

SPURIOUS CONDUCTED EMISSIONS - 4G LTE



XMM 2020.12.30.0

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
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	2021-03-11	2022-03-11
Block - DC	Fairview Microwave	SD3379	AMM	2021-09-14	2022-09-14
Block - DC	Fairview Microwave	SD3239	ANC	2021-06-24	2022-06-24
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	2021-03-11	2022-03-11

TEST DESCRIPTION

The antenna port spurious emissions were measured at the RF output terminal of the EUT through 4 different attenuation configurations which continues through to the RF input of the spectrum analyzer. Analyzer plots utilizing a resolution bandwidth called out by the client's test plan were made for each modulation type from 9 KHz to 27 GHz. The conducted power of spurious emissions, up to the 10th harmonic of the transmit frequency, were investigated to ensure they were less than the limits also called out by the client's test plan shown below.

The measurement methods are detailed in KDB 971168 D01v03 section 6 and ANSI C63.26-2015.

Per FCC 2.1057(a)(1) and RSS Gen 6.13, the upper level of measurement is the 10th harmonic of the highest fundamental frequency.

These measurements are for the frequency band after the first 1.0 MHz bands immediately outside and adjacent to the frequency block.

RF conducted emissions testing was performed only on one port. The AZHL antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in output power testing) and antenna port 1 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i, and 6.4.

Per FCC Part 27.53(m)(2), the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The BTS may operate as a 8 port MIMO transmitter with transmitter outputs connected to four cross-polarized antennas [four transmitter outputs are connected to (+) radiators and four transmitter outputs are connected to (-) radiators]. The limit is adjusted to -19 dBm [-13 dBm -10 log (4)] per FCC KDB 662911D01 v02r01, ANSI C63.26-2015 section 6.4.6.3 b)2) and KDB 662911 D02v01 page 3 example (2) since the transmitter outputs to each antenna are 90 degree-phase shifted relative to each other (cross-polarized radiators).


Per FCC 27.53(m)(6), "Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.....A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified)".

The limit for the 9kHz to 150kHz frequency range was adjusted to -49dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 1MHz [i.e.: -49dBm = -19dBm -10log(1MHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to -39dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 1MHz [i.e.: -39dBm = -19dBm -10log(1MHz/10kHz)]. The required limit of -19dBm with a RBW of ≥ 1 MHz was used for all other frequency ranges. (See ANSI C63.26-2015 paragraph 5.7.2a for details on the Limit/RBW scaling method)

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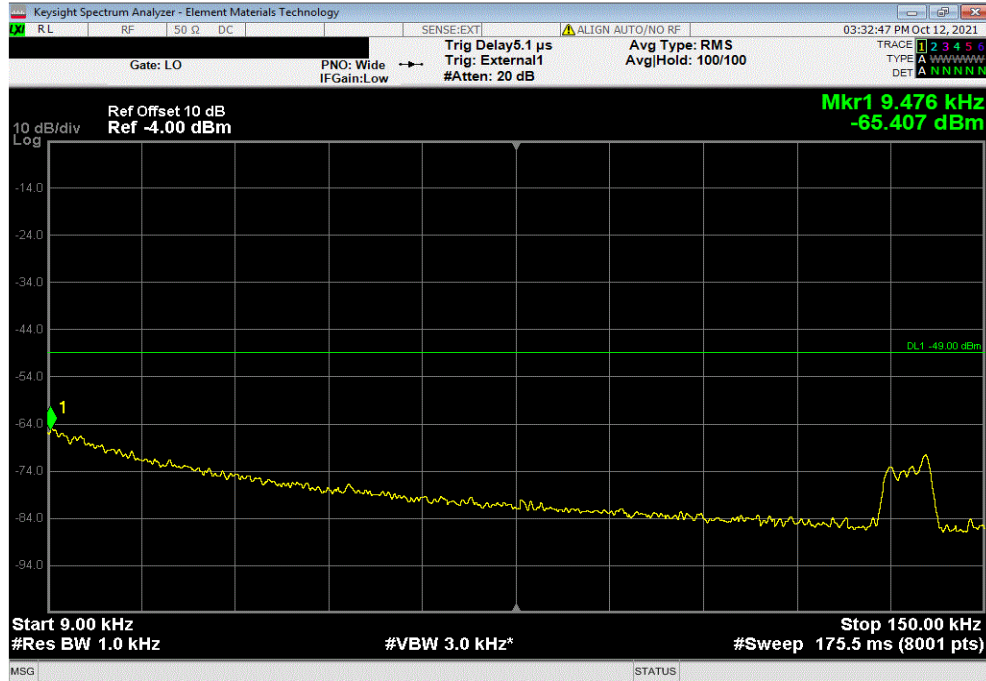
EUT: AZHL (C2PC LTE/5G NR B41)		Work Order: NOKI0035				
Serial Number: YK203400025		Date: 13-Oct-21				
Customer: Nokia Solutions and Networks		Temperature: 22.8 °C				
Attendees: David Le, John Rattanavong		Humidity: 52.6% RH				
Project: None		Barometric Pres.: 1011 mbar				
Tested by: Brandon Hobbs		Power: 54 VDC	Job Site: TX09			
TEST SPECIFICATIONS		Test Method				
FCC 27:2021		ANSI C63.26:2015				
COMMENTS						
All losses in the measurement path were accounted for: attenuators, cables, DC block and filter when in use. Band n41 carriers and enabled at maximum power. External 1 gating was set using a trig delay = 5.044ms and a gate length = 6.8061ms.						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	1,2,3,4	Signature 				
		Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result
4G LTE, Band 41, 2496 MHz - 2690 MHz						
Port 1						
LTE15 (15MHz)						
QPSK						
	Mid Channel 2593 MHz	9 kHz - 150 kHz	0.01	-65.4	-49	Pass
	Mid Channel 2593 MHz	150 kHz - 20 MHz	0.15	-59.3	-39	Pass
	Mid Channel 2593 MHz	20 MHz - 4 GHz	3747.21	-27.7	-19	Pass
	Mid Channel 2593 MHz	2.45 GHz - 2.75 GHz	2705.86	-34.8	-19	Pass
	Mid Channel 2593 MHz	4 GHz - 11 GHz	4786.8	-49.8	-19	Pass
	Mid Channel 2593 MHz	11 GHz - 18 GHz	13601.9	-42.3	-19	Pass
	Mid Channel 2593 MHz	18 GHz - 27 GHz	26231.4	-47.1	-19	Pass
16QAM						
	Mid Channel 2593 MHz	9 kHz - 150 kHz	0.01	-65.0	-49	Pass
	Mid Channel 2593 MHz	150 kHz - 20 MHz	0.17	-60.8	-39	Pass
	Mid Channel 2593 MHz	20 MHz - 4 GHz	3767.61	-27.6	-19	Pass
	Mid Channel 2593 MHz	2.45 GHz - 2.75 GHz	2708.29	-34.8	-19	Pass
	Mid Channel 2593 MHz	4 GHz - 11 GHz	4786.45	-49.9	-19	Pass
	Mid Channel 2593 MHz	11 GHz - 18 GHz	14351.6	-42.3	-19	Pass
	Mid Channel 2593 MHz	18 GHz - 27 GHz	26241.3	-47.6	-19	Pass
64QAM						
	Mid Channel 2593 MHz	9 kHz - 150 kHz	0.01	-65.5	-49	Pass
	Mid Channel 2593 MHz	150 kHz - 20 MHz	0.15	-59.1	-39	Pass
	Mid Channel 2593 MHz	20 MHz - 4 GHz	3753.18	-27.6	-19	Pass
	Mid Channel 2593 MHz	2.45 GHz - 2.75 GHz	2707.38	-34.8	-19	Pass
	Mid Channel 2593 MHz	4 GHz - 11 GHz	4772.8	-49.9	-19	Pass
	Mid Channel 2593 MHz	11 GHz - 18 GHz	13600.5	-42.2	-19	Pass
	Mid Channel 2593 MHz	18 GHz - 27 GHz	26266.05	-47.2	-19	Pass
256QAM						
	Mid Channel 2593 MHz	9 kHz - 150 kHz	0.01	-64.8	-49	Pass
	Mid Channel 2593 MHz	150 kHz - 20 MHz	0.15	-59.1	-39	Pass
	Mid Channel 2593 MHz	20 MHz - 4 GHz	3750.69	-27.6	-19	Pass
	Mid Channel 2593 MHz	2.45 GHz - 2.75 GHz	2705.58	-34.8	-19	Pass
	Mid Channel 2593 MHz	4 GHz - 11 GHz	4786.45	-50.0	-19	Pass
	Mid Channel 2593 MHz	11 GHz - 18 GHz	13613.8	-42.2	-19	Pass
	Mid Channel 2593 MHz	18 GHz - 27 GHz	26242.65	-47.1	-19	Pass
LTE20 (20MHz)						
256QAM						
	Mid Channel 2593 MHz	9 kHz - 150 kHz	0.01	-65.0	-49	Pass
	Mid Channel 2593 MHz	150 kHz - 20 MHz	0.15	-58.9	-39	Pass
	Mid Channel 2593 MHz	20 MHz - 4 GHz	3720.84	-27.7	-19	Pass
	Mid Channel 2593 MHz	2.45 GHz - 2.75 GHz	2704.98	-34.9	-19	Pass
	Mid Channel 2593 MHz	4 GHz - 11 GHz	4776.3	-50.3	-19	Pass
	Mid Channel 2593 MHz	11 GHz - 18 GHz	14355.45	-42.3	-19	Pass
	Mid Channel 2593 MHz	18 GHz - 27 GHz	26284.05	-47.3	-19	Pass

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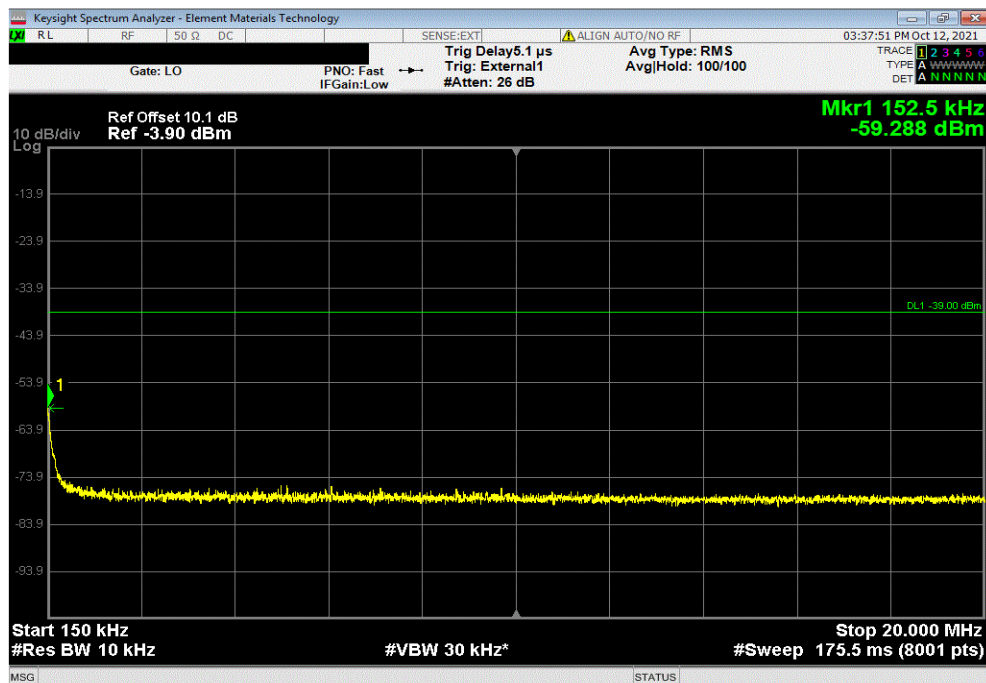


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4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), QPSK, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
9 kHz - 150 kHz	0.01	-65.41	-49	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), QPSK, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
150 kHz - 20 MHz	0.15	-59.29	-39	Pass	

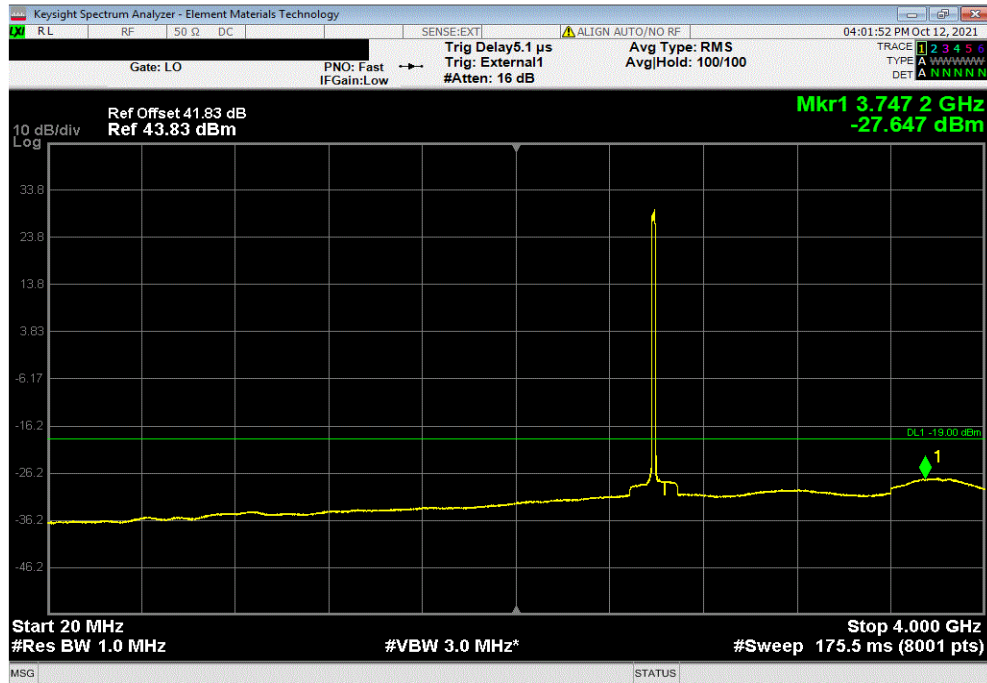


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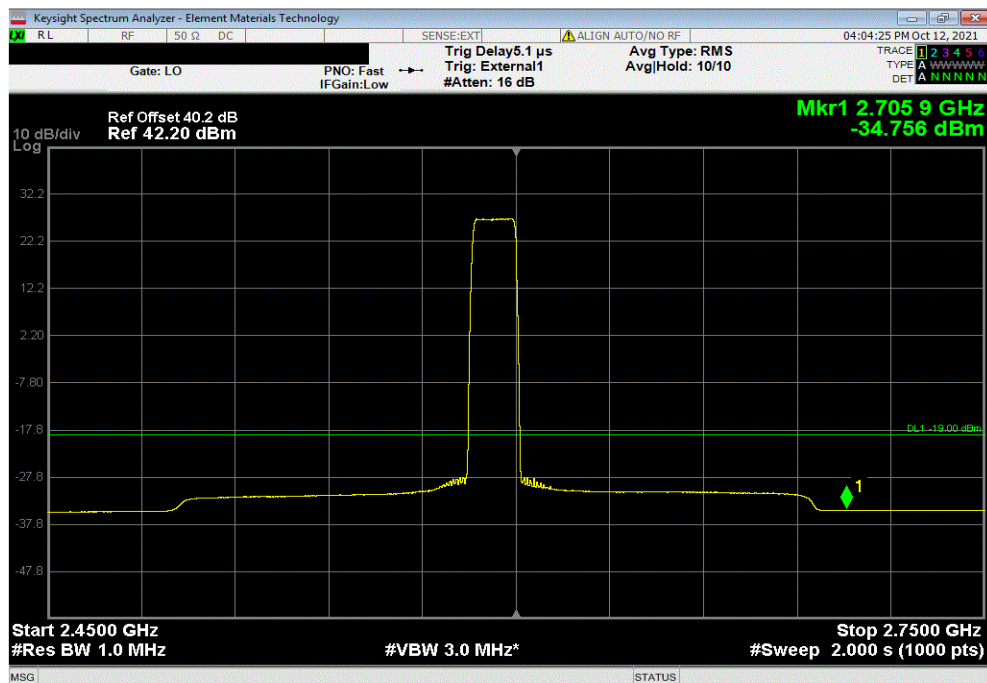


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4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), QPSK, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
20 MHz - 4 GHz	3747.21	-27.65	-19	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), QPSK, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
2.45 GHz - 2.75 GHz	2705.86	-34.76	-19	Pass	

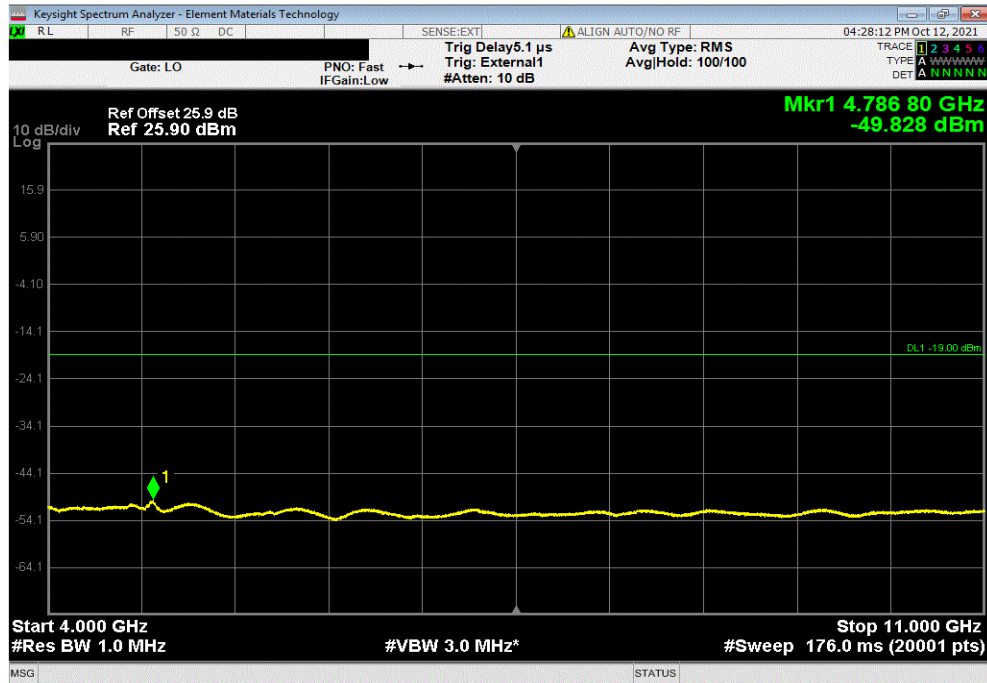


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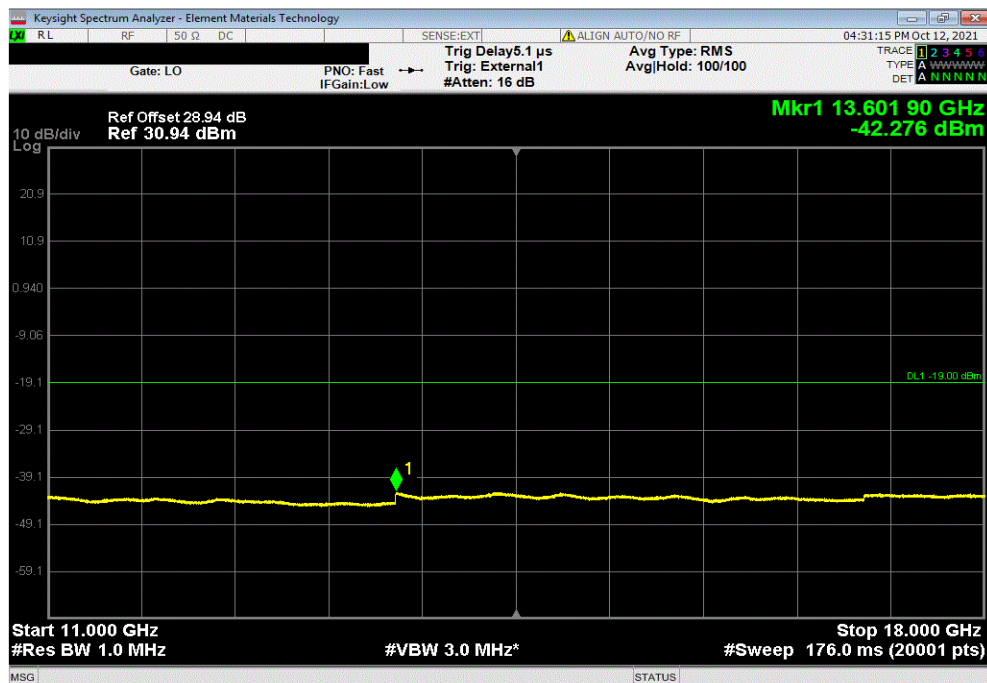


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4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), QPSK, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
4 GHz - 11 GHz	4786.8	-49.83	-19	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), QPSK, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
11 GHz - 18 GHz	13601.9	-42.28	-19	Pass	

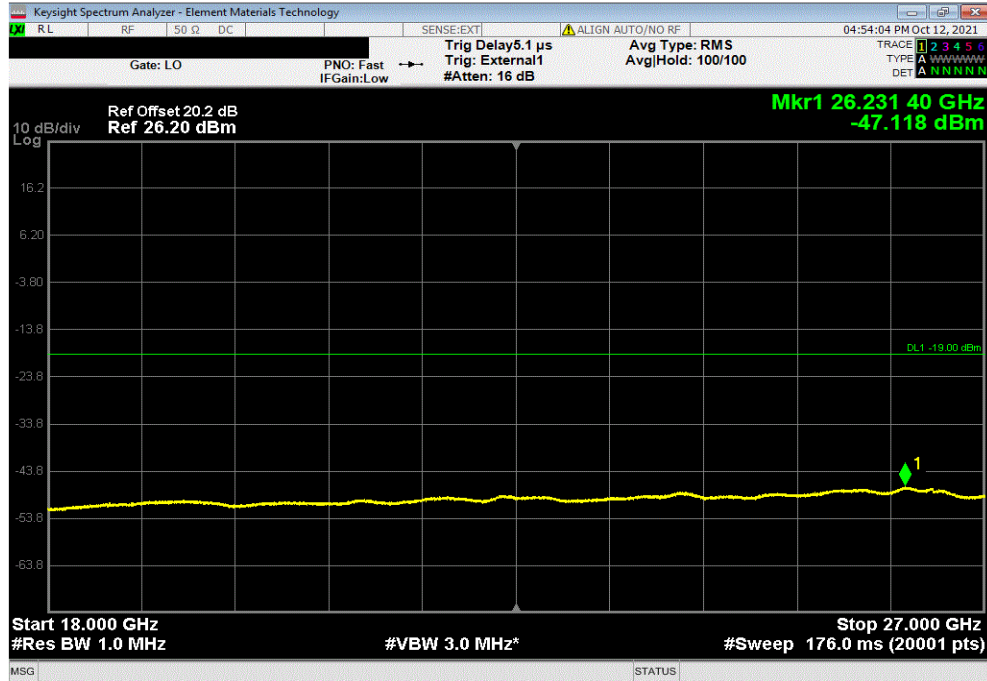


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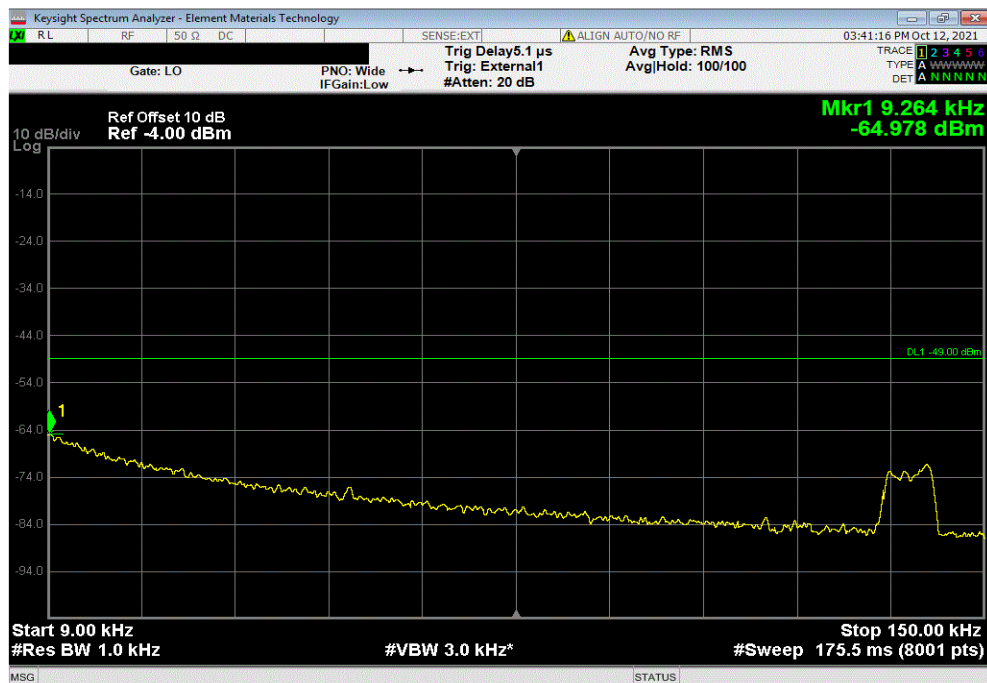


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4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), QPSK, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
18 GHz - 27 GHz	26231.4	-47.12	-19	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 16QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
9 kHz - 150 kHz	0.01	-64.98	-49	Pass	

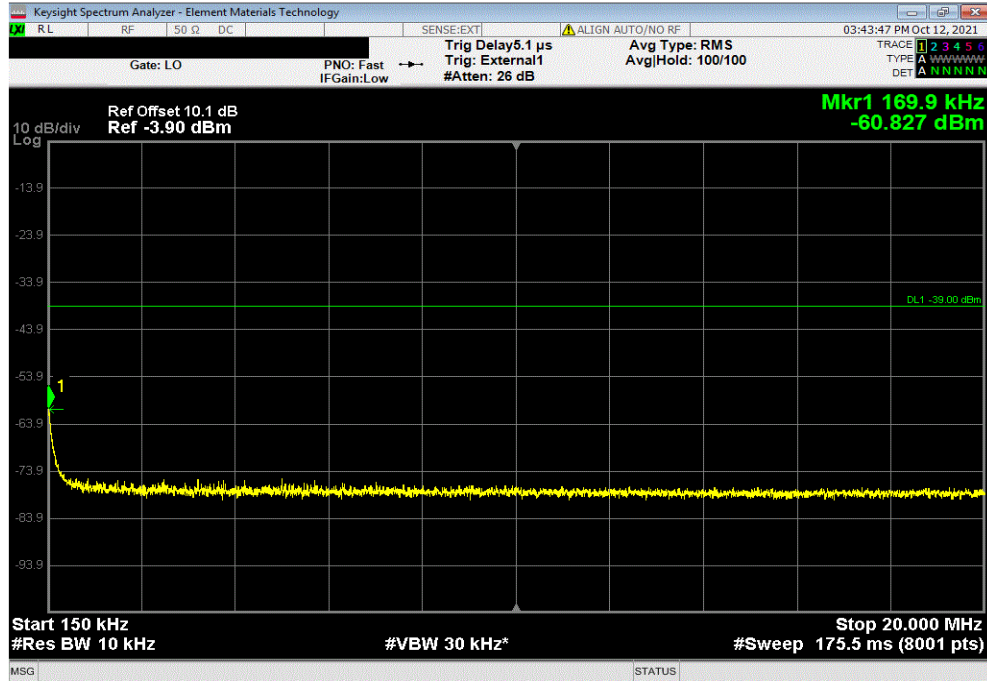


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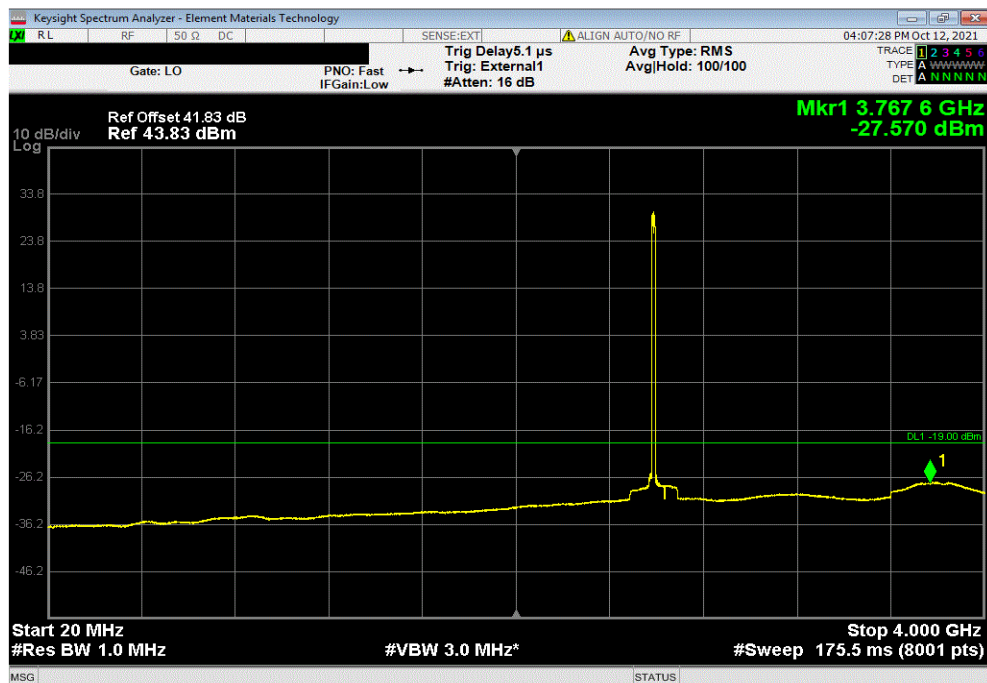


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4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 16QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
150 kHz - 20 MHz	0.17	-60.83	-39	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 16QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
20 MHz - 4 GHz	3767.61	-27.57	-19	Pass	

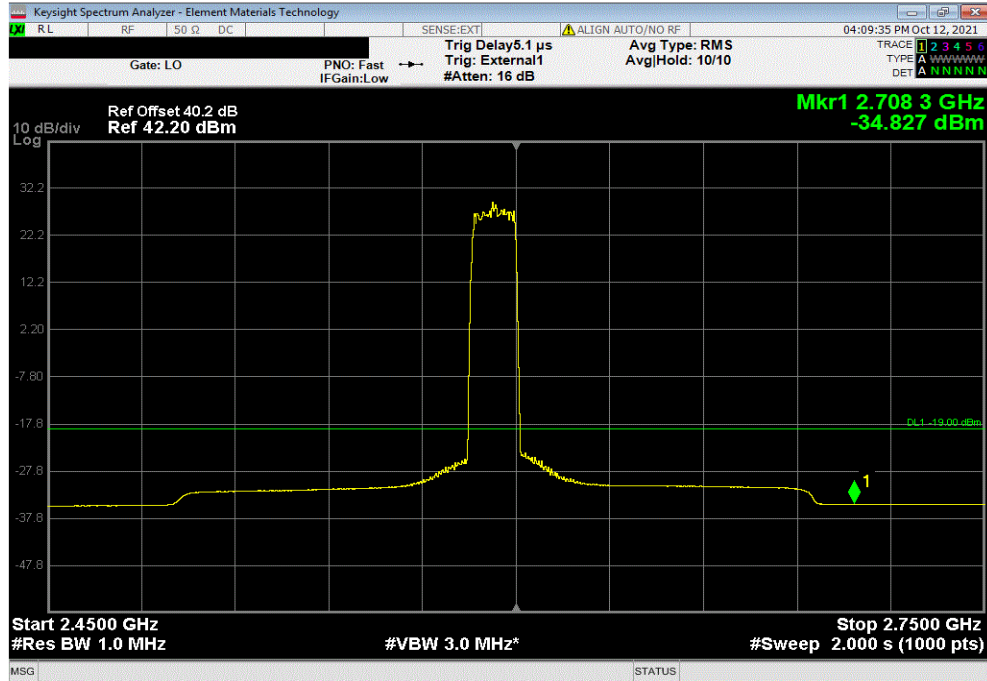


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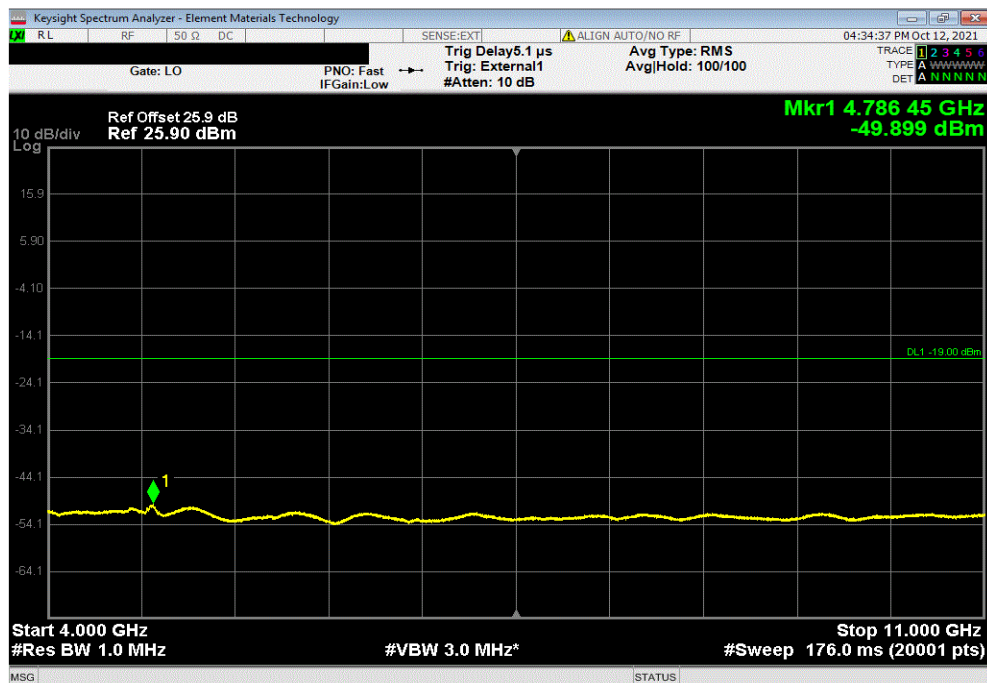


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4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 16QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
2.45 GHz - 2.75 GHz	2708.29	-34.83	-19	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 16QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
4 GHz - 11 GHz	4786.45	-49.9	-19	Pass	

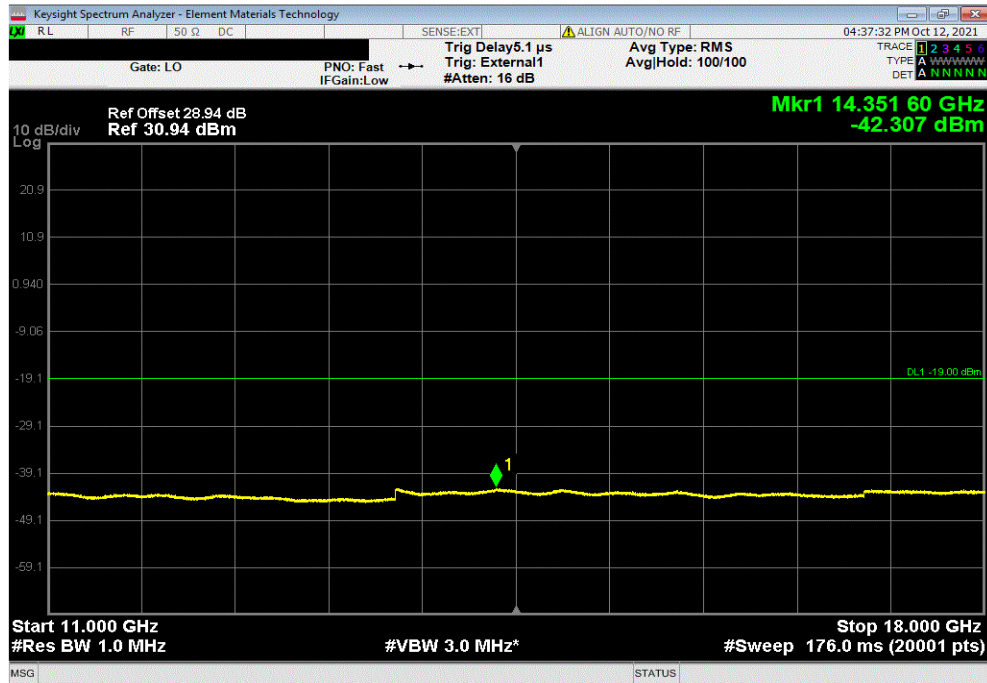


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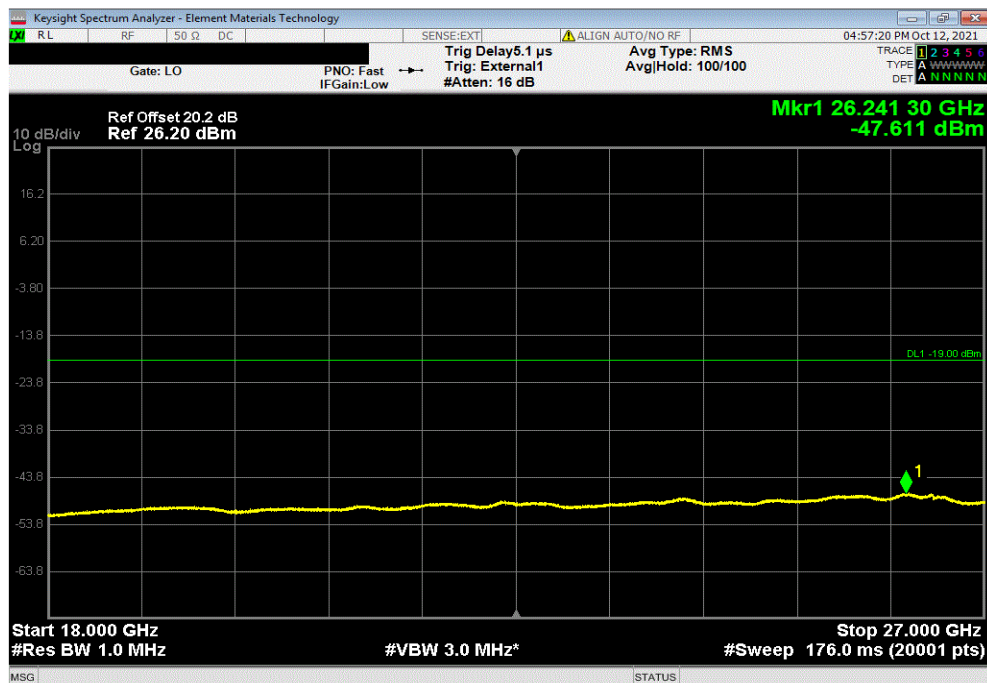


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4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 16QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
11 GHz - 18 GHz	14351.6	-42.31	-19	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 16QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
18 GHz - 27 GHz	26241.3	-47.61	-19	Pass	

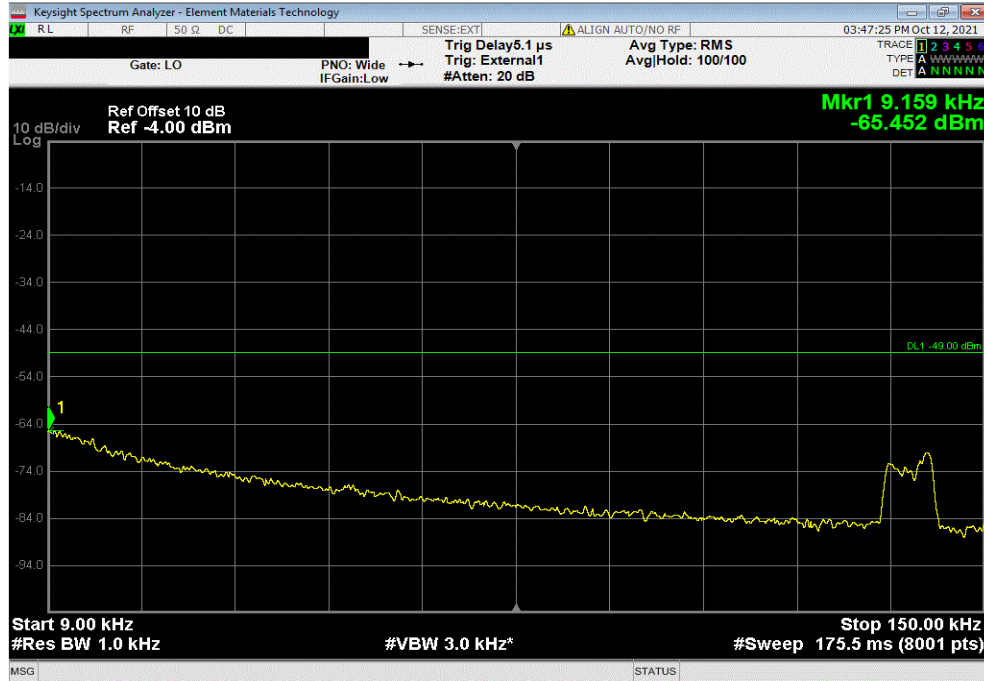


SPURIOUS CONDUCTED EMISSIONS - 4G LTE

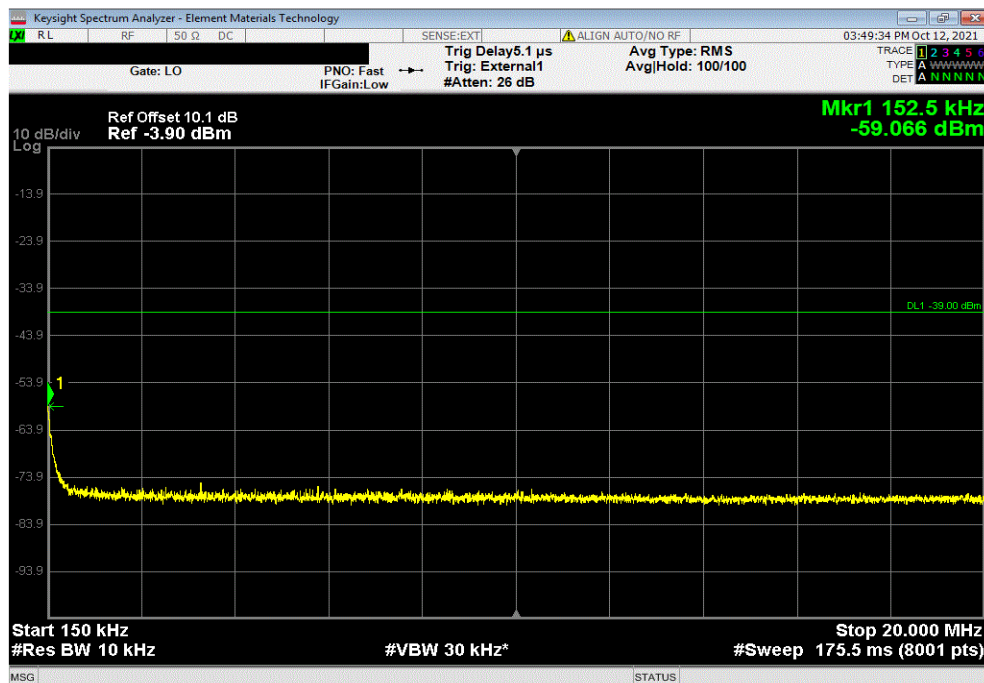


TbTtX 2021.03.19.1 XMt 2020.12.30.0

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 64QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
9 kHz - 150 kHz	0.01	-65.45	-49	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 64QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
150 kHz - 20 MHz	0.15	-59.07	-39	Pass	

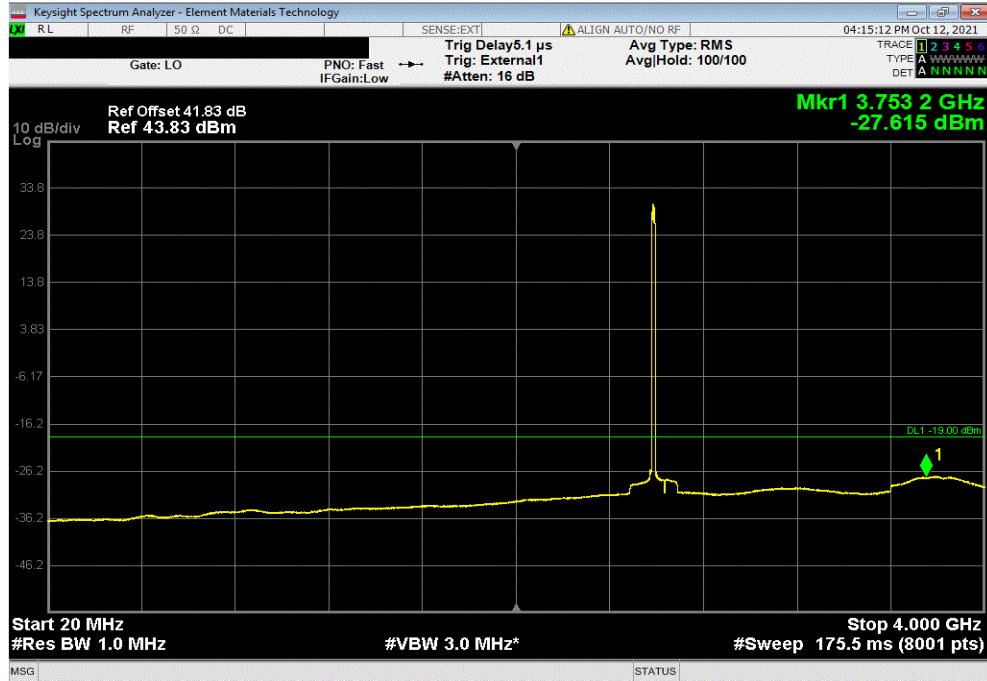


SPURIOUS CONDUCTED EMISSIONS - 4G LTE

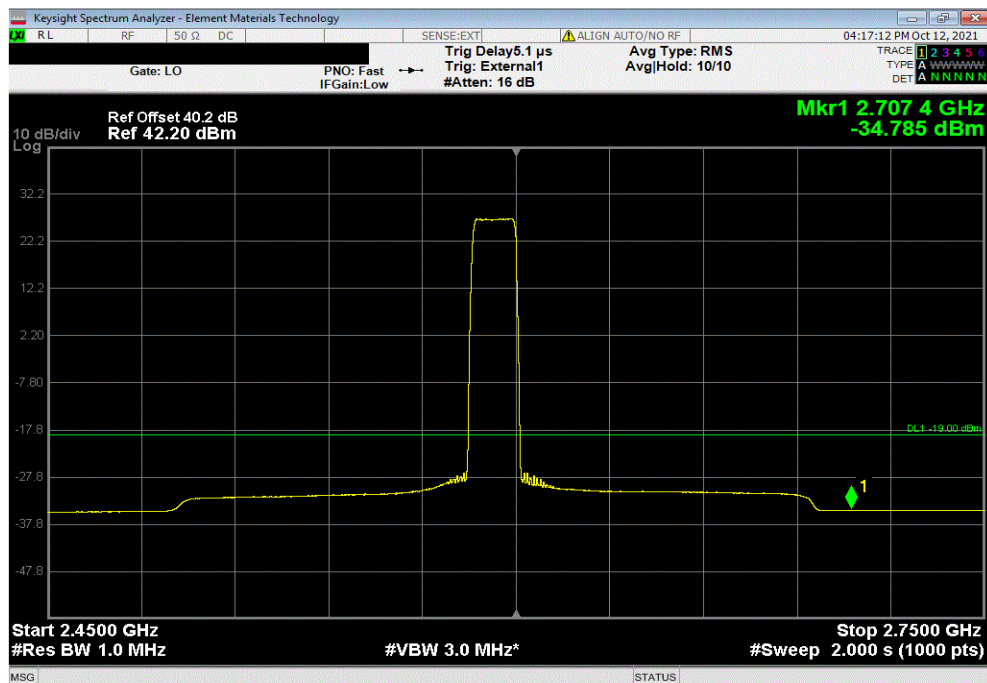


TbTx 2021.03.19.1 XMt 2020.12.30.0

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 64QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
20 MHz - 4 GHz	3753.18	-27.62	-19	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 64QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
2.45 GHz - 2.75 GHz	2707.38	-34.79	-19	Pass	

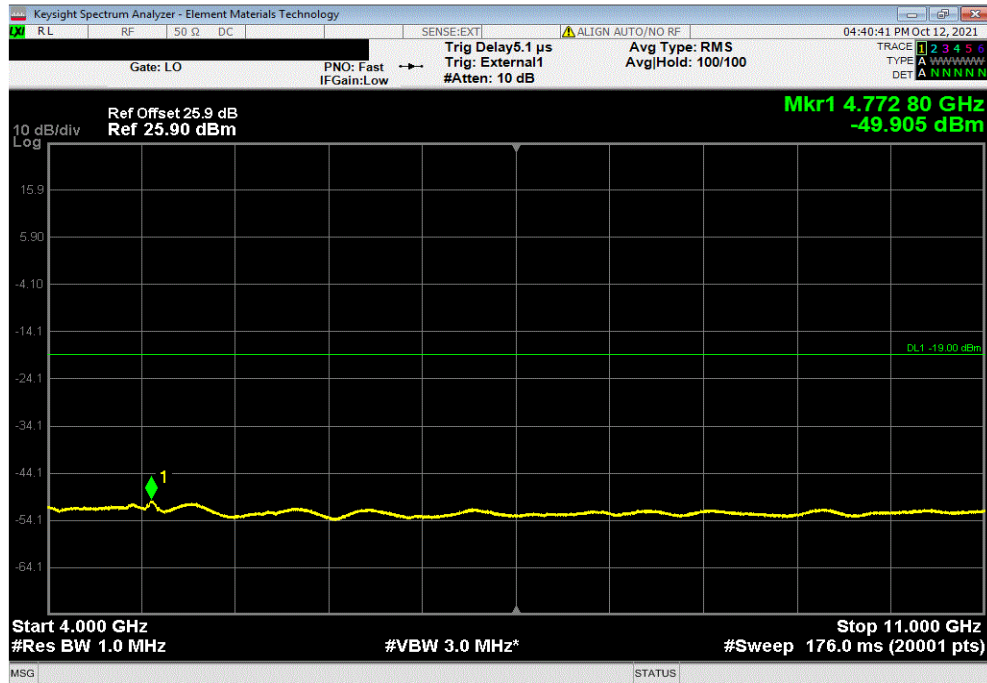


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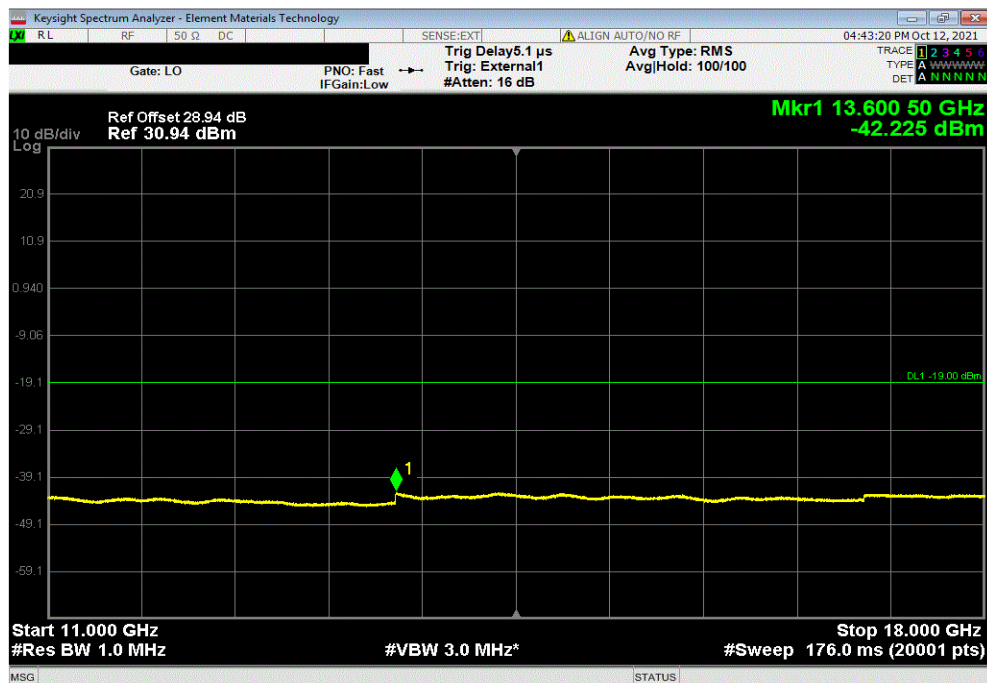


TbTx 2021.03.19.1 XMt 2020.12.30.0

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 64QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
4 GHz - 11 GHz	4772.8	-49.91	-19	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 64QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
11 GHz - 18 GHz	13600.5	-42.23	-19	Pass	

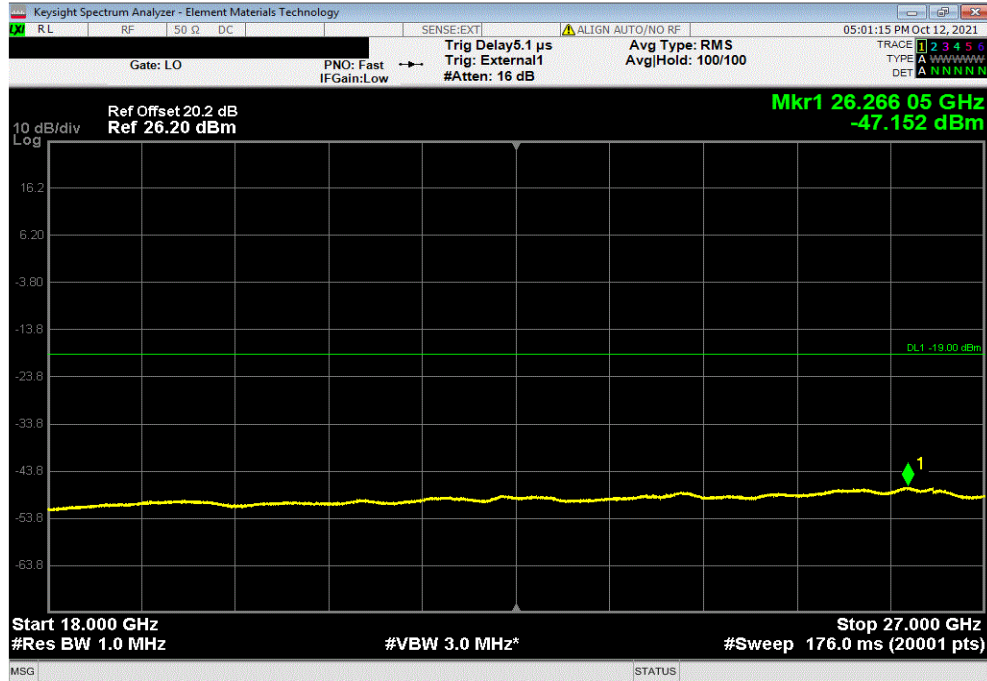


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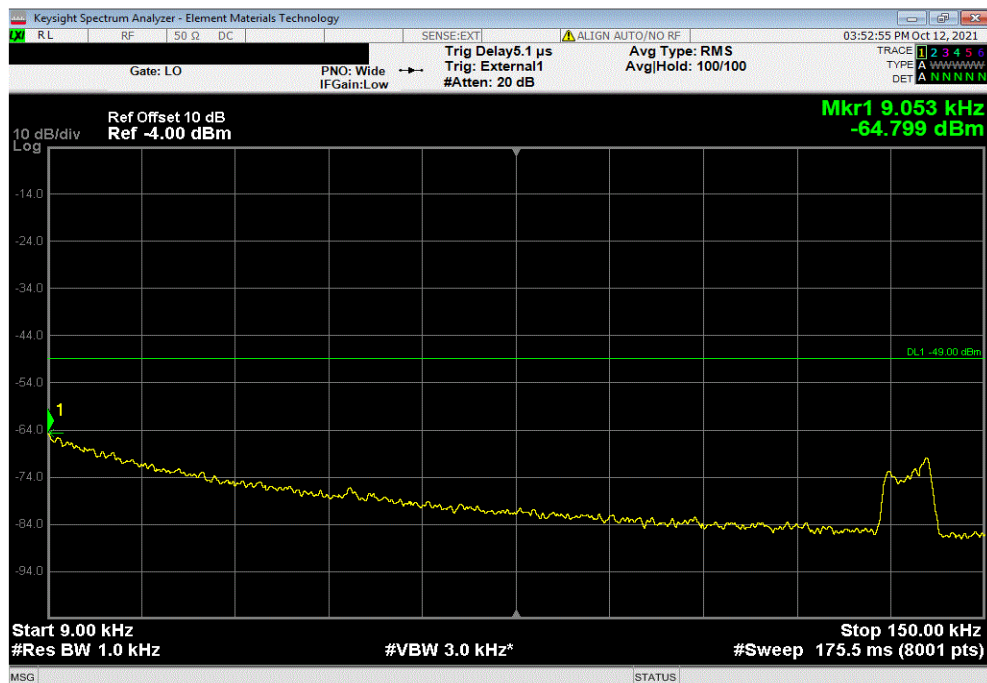


TbTtx 2021.03.19.1 XMt 2020.12.30.0

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 64QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
18 GHz - 27 GHz	26266.05	-47.15	-19	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 256QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
9 kHz - 150 kHz	0.01	-64.8	-49	Pass	

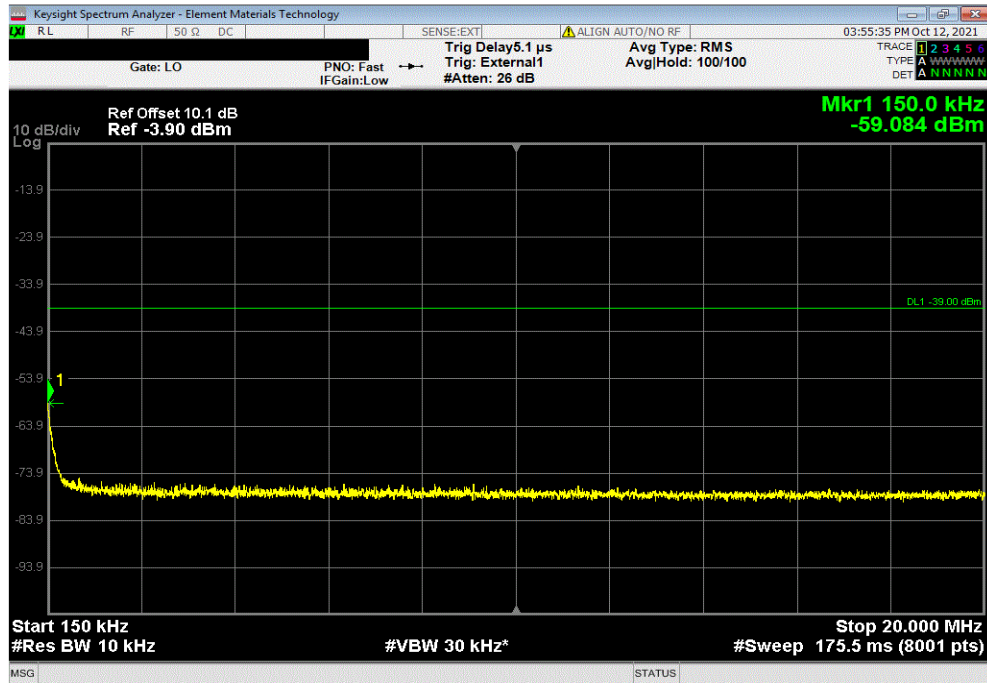


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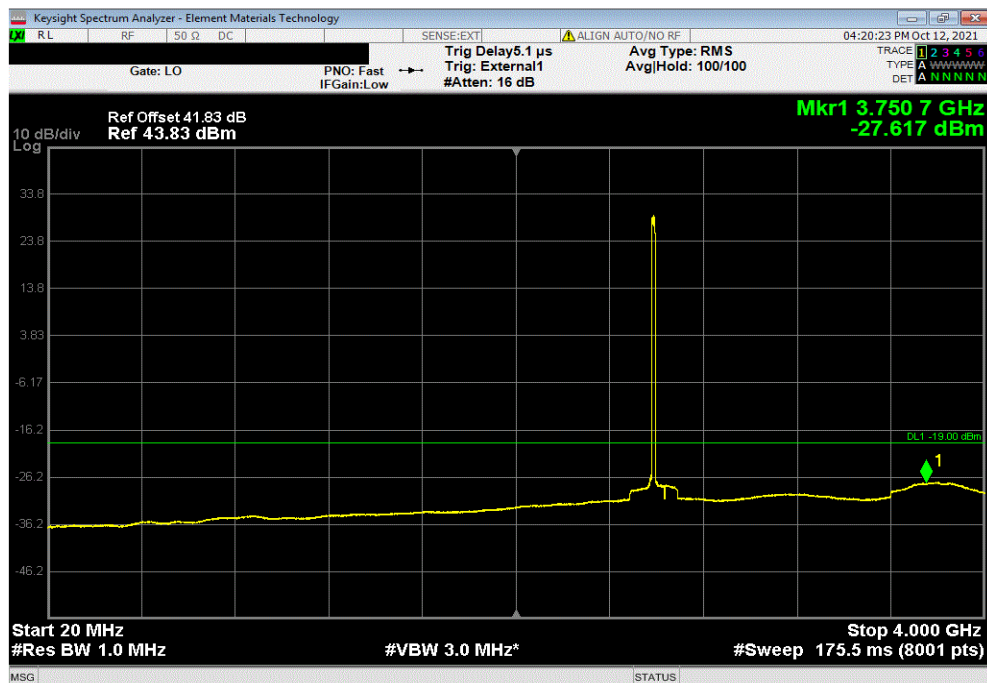


TbTx 2021.03.19.1 XMt 2020.12.30.0

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 256QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
150 kHz - 20 MHz	0.15	-59.08	-39	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 256QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
20 MHz - 4 GHz	3750.69	-27.62	-19	Pass	

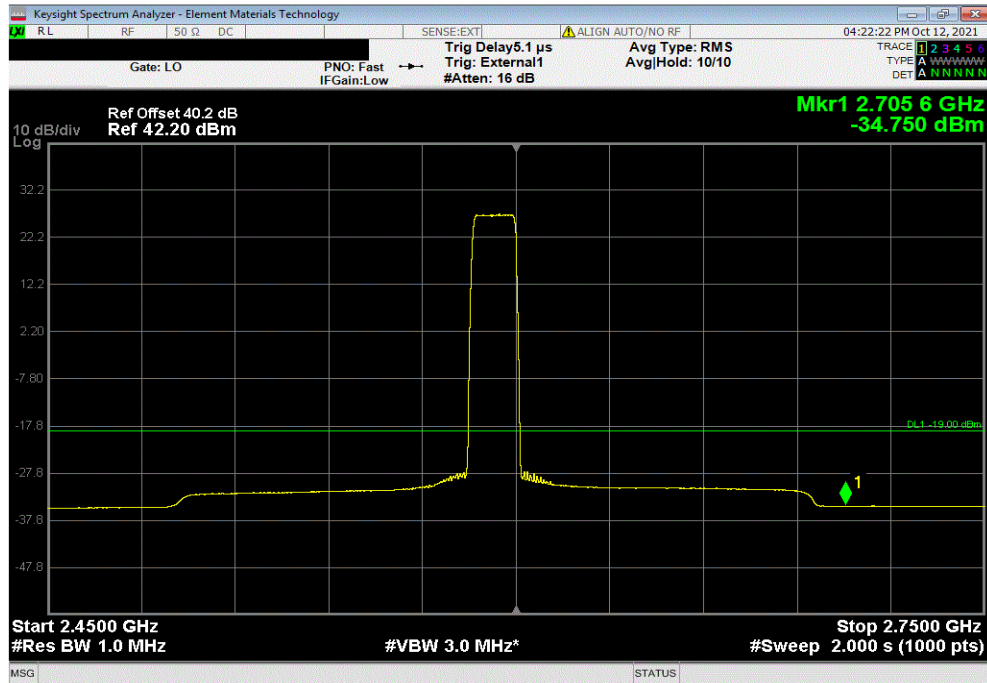


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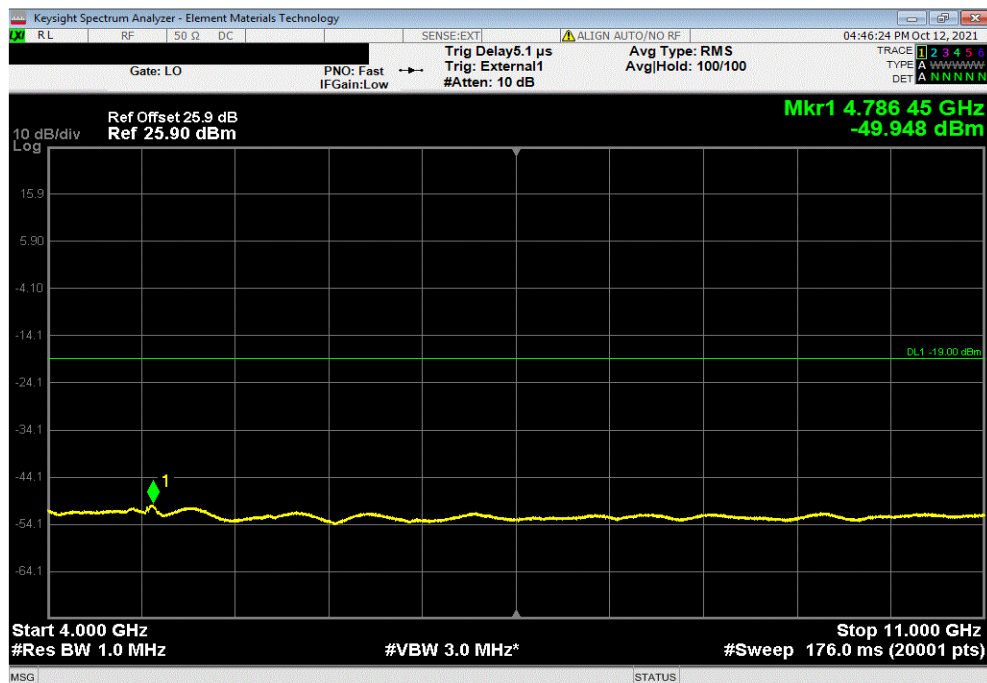


TbTx 2021.03.19.1 XMt 2020.12.30.0

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 256QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
2.45 GHz - 2.75 GHz	2705.58	-34.75	-19	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 256QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
4 GHz - 11 GHz	4786.45	-49.95	-19	Pass	

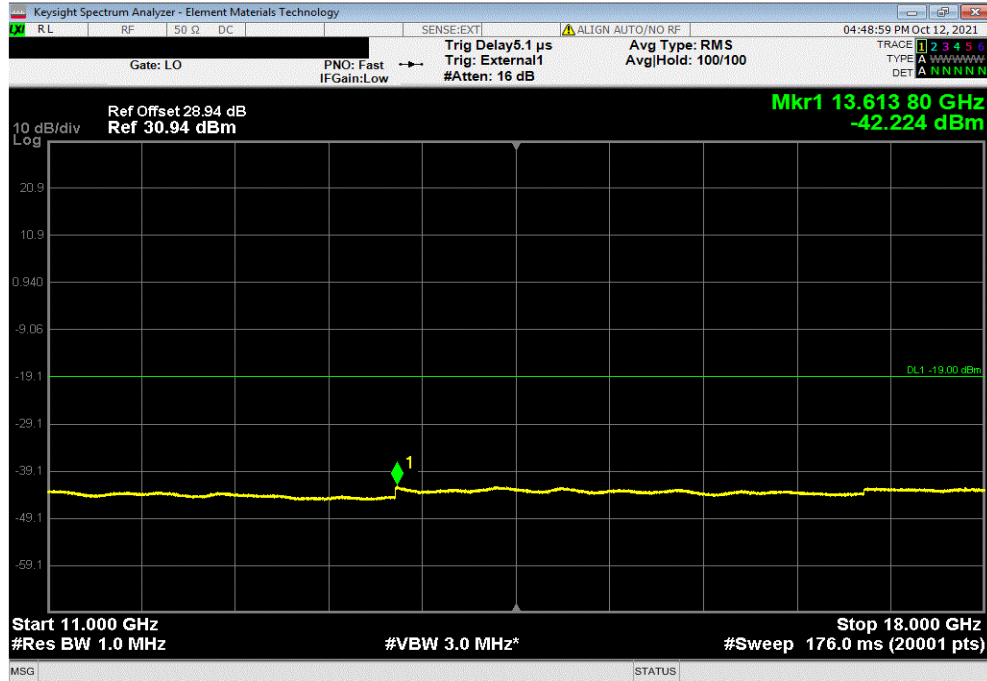


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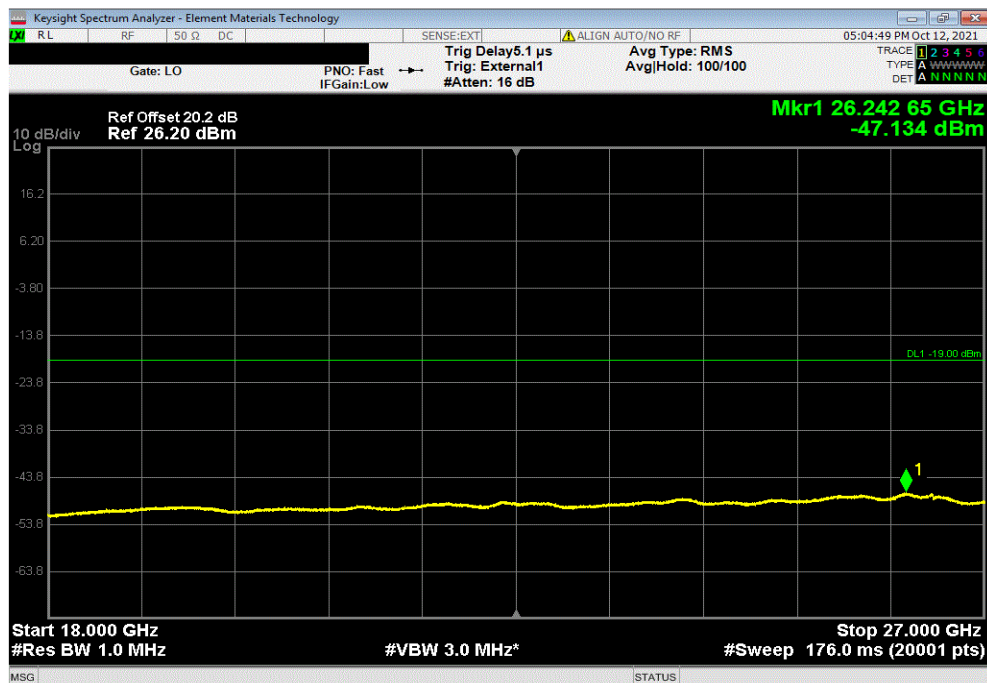


TbTtX 2021.03.19.1 XMt 2020.12.30.0

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 256QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
11 GHz - 18 GHz	13613.8	-42.22	-19	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE15 (15MHz), 256QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
18 GHz - 27 GHz	26242.65	-47.13	-19	Pass	

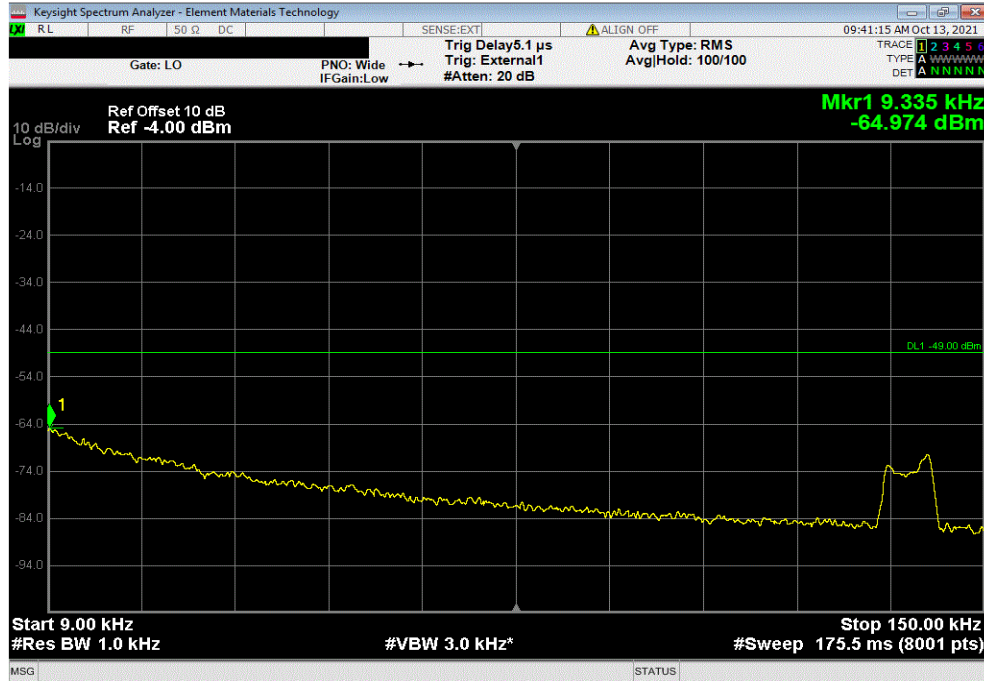


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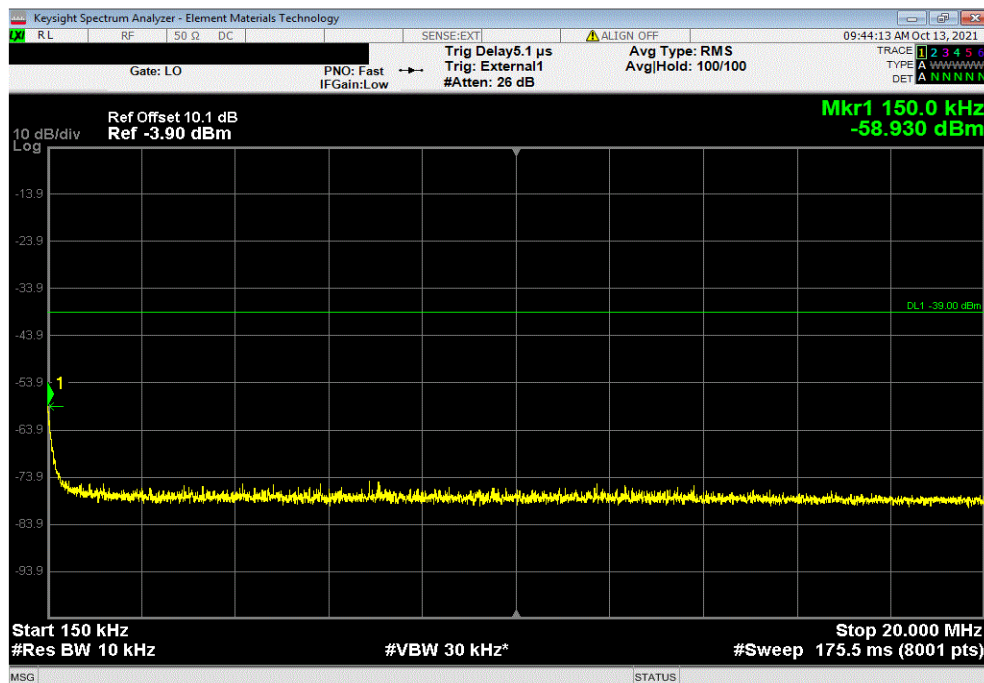


TbTx 2021.03.19.1 XMt 2020.12.30.0

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE20 (20MHz), 256QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
9 kHz - 150 kHz	0.01	-64.97	-49	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE20 (20MHz), 256QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
150 kHz - 20 MHz	0.15	-58.93	-39	Pass	

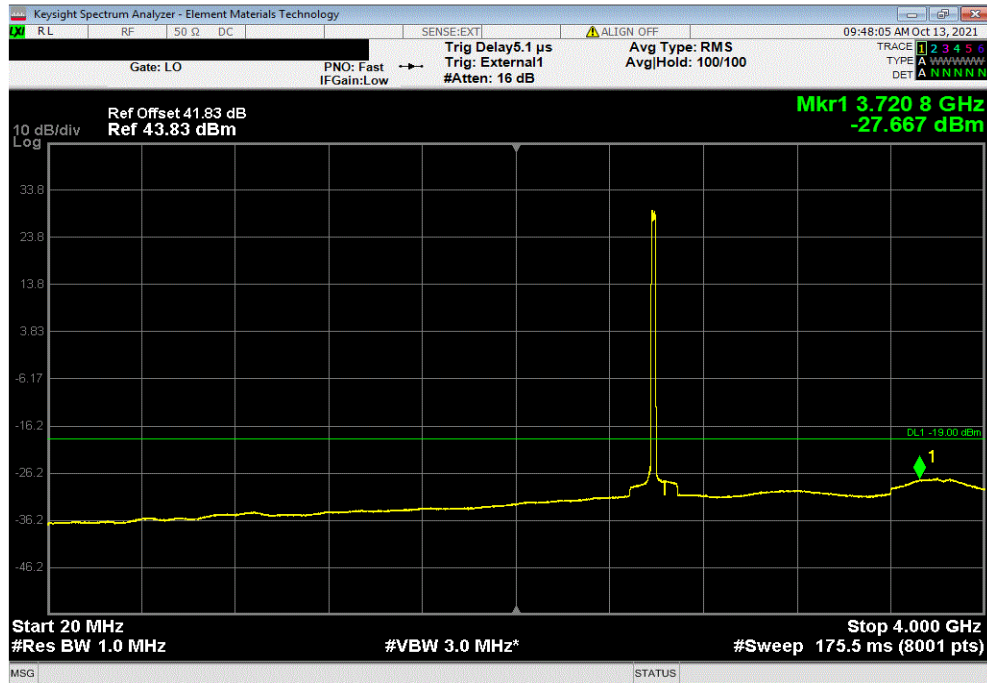


SPURIOUS CONDUCTED EMISSIONS - 4G LTE

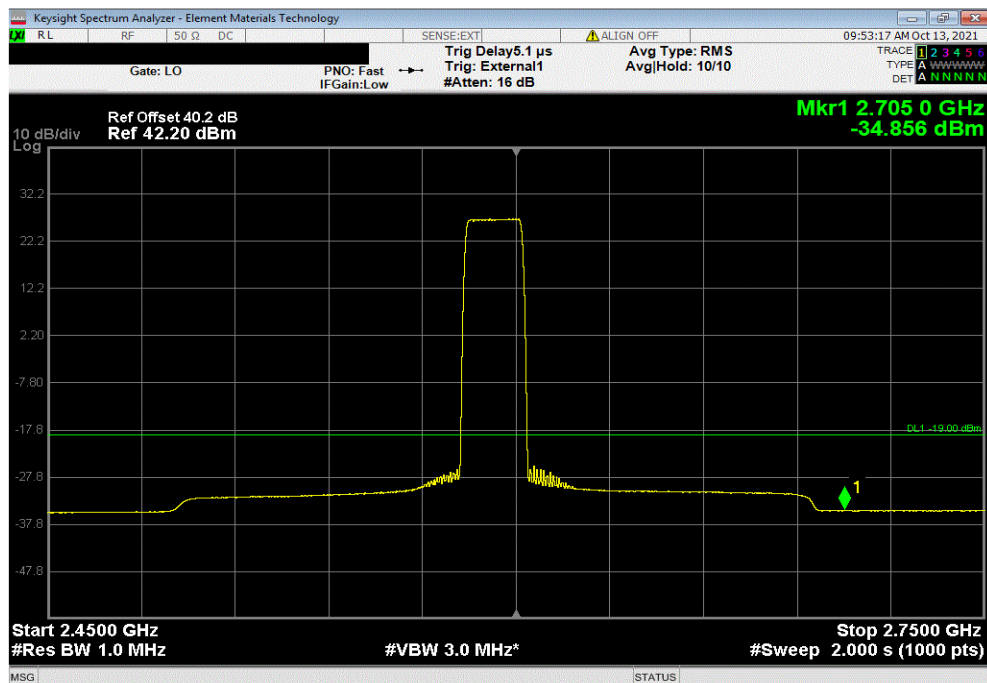


TbTx 2021.03.19.1 XMt 2020.12.30.0

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE20 (20MHz), 256QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
20 MHz - 4 GHz	3720.84	-27.67	-19	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE20 (20MHz), 256QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
2.45 GHz - 2.75 GHz	2704.98	-34.86	-19	Pass	

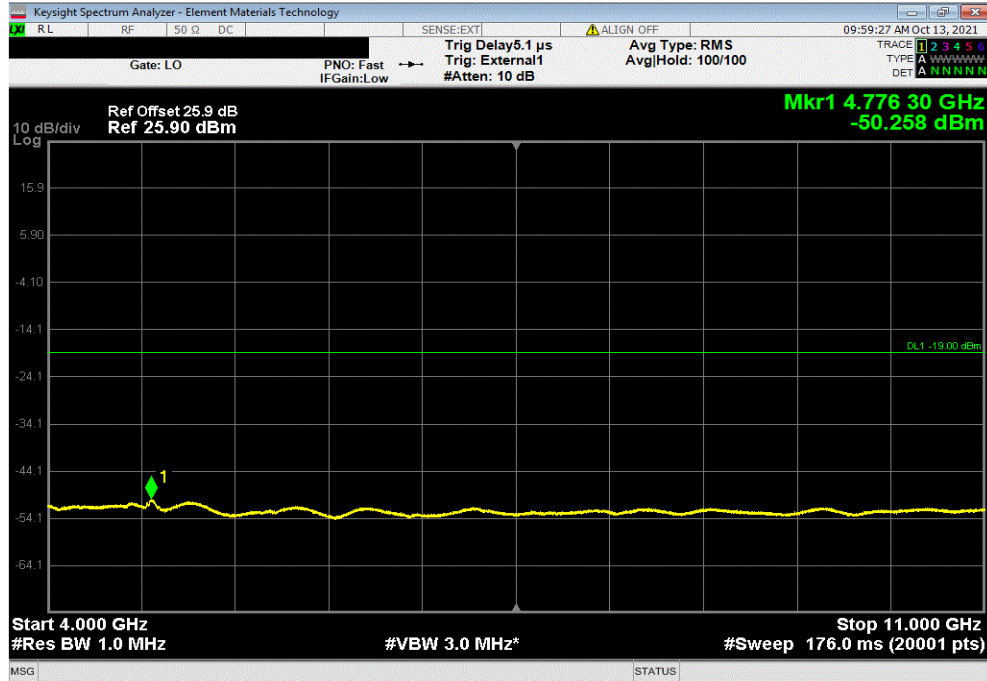


SPURIOUS CONDUCTED EMISSIONS - 4G LTE

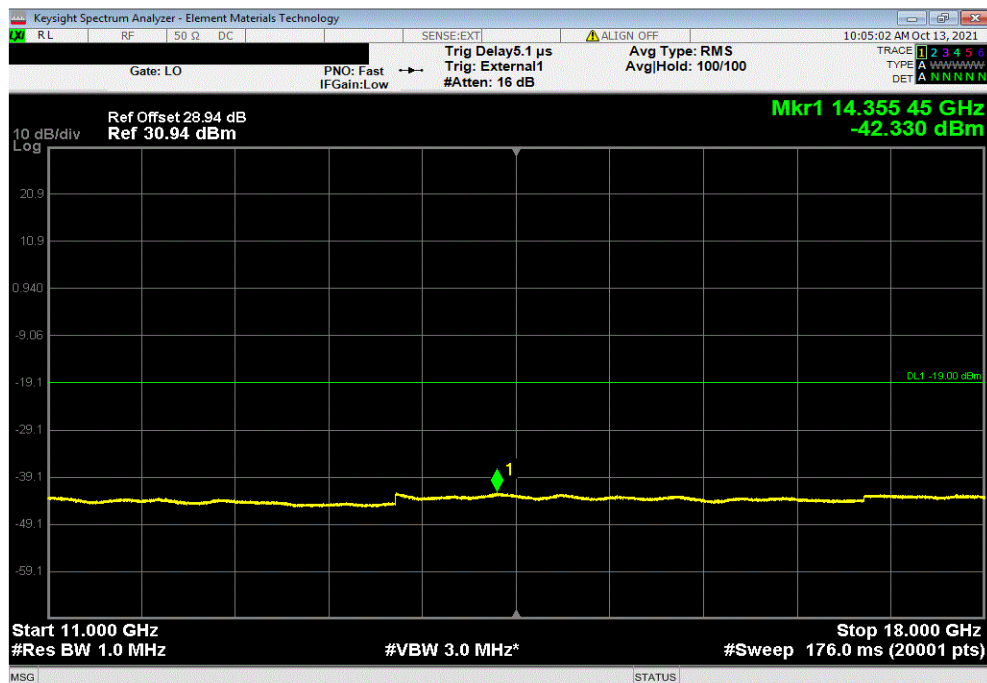


TbTx 2021.03.19.1 XMt 2020.12.30.0

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE20 (20MHz), 256QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
4 GHz - 11 GHz	4776.3	-50.26	-19	Pass	



4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE20 (20MHz), 256QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
11 GHz - 18 GHz	14355.45	-42.33	-19	Pass	

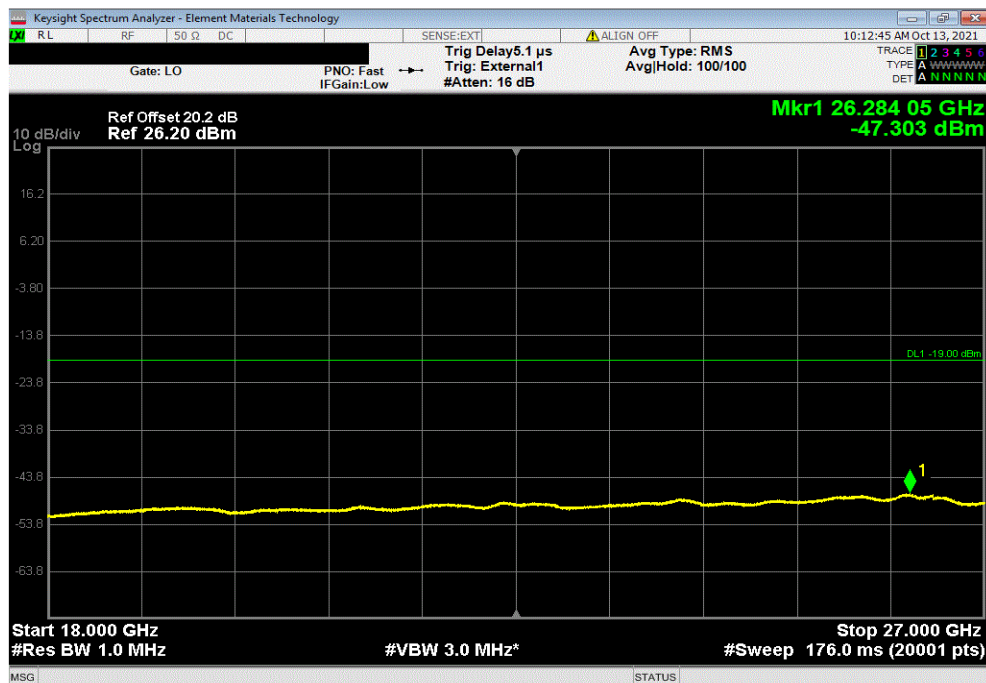


SPURIOUS CONDUCTED EMISSIONS - 4G LTE



TbTx 2021.03.19.1 XMt 2020.12.30.0

4G LTE, Band 41, 2496 MHz - 2690 MHz, Port 1, LTE20 (20MHz), 256QAM, Mid Channel 2593 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Limit < (dBm)	Result	
18 GHz - 27 GHz	26284.05	-47.3	-19	Pass	



End of Test Report