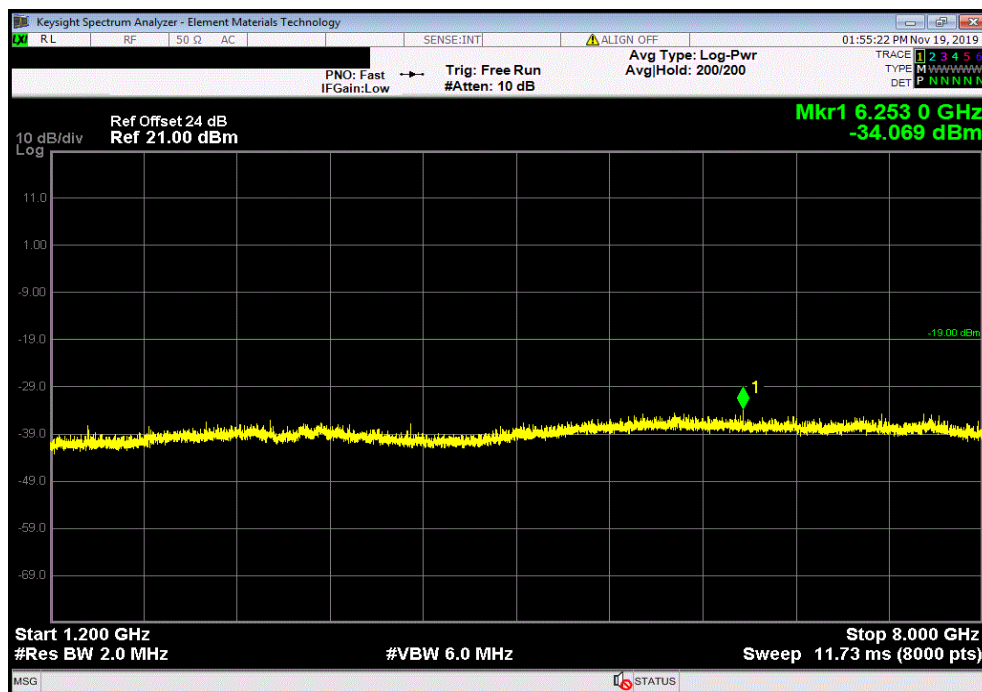


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Band 12, 16QAM Modulation, LTE5 Bandwidth, 800MHz-1.2GHz						
				Value (dBm)	Limit (dBm)	Result
				-33.409	-19	Pass

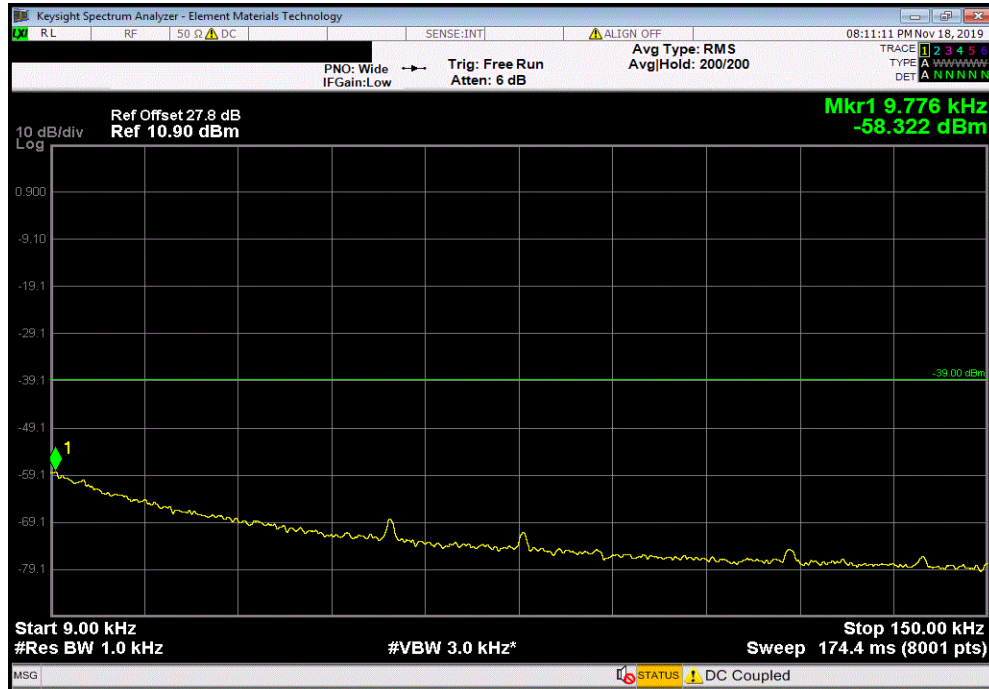


Band 12, 16QAM Modulation, LTE5 Bandwidth, 1.2GHz-8GHz						
				Value (dBm)	Limit (dBm)	Result
				-34.069	-19	Pass

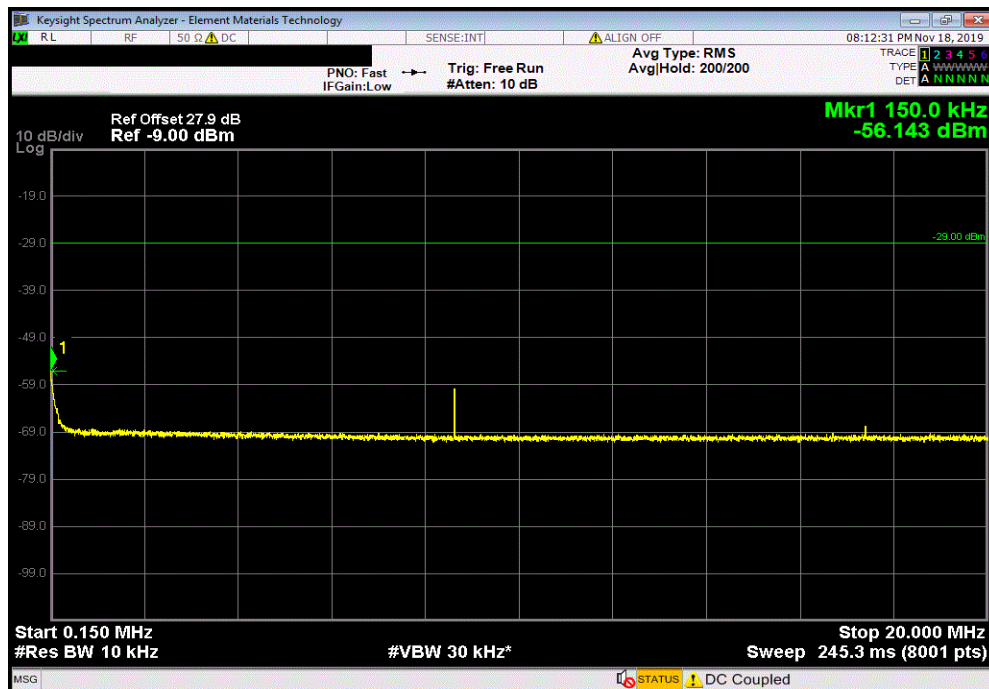


SPURIOUS CONDUCTED EMISSIONS

Band 12, 16QAM Modulation, LTE10 Bandwidth, 9kHz-150kHz						
				Value (dBm)	Limit (dBm)	Result
				-58.322	-39	Pass



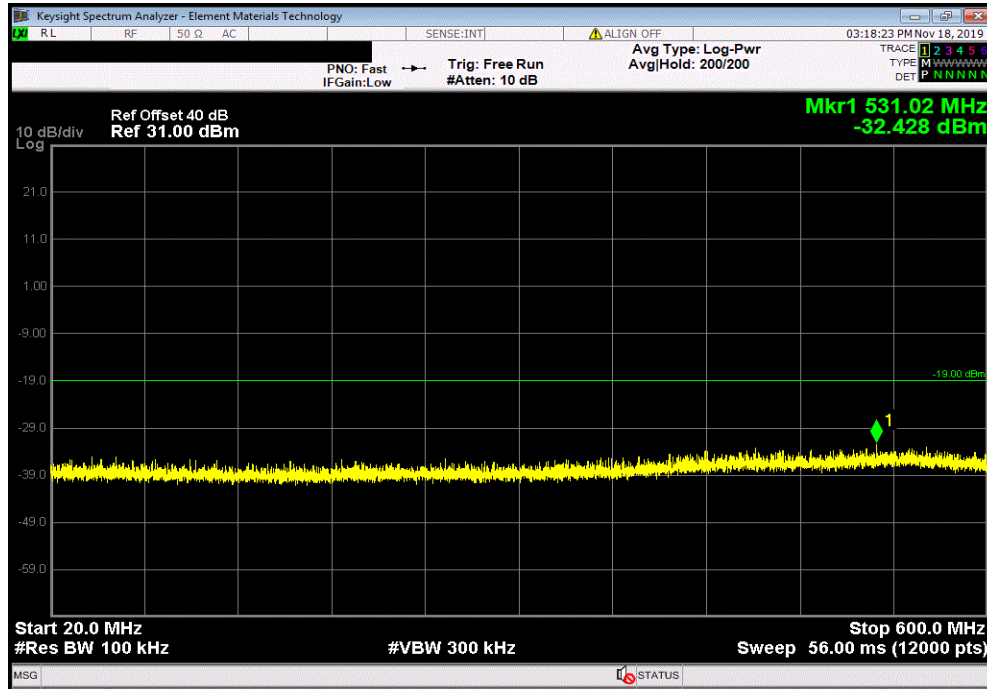
Band 12, 16QAM Modulation, LTE10 Bandwidth, 150kHz-20MHz						
				Value (dBm)	Limit (dBm)	Result
				-56.143	-29	Pass



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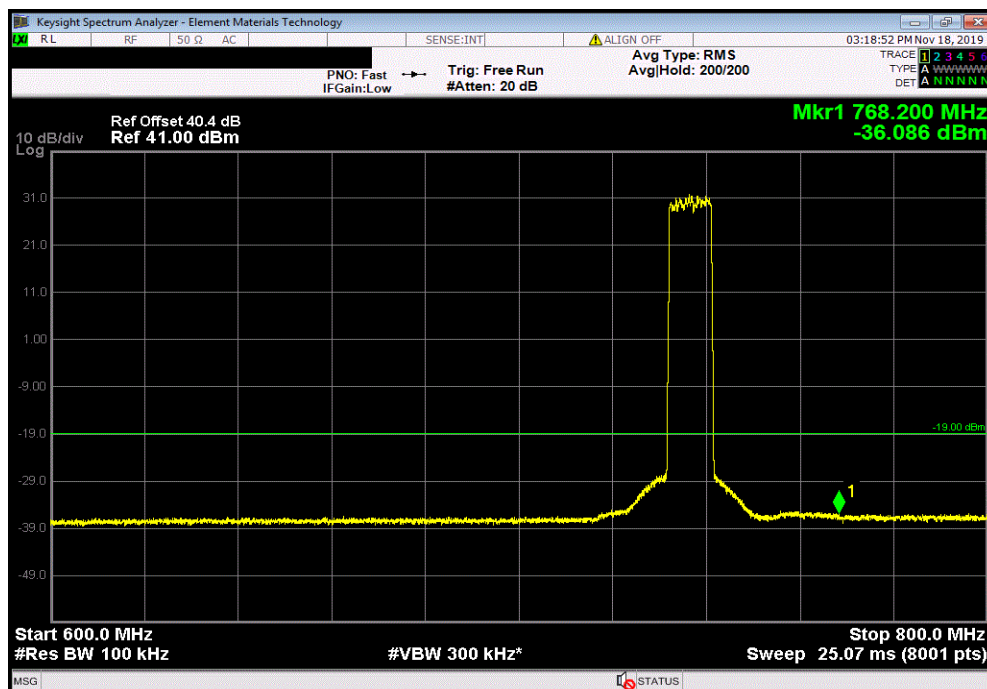
Band 12, 16QAM Modulation, LTE10 Bandwidth, 20MHz-600MHz

				Value (dBm)	Limit (dBm)	Result
				-32.428	-19	Pass



Band 12, 16QAM Modulation, LTE10 Bandwidth, 600MHz-800MHz

				Value (dBm)	Limit (dBm)	Result
				-36.086	-19	Pass

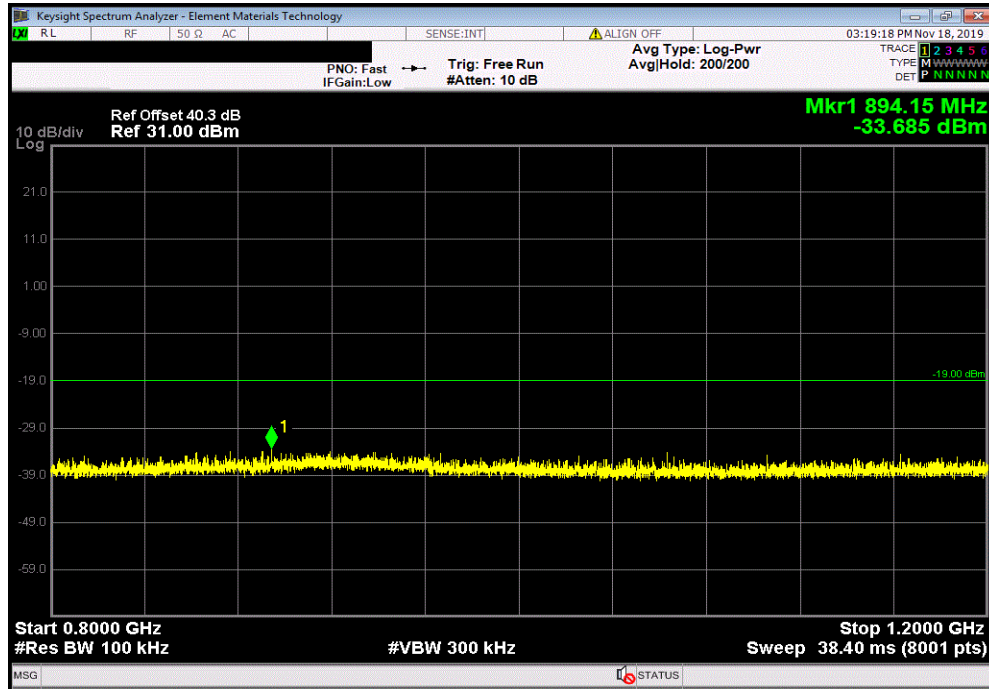


SPURIOUS CONDUCTED EMISSIONS

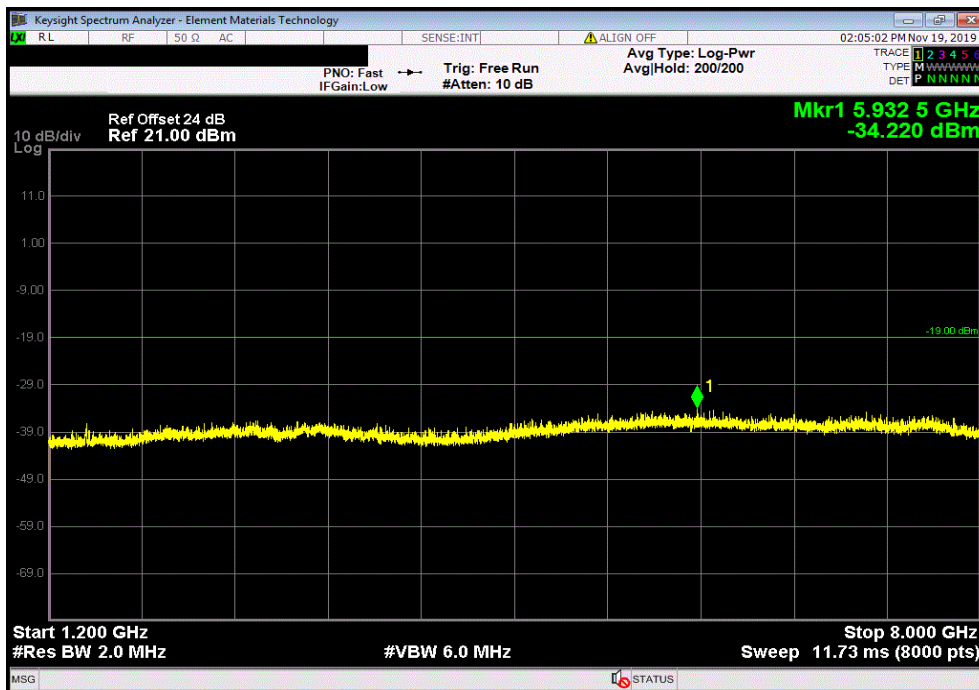


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Band 12, 16QAM Modulation, LTE10 Bandwidth, 800MHz-1.2GHz						
				Value (dBm)	Limit (dBm)	Result
				-33.685	-19	Pass

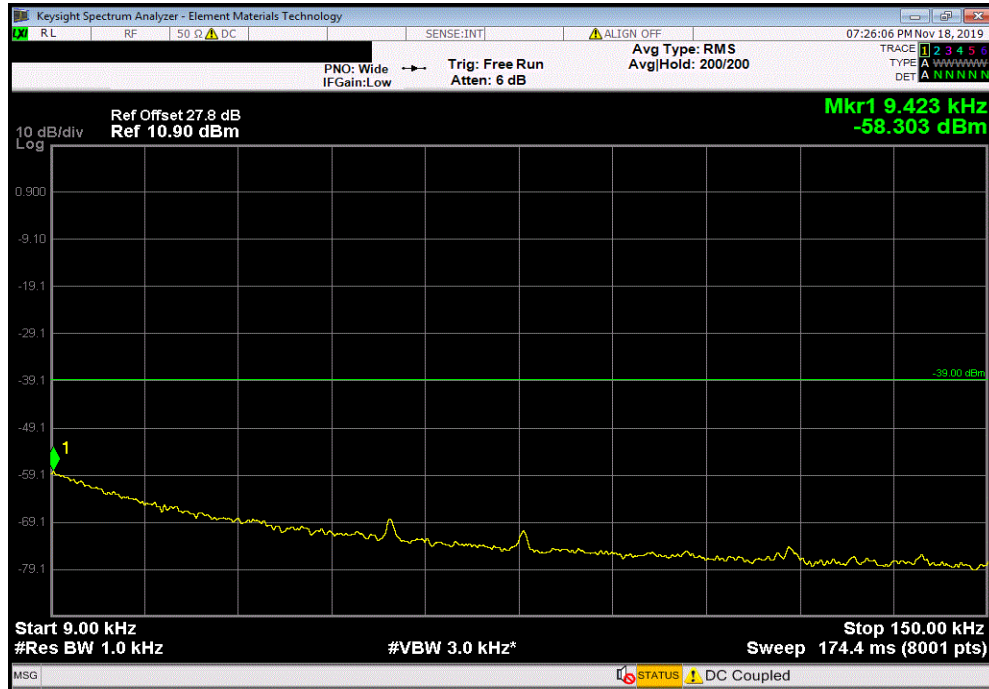


Band 12, 16QAM Modulation, LTE10 Bandwidth, 1.2GHz-8GHz						
				Value (dBm)	Limit (dBm)	Result
				-34.22	-19	Pass

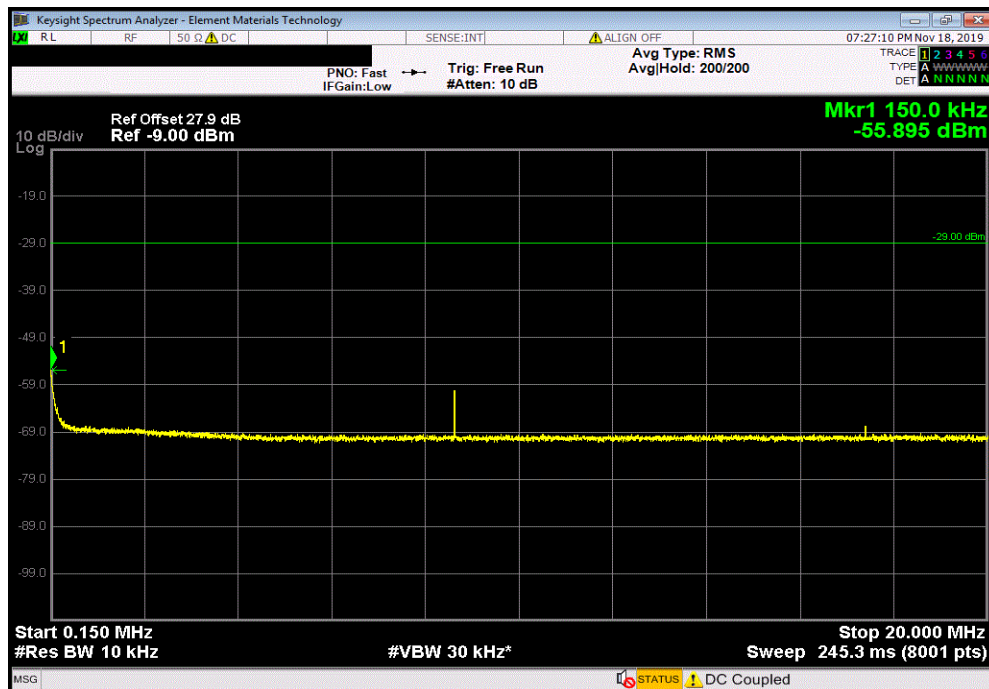


SPURIOUS CONDUCTED EMISSIONS

Band 12, 64QAM Modulation, LTE5 Bandwidth, 9kHz-150kHz						
				Value (dBm)	Limit (dBm)	Result
				-58.303	-39	Pass

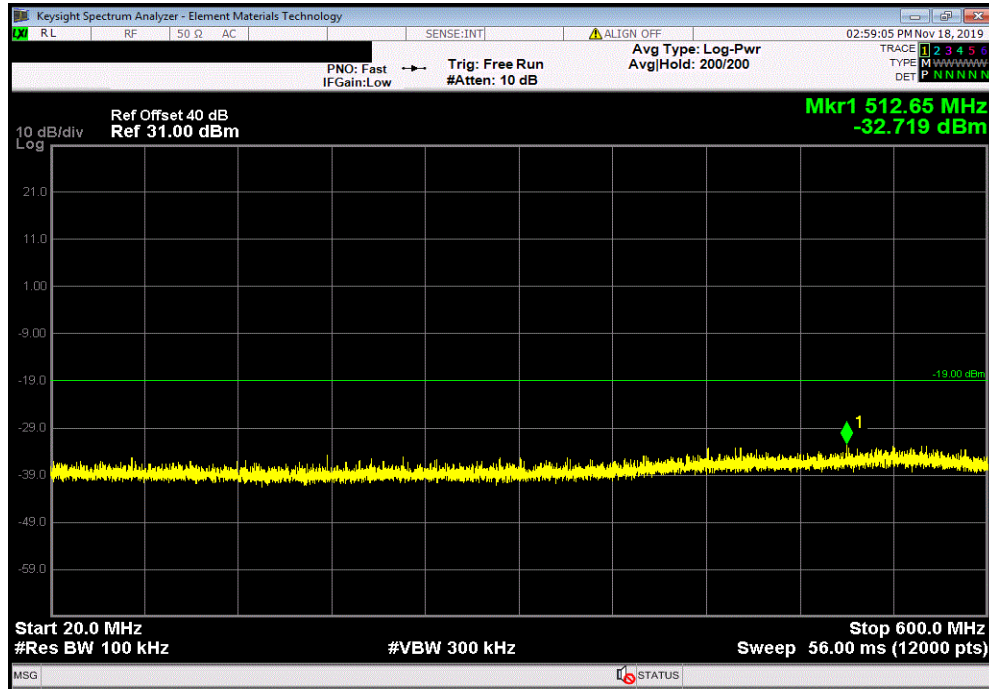


Band 12, 64QAM Modulation, LTE5 Bandwidth, 150kHz-20MHz						
				Value (dBm)	Limit (dBm)	Result
				-55.895	-29	Pass

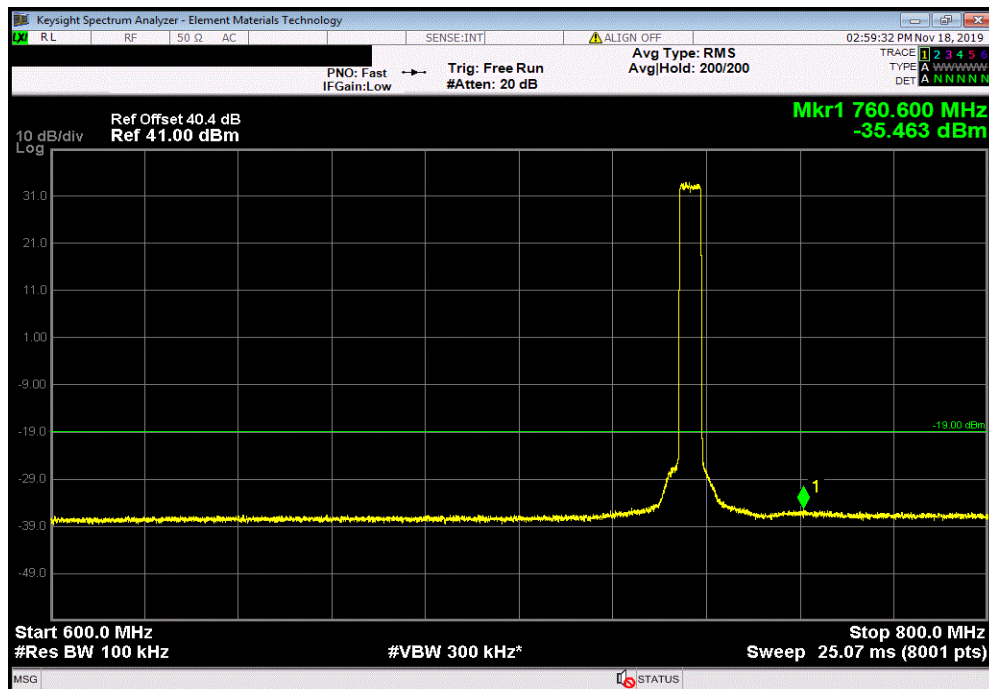


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Band 12, 64QAM Modulation, LTE5 Bandwidth, 20MHz-600MHz						
				Value (dBm)	Limit (dBm)	Result
				-32.719	-19	Pass



Band 12, 64QAM Modulation, LTE5 Bandwidth, 600MHz-800MHz						
				Value (dBm)	Limit (dBm)	Result
				-35.463	-19	Pass

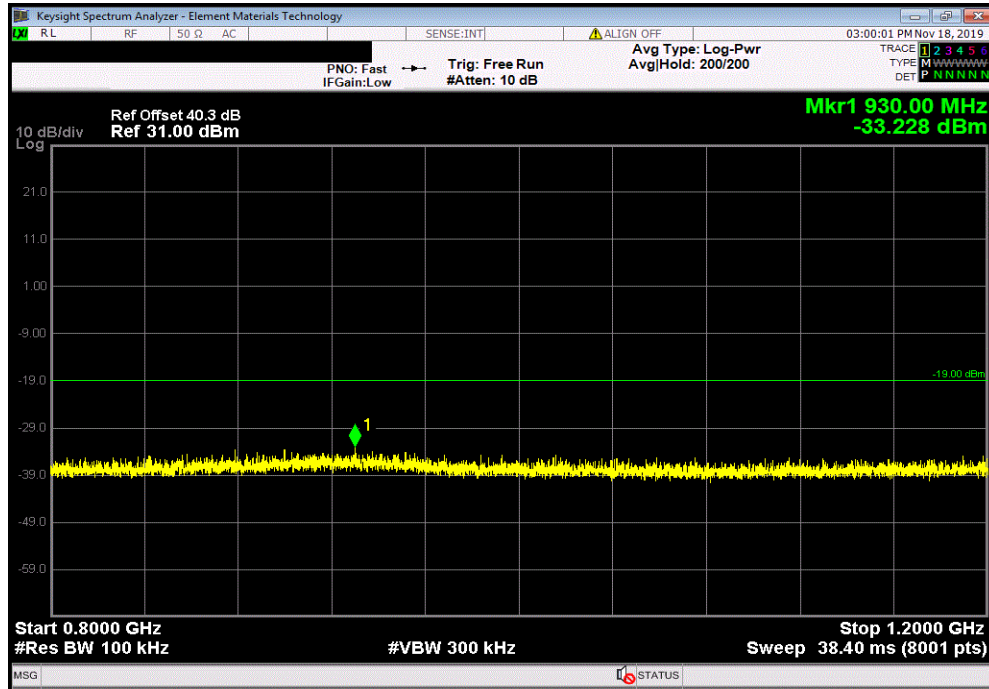


SPURIOUS CONDUCTED EMISSIONS

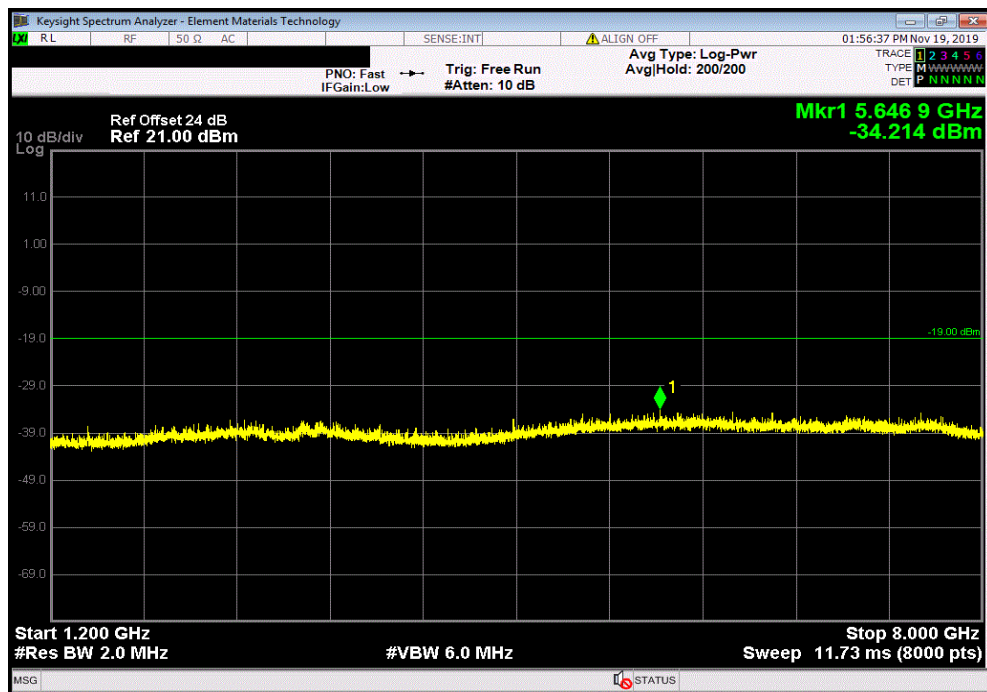


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Band 12, 64QAM Modulation, LTE5 Bandwidth, 800MHz-1.2GHz						
				Value (dBm)	Limit (dBm)	Result
				-33.228	-19	Pass

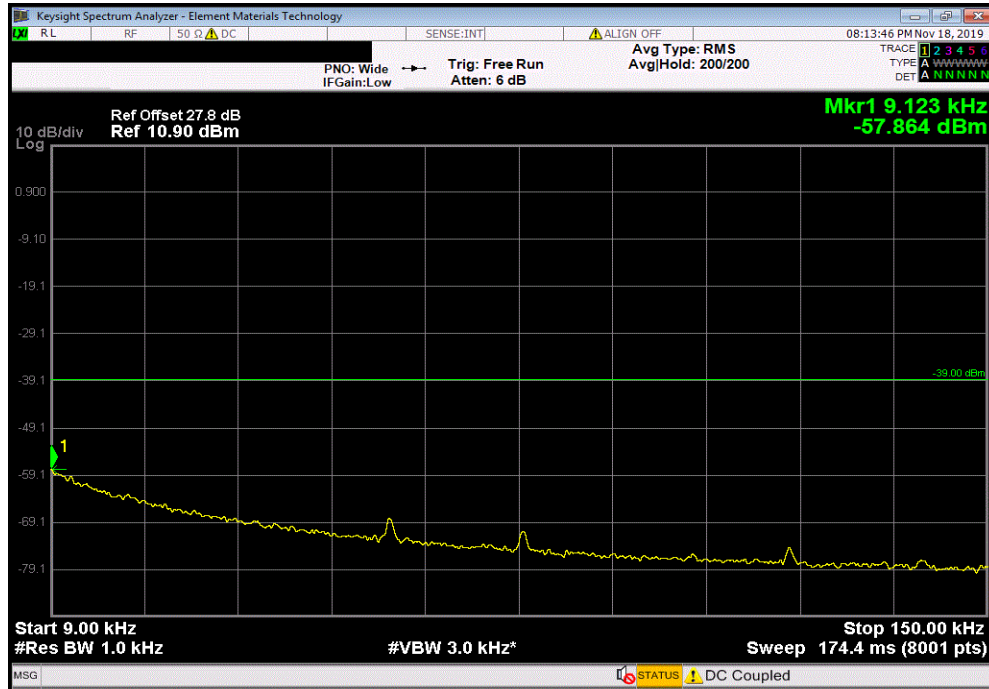


Band 12, 64QAM Modulation, LTE5 Bandwidth, 1.2GHz-8GHz						
				Value (dBm)	Limit (dBm)	Result
				-34.214	-19	Pass

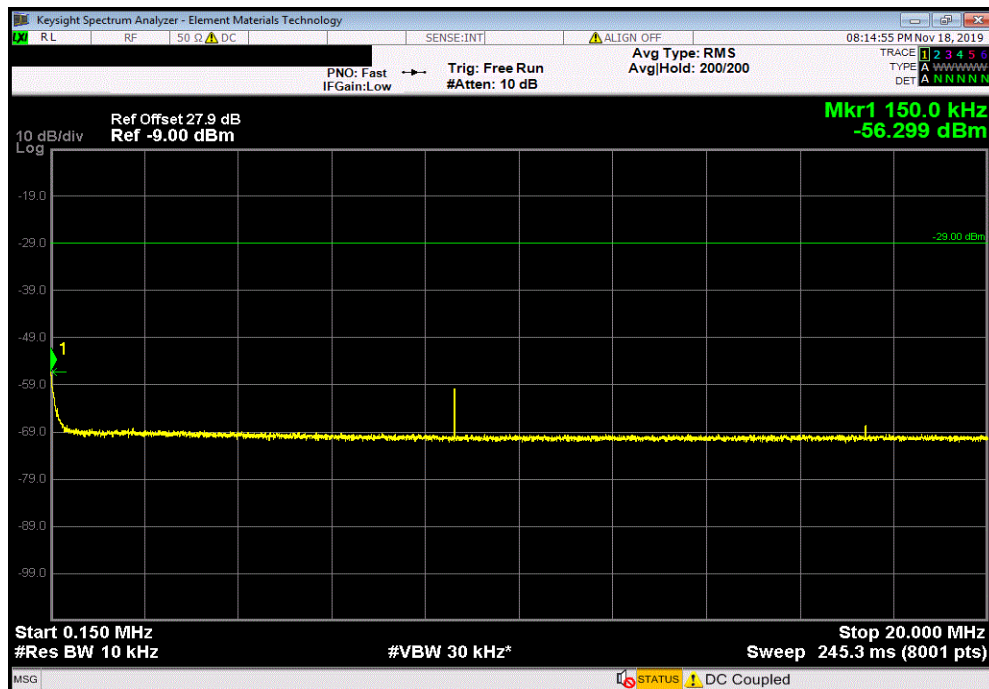


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Band 12, 64QAM Modulation, LTE10 Bandwidth, 9kHz-150kHz						
				Value (dBm)	Limit (dBm)	Result
				-57.864	-39	Pass



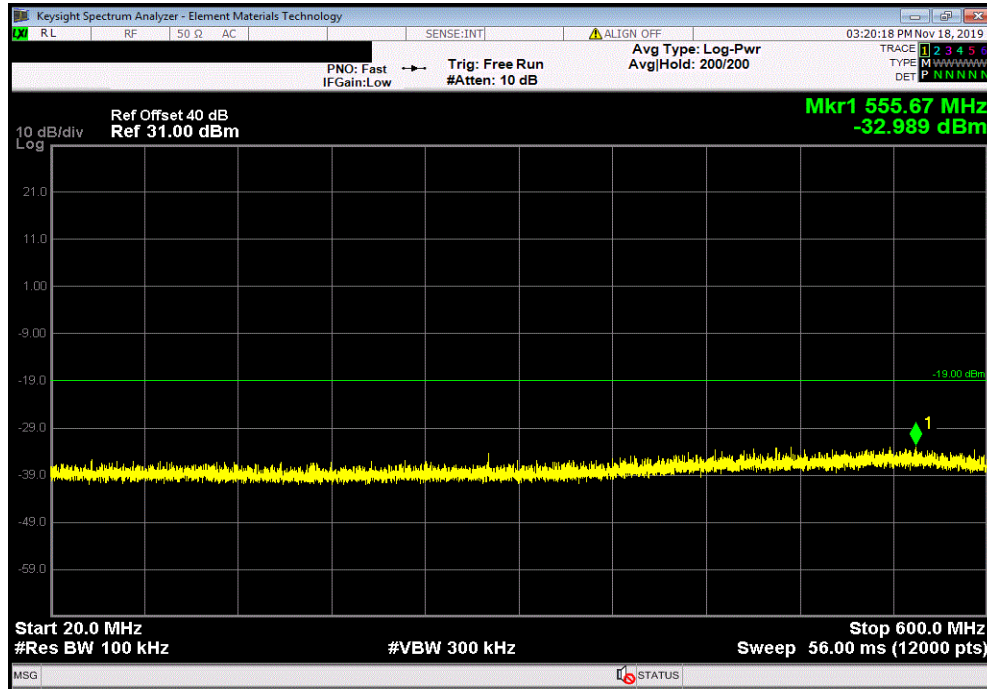
Band 12, 64QAM Modulation, LTE10 Bandwidth, 150kHz-20MHz						
				Value (dBm)	Limit (dBm)	Result
				-56.299	-29	Pass



SPURIOUS CONDUCTED EMISSIONS

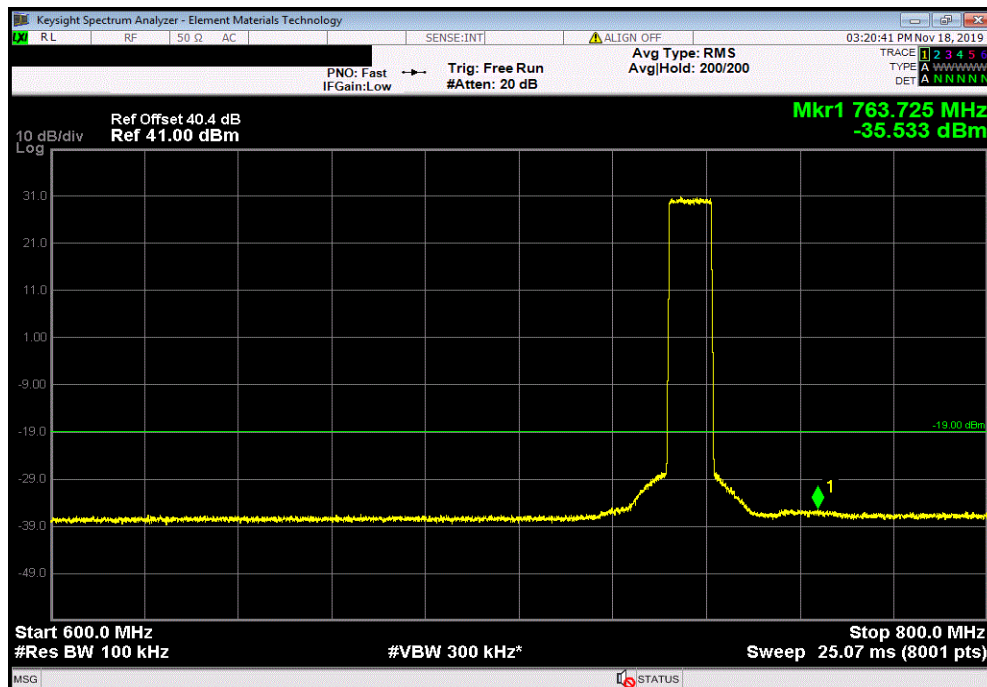
Band 12, 64QAM Modulation, LTE10 Bandwidth, 20MHz-600MHz

				Value (dBm)	Limit (dBm)	Result
				-32.989	-19	Pass



Band 12, 64QAM Modulation, LTE10 Bandwidth, 600MHz-800MHz

				Value (dBm)	Limit (dBm)	Result
				-35.533	-19	Pass



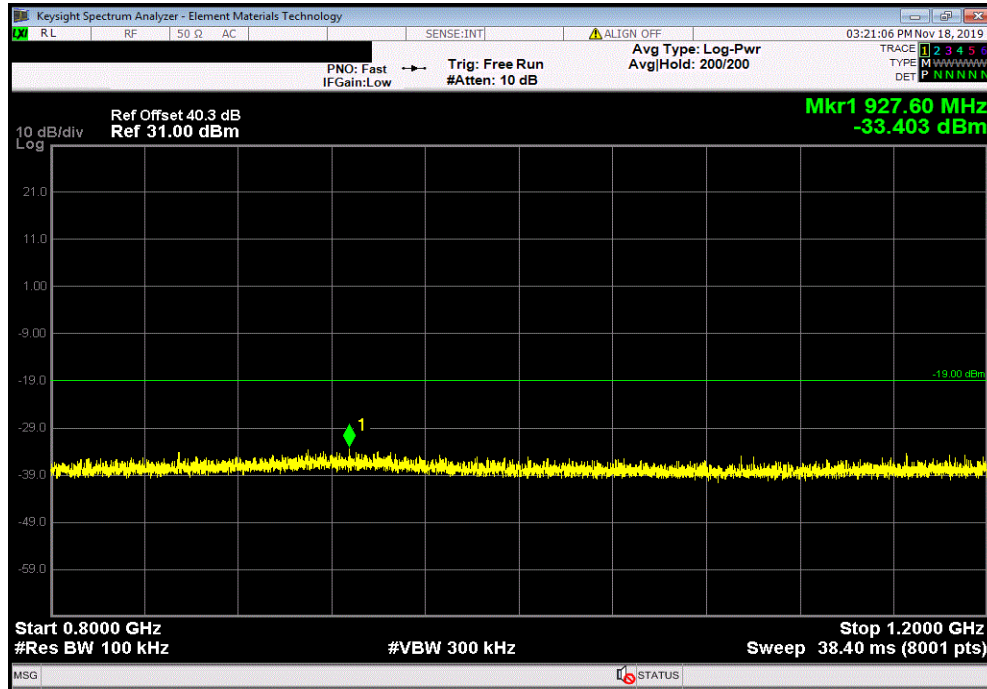
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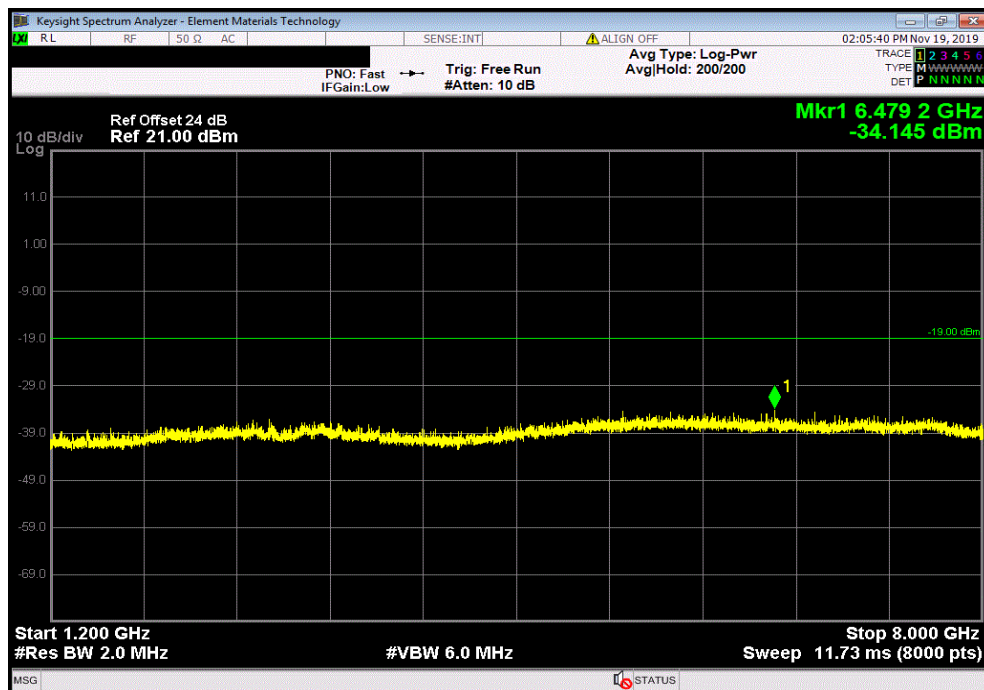
Band 12, 64QAM Modulation, LTE10 Bandwidth, 800MHz-1.2GHz

				Value (dBm)	Limit (dBm)	Result
				-33.403	-19	Pass



Band 12, 64QAM Modulation, LTE10 Bandwidth, 1.2GHz-8GHz

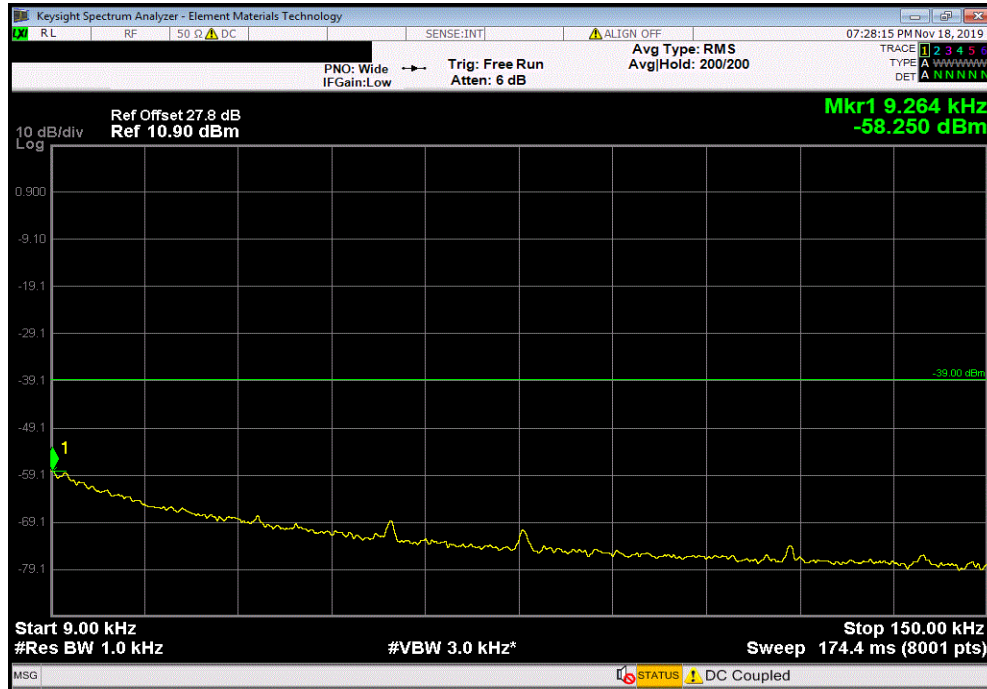
				Value (dBm)	Limit (dBm)	Result
				-34.145	-19	Pass



SPURIOUS CONDUCTED EMISSIONS

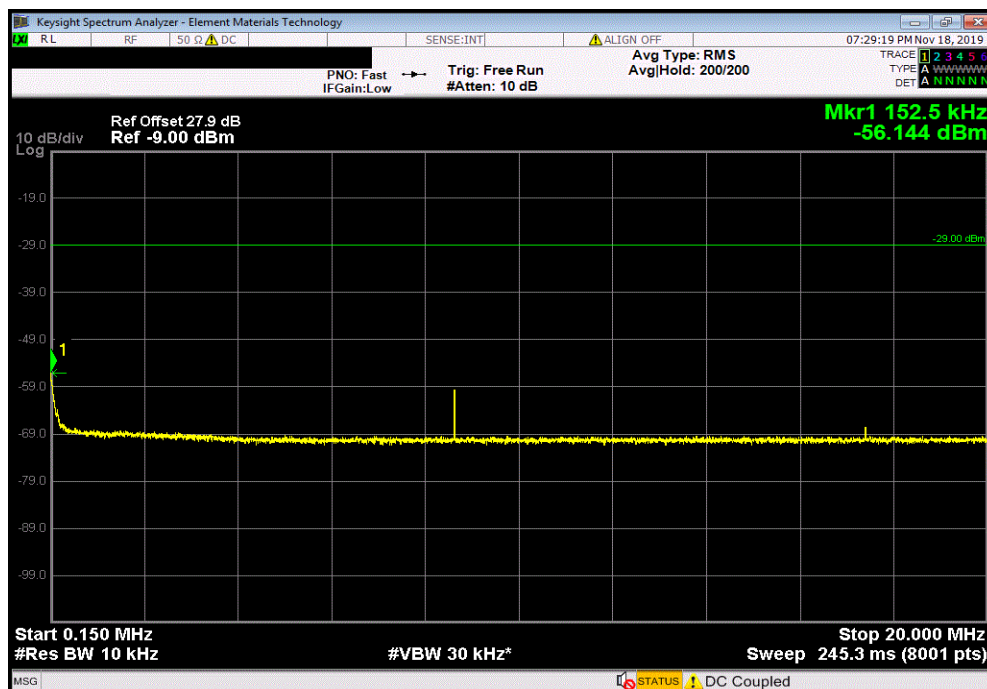
Band 12, 256QAM Modulation, LTE5 Bandwidth, 9kHz-150kHz

				Value (dBm)	Limit (dBm)	Result
				-58.25	-39	Pass



Band 12, 256QAM Modulation, LTE5 Bandwidth, 150kHz-20MHz

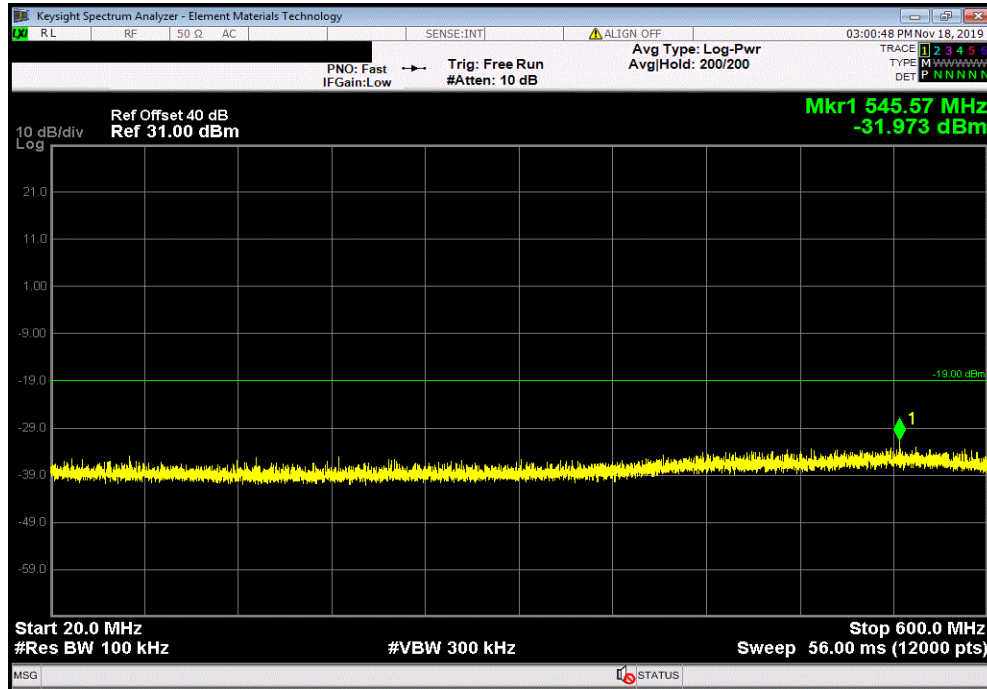
				Value (dBm)	Limit (dBm)	Result
				-56.144	-29	Pass



SPURIOUS CONDUCTED EMISSIONS

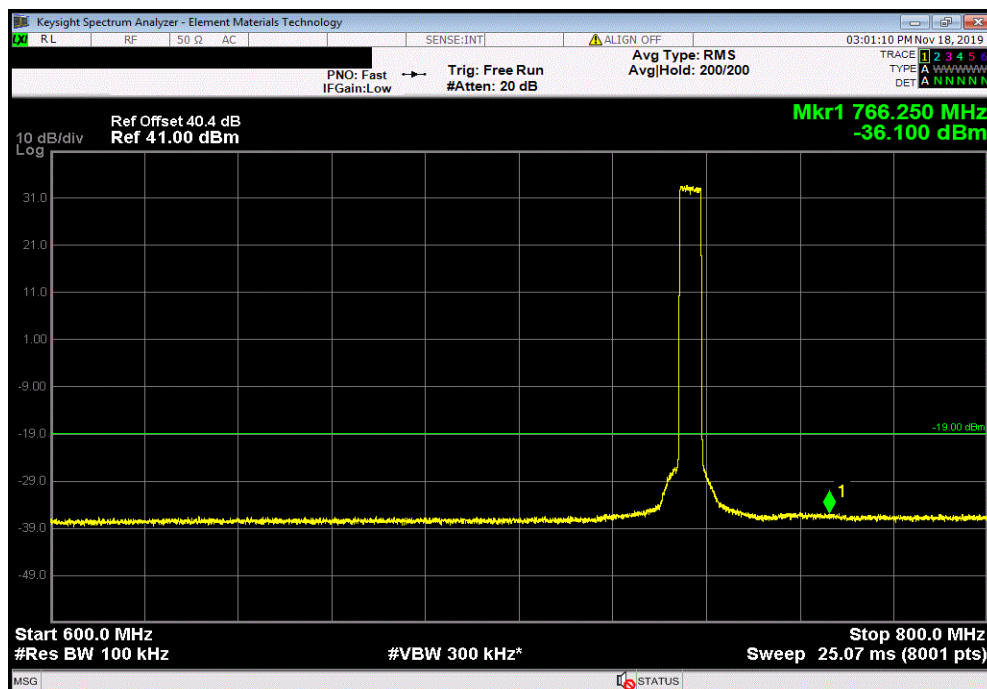
Band 12, 256QAM Modulation, LTE5 Bandwidth, 20MHz-600MHz

				Value (dBm)	Limit (dBm)	Result
				-31.973	-19	Pass



Band 12, 256QAM Modulation, LTE5 Bandwidth, 600MHz-800MHz

				Value (dBm)	Limit (dBm)	Result
				-36.1	-19	Pass

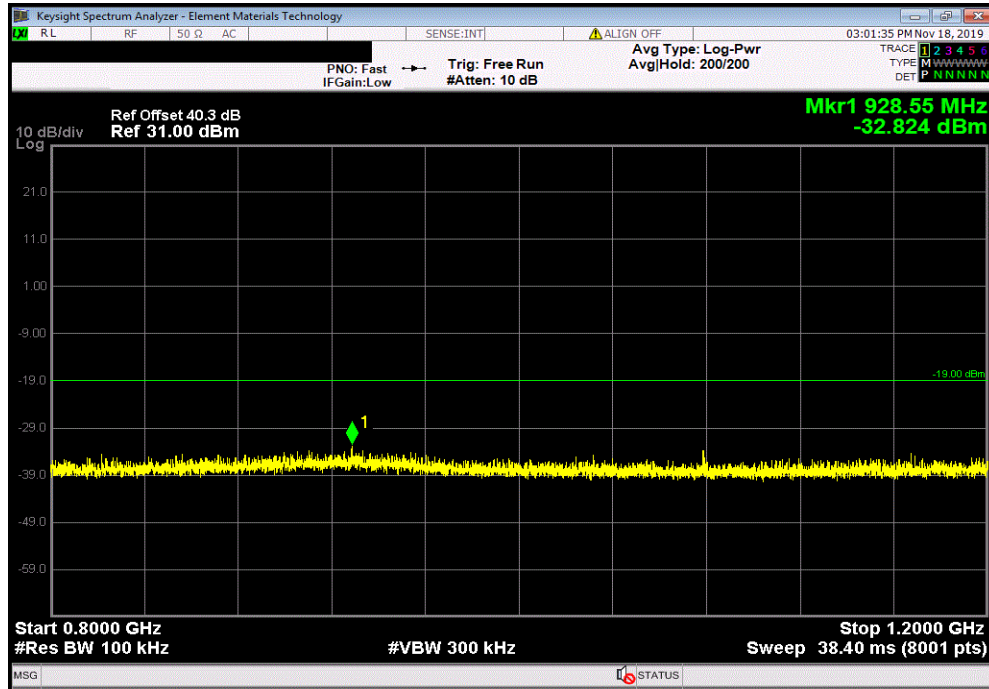


SPURIOUS CONDUCTED EMISSIONS

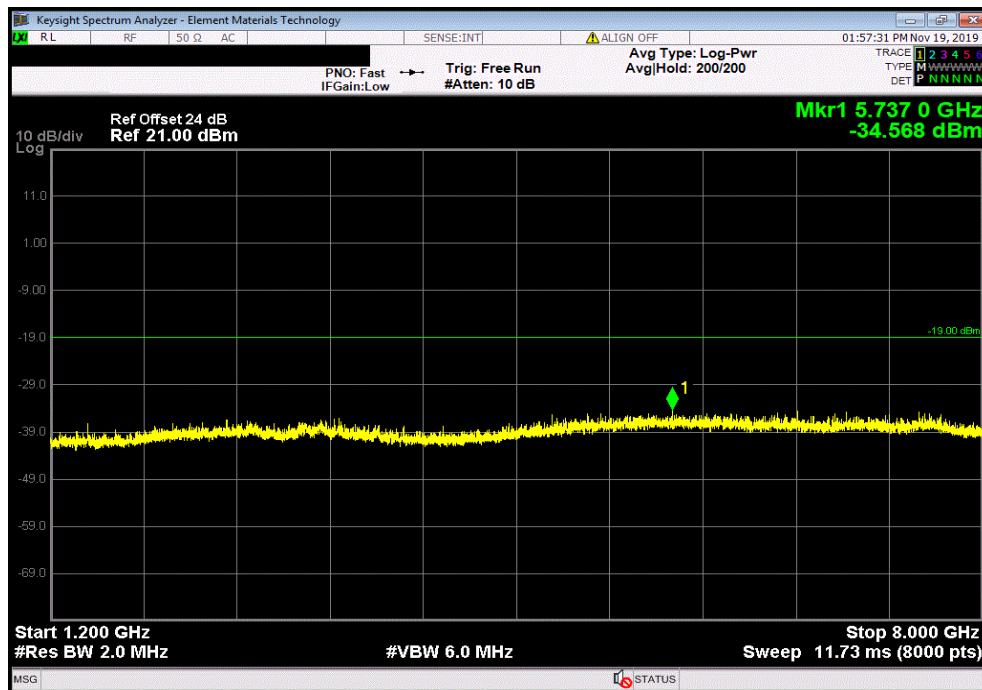


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Band 12, 256QAM Modulation, LTE5 Bandwidth, 800MHz-1.2GHz						
				Value (dBm)	Limit (dBm)	Result
				-32.824	-19	Pass

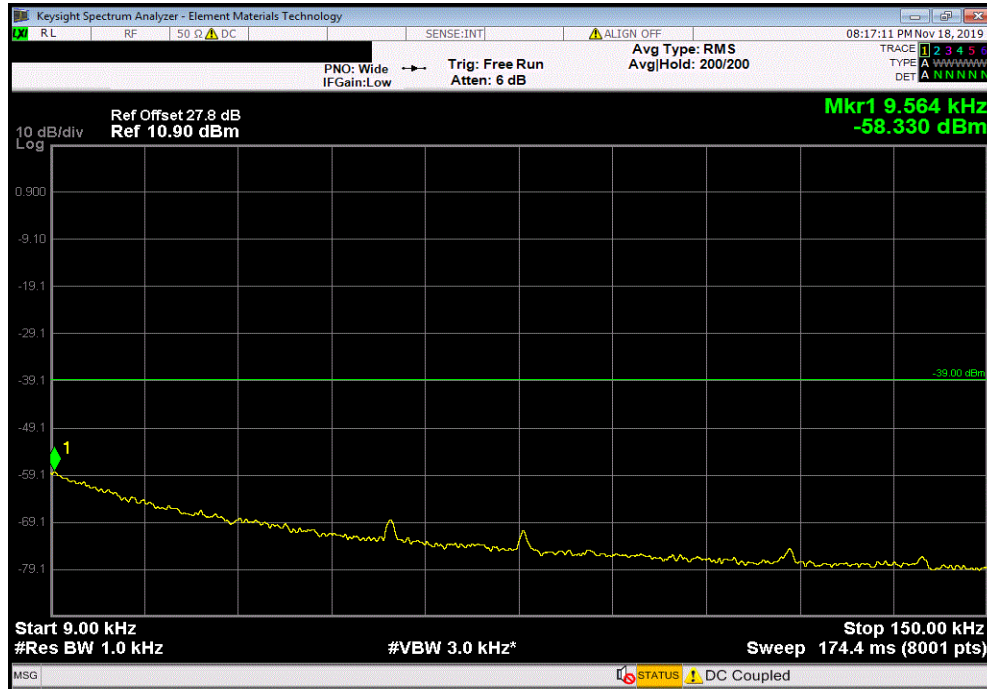


Band 12, 256QAM Modulation, LTE5 Bandwidth, 1.2GHz-8GHz						
				Value (dBm)	Limit (dBm)	Result
				-34.568	-19	Pass

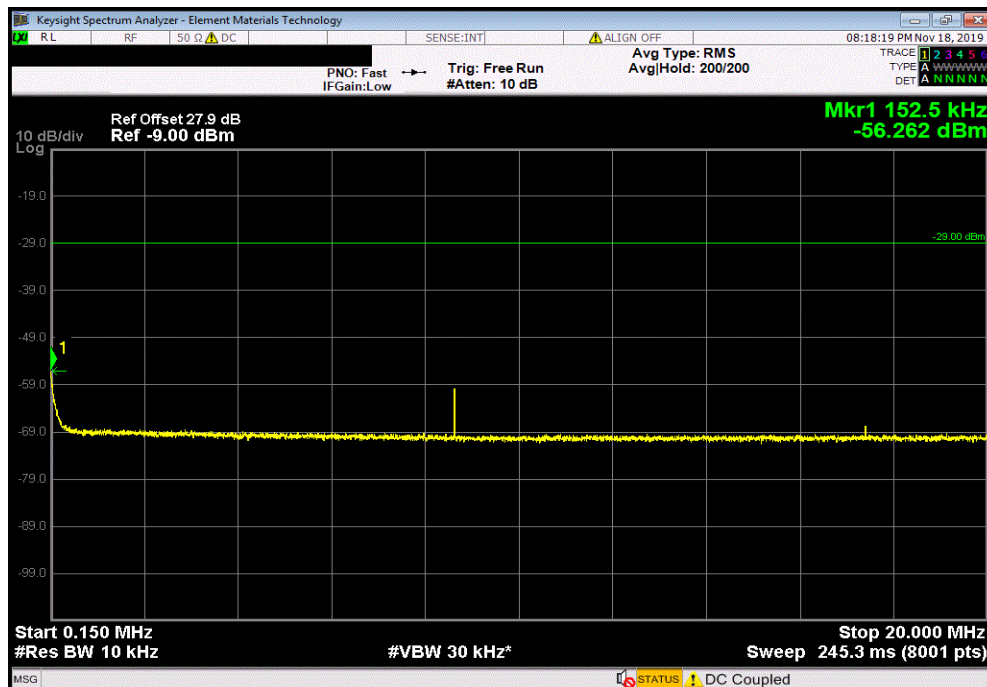


SPURIOUS CONDUCTED EMISSIONS

Band 12, 256QAM Modulation, LTE10 Bandwidth, 9kHz-150kHz						
				Value (dBm)	Limit (dBm)	Result
				-58.33	-39	Pass

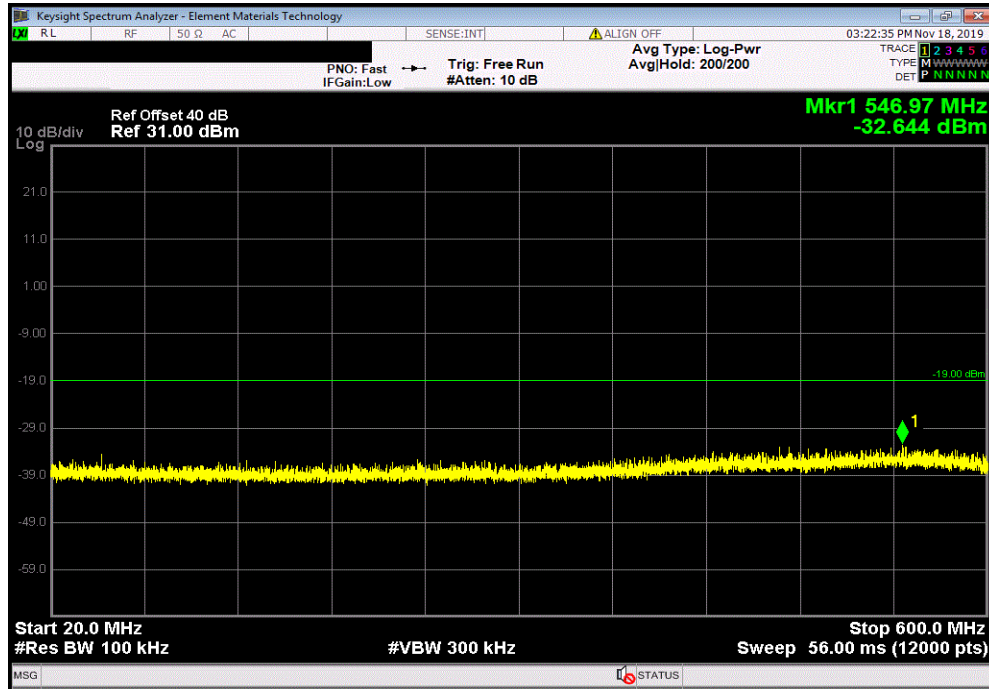


Band 12, 256QAM Modulation, LTE10 Bandwidth, 150kHz-20MHz						
				Value (dBm)	Limit (dBm)	Result
				-56.262	-29	Pass

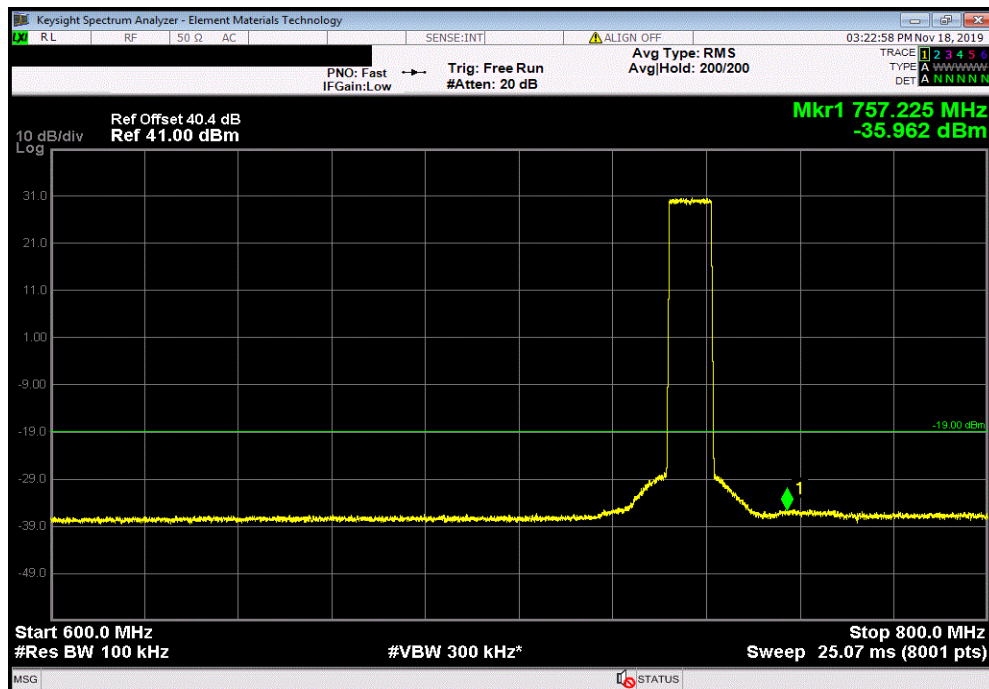


SPURIOUS CONDUCTED EMISSIONS

Band 12, 256QAM Modulation, LTE10 Bandwidth, 20MHz-600MHz						
				Value (dBm)	Limit (dBm)	Result
				-32.644	-19	Pass



Band 12, 256QAM Modulation, LTE10 Bandwidth, 600MHz-800MHz						
				Value (dBm)	Limit (dBm)	Result
				-35.962	-19	Pass

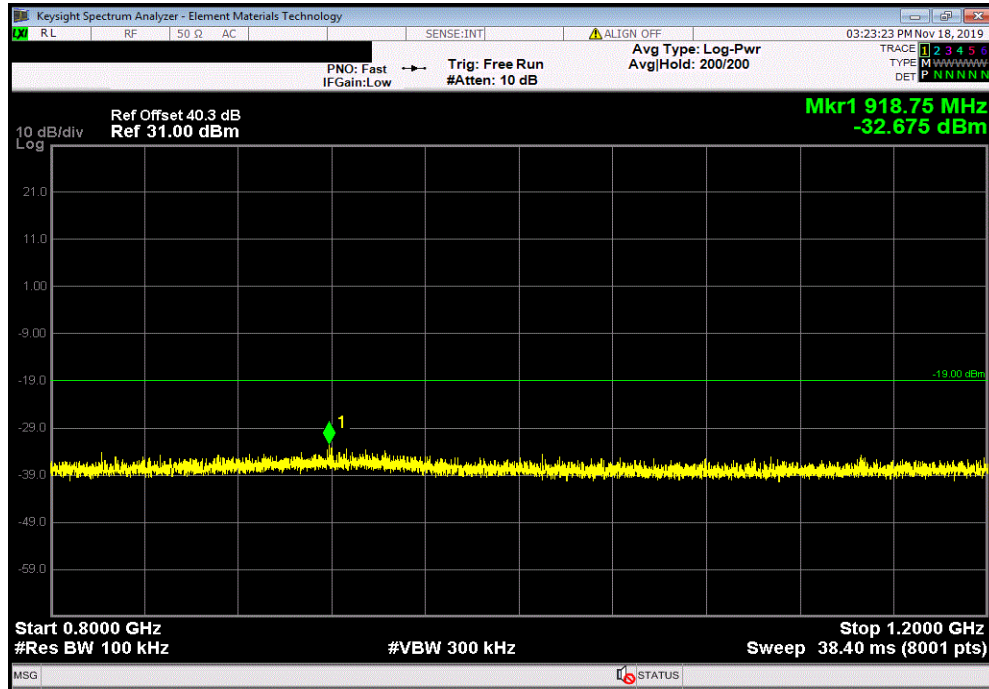


SPURIOUS CONDUCTED EMISSIONS



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Band 12, 256QAM Modulation, LTE10 Bandwidth, 800MHz-1.2GHz						
				Value (dBm)	Limit (dBm)	Result
				-32.675	-19	Pass



Band 12, 256QAM Modulation, LTE10 Bandwidth, 1.2GHz-8GHz						
				Value (dBm)	Limit (dBm)	Result
				-34.087	-19	Pass

