

BAND EDGE COMPLIANCE



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	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 measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in the available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet.

The spectrum was scanned below the lower band edge and above the higher band edge.

All limits were adjusted by a factor of $[-10 \cdot \log(16)]$ dB to account for the device operation as a 16 port MIMO transmitter, as per FCC KDB 622911.

Per FCC 24.238(a) and RSS 133 6.5.1 . the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -25 dBm $[-13 \text{ dBm} - 10 \log(16)]$ per FCC KDB 662911D01 v02r01 because the BTS may operate as a 16 port MIMO transmitter.

Per FCC 24.238(b) and RSS 133 6.5.1 (i). emissions seen up to 1 MHz outside of authorized operating frequency range band edges shall be measured with a RBW of 1% of the measured emission bandwidth. Any emission seen to be > 1 MHz further outside the band edges shall be measured with a RBW of 1 MHz. However, a narrower RBW of at least 1% of the emission bandwidth is still allowed provided that the measured power is integrated over the full reference bandwidth of 1 MHz.

BAND EDGE COMPLIANCE



EUT: AAFB		Work Order: NOKI0005
Serial Number: YK190400217		Date: 31-Jan-20
Customer: Nokia Solutions and Networks		Temperature: 23.5 °C
Attendees: Mitch Hill, John Rattanaovong		Humidity: 39.4% RH
Project: None		Barometric Pres.: 1014 mbar
Tested by: Willie Love, Brandon Hobbs		Job Site: TX09
Power: 54VDC		
TEST SPECIFICATIONS		
FCC 24E:2020		Test Method
RSS-133:2018		ANSI C63.26:2015
		RSS-Gen:2019
COMMENTS		
All losses in the measurement path were accounted for. The highest power port operating at maximum power was used for these measurements. The highest power port was determined by measuring the average power on each of the 16 antenna ports using a 10 MHz channel bandwidth at the middle channel found elsewhere in the report.		
DEVIATIONS FROM TEST STANDARD		
None		
Configuration #	1	Signature 
		Value Limit Result
Band 25 (Single Carrier) Port 1		
10 MHz		
NB-IoT		
Low Channel, 1935 MHz		
Low Channel Range 1 (1.929 GHz - 1.931 GHz)		-35.1 -25 Pass
Low Channel Range 2 (1.928 GHz - 1.929 GHz)		-33.1 -25 Pass
Low Channel Range 3 (1.908 GHz - 1.928 GHz)		-32.4 -25 Pass
High Channel, 1990 MHz		
High Channel Range 1 (1.994 GHz - 1.996 GHz)		-35.5 -25 Pass
High Channel Range 2 (1.996 GHz - 1.997 GHz)		-34.7 -25 Pass
High Channel Range 3 (1.997 GHz - 2.017 GHz)		-33.7 -25 Pass
15 MHz		
NB-IoT		
Low Channel, 1935 MHz		
Low Channel Range 1 (1.929 GHz - 1.931 GHz)		-32.1 -25 Pass
Low Channel Range 2 (1.928 GHz - 1.929 GHz)		-33.4 -25 Pass
Low Channel Range 3 (1.908 GHz - 1.928 GHz)		-32.8 -25 Pass
High Channel, 1990 MHz		
High Channel Range 1 (1.994 GHz - 1.996 GHz)		-31.7 -25 Pass
High Channel Range 2 (1.996 GHz - 1.997 GHz)		-34.9 -25 Pass
High Channel Range 3 (1.997 GHz - 2.017 GHz)		-33.4 -25 Pass
20 MHz		
NB-IoT		
Low Channel, 1935 MHz		
Low Channel Range 1 (1.929 GHz - 1.931 GHz)		-35.6 -25 Pass
Low Channel Range 2 (1.928 GHz - 1.929 GHz)		-34.4 -25 Pass
Low Channel Range 3 (1.908 GHz - 1.928 GHz)		-33.5 -25 Pass
High Channel, 1990 MHz		
High Channel Range 1 (1.994 GHz - 1.996 GHz)		-34.5 -25 Pass
High Channel Range 2 (1.996 GHz - 1.997 GHz)		-35.3 -25 Pass
High Channel Range 3 (1.997 GHz - 2.017 GHz)		-33.7 -25 Pass

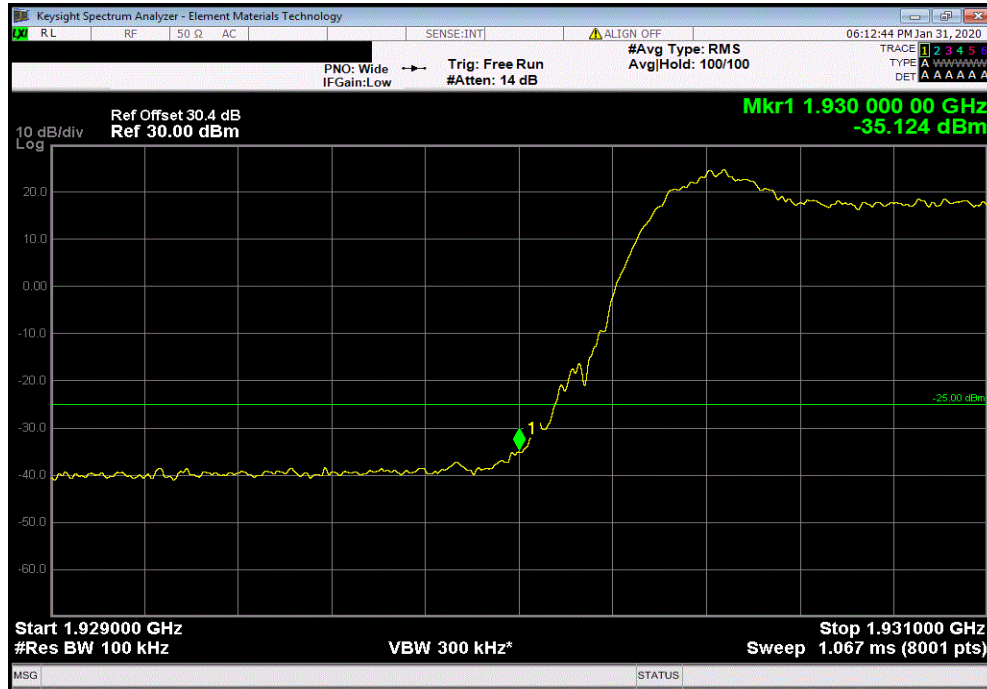
BAND EDGE COMPLIANCE



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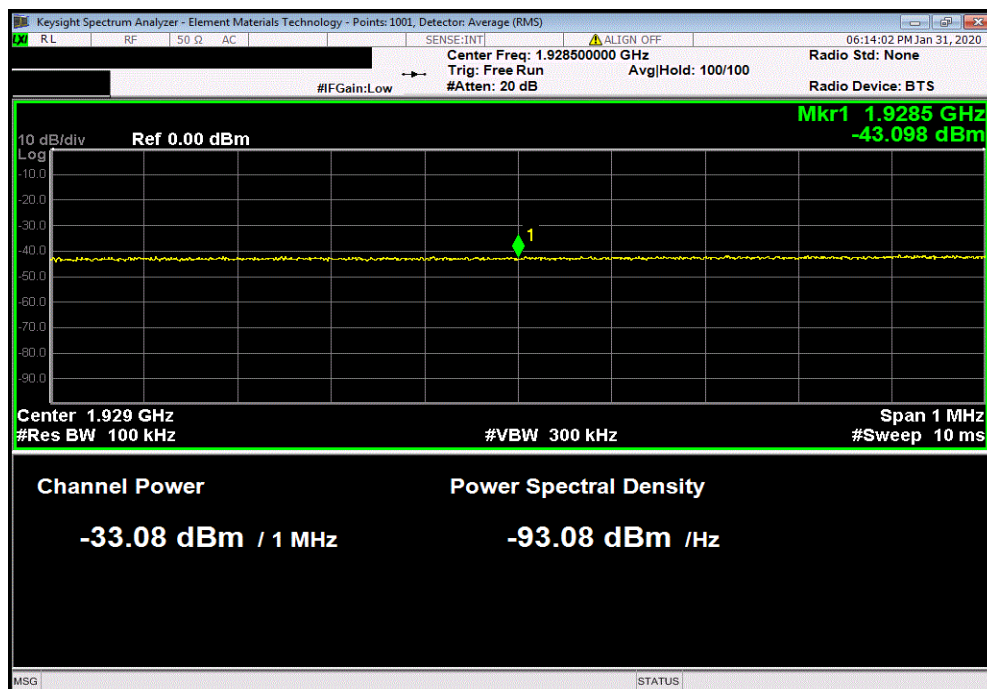
Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, Low Channel, 1935 MHz, Low Channel Range 1 (1.929 GHz - 1.931 GHz)

	Value	Limit	Result
	-35.1	-25	Pass



Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, Low Channel, 1935 MHz, Low Channel Range 2 (1.928 GHz - 1.929 GHz)

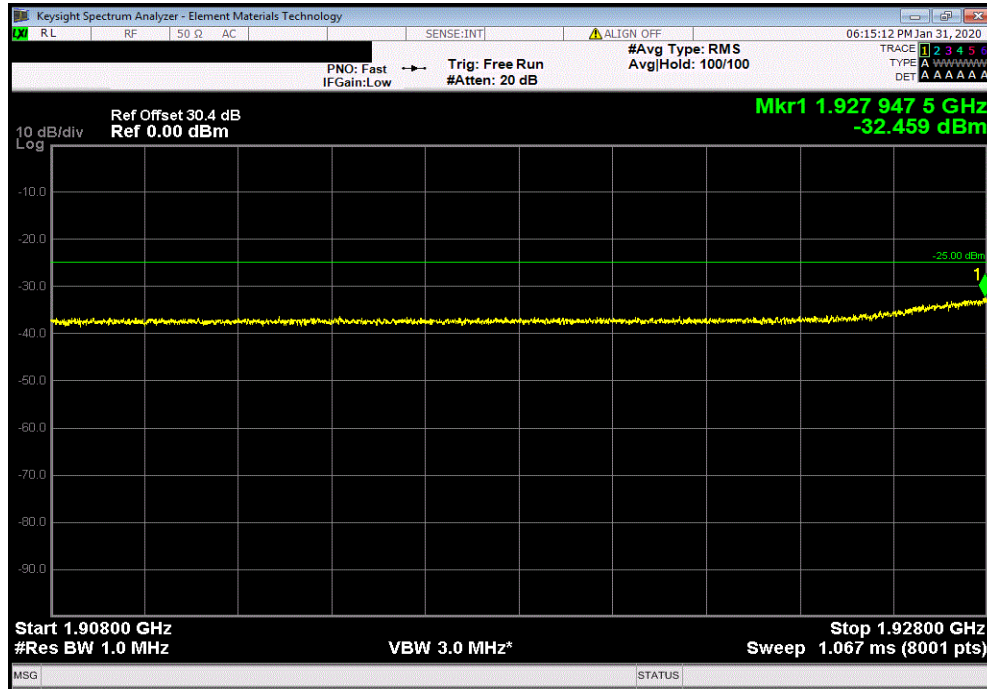
	Value	Limit	Result
	-33.08	-25	Pass



BAND EDGE COMPLIANCE

Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, Low Channel, 1935 MHz, Low Channel Range 3 (1.908 GHz - 1.928 GHz)

	Value	Limit	Result
	-32.4	-25	Pass



Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, High Channel, 1990 MHz, High Channel Range 1 (1.994 GHz - 1.996 GHz)

	Value	Limit	Result
	-35.5	-25	Pass



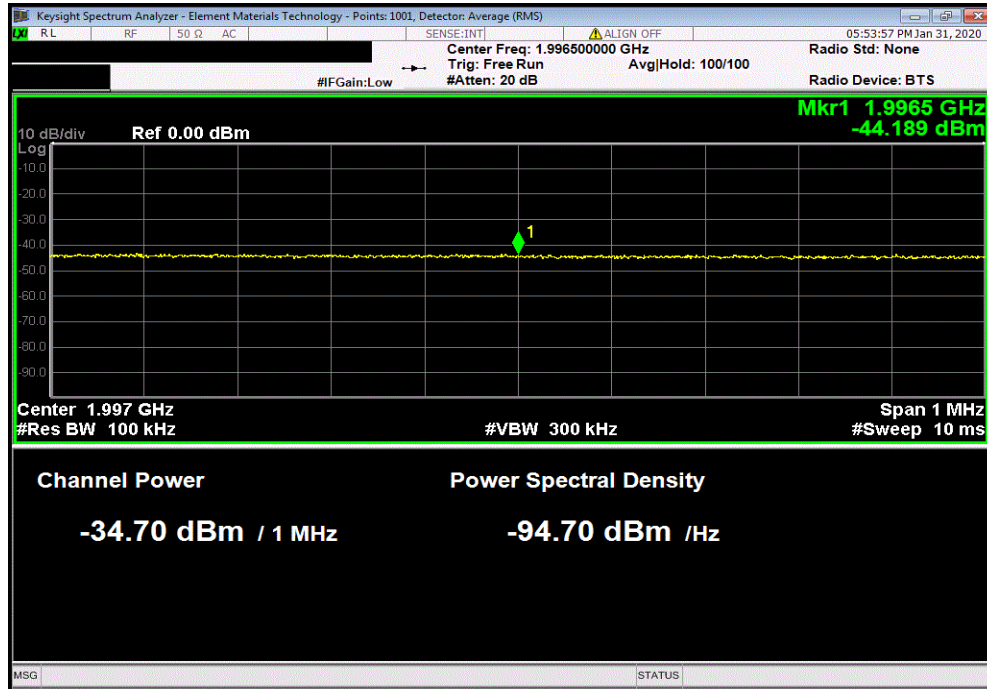
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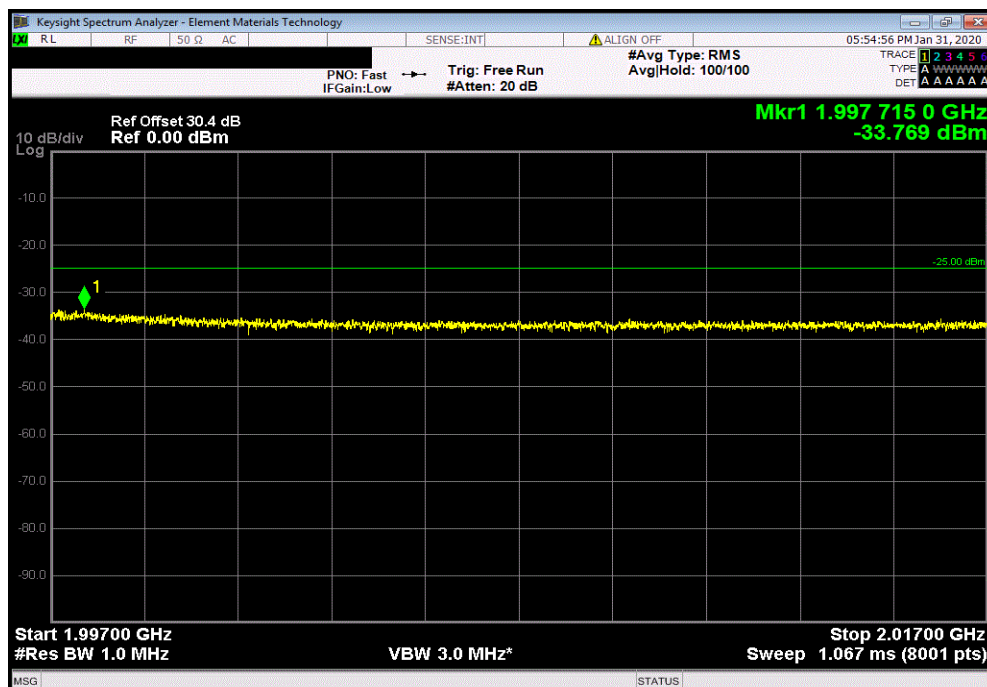
Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, High Channel, 1990 MHz, High Channel Range 2 (1.996 GHz - 1.997 GHz)

	Value	Limit	Result
	-34.7	-25	Pass



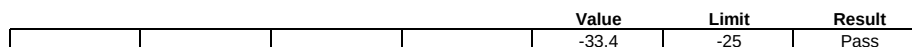
Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, High Channel, 1990 MHz, High Channel Range 3 (1.997 GHz - 2.017 GHz)

	Value	Limit	Result
	-33.7	-25	Pass



YMR 2019.09.01

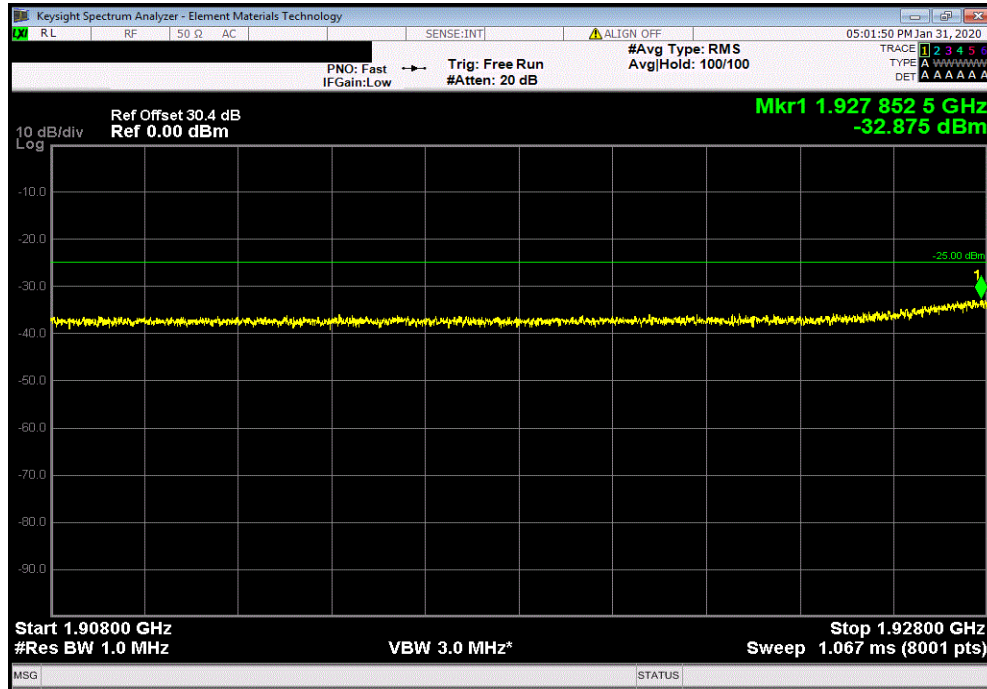
				Value	Limit	Result
				-32.1	-25	Pass



BAND EDGE COMPLIANCE

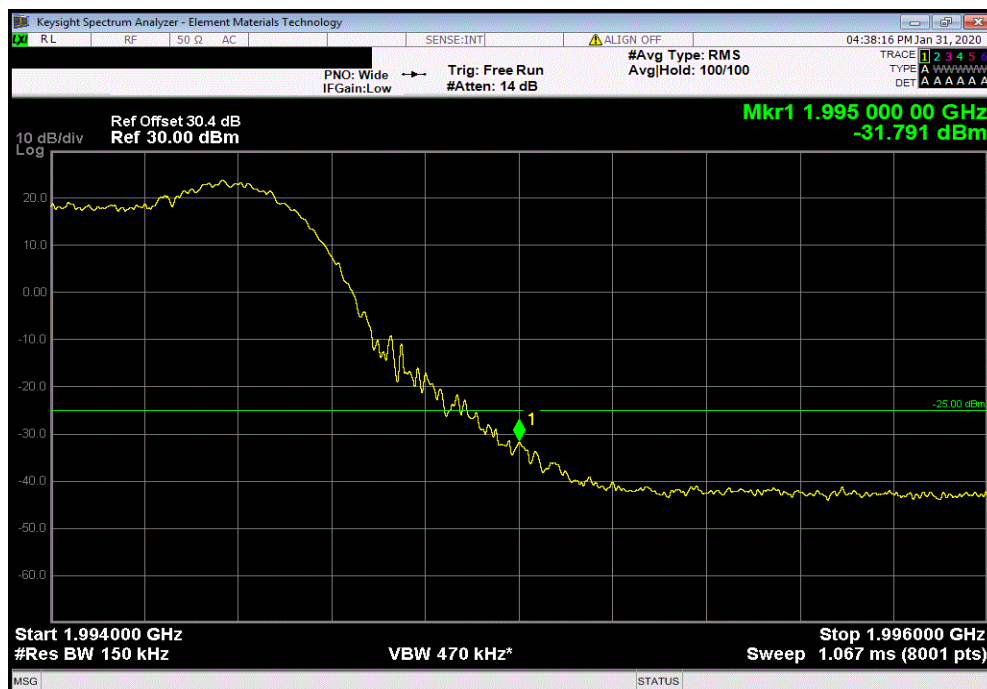
Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, Low Channel, 1935 MHz, Low Channel Range 3 (1.908 GHz - 1.928 GHz)

	Value	Limit	Result
	-32.8	-25	Pass



Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, High Channel, 1990 MHz, High Channel Range 1 (1.994 GHz - 1.996 GHz)

	Value	Limit	Result
	-31.7	-25	Pass



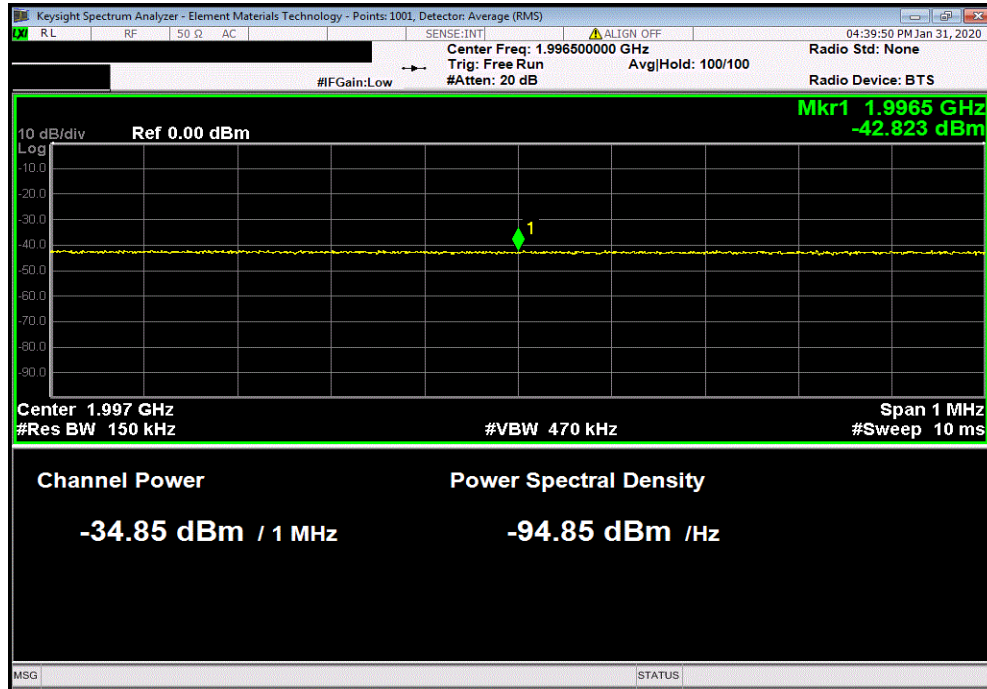
BAND EDGE COMPLIANCE



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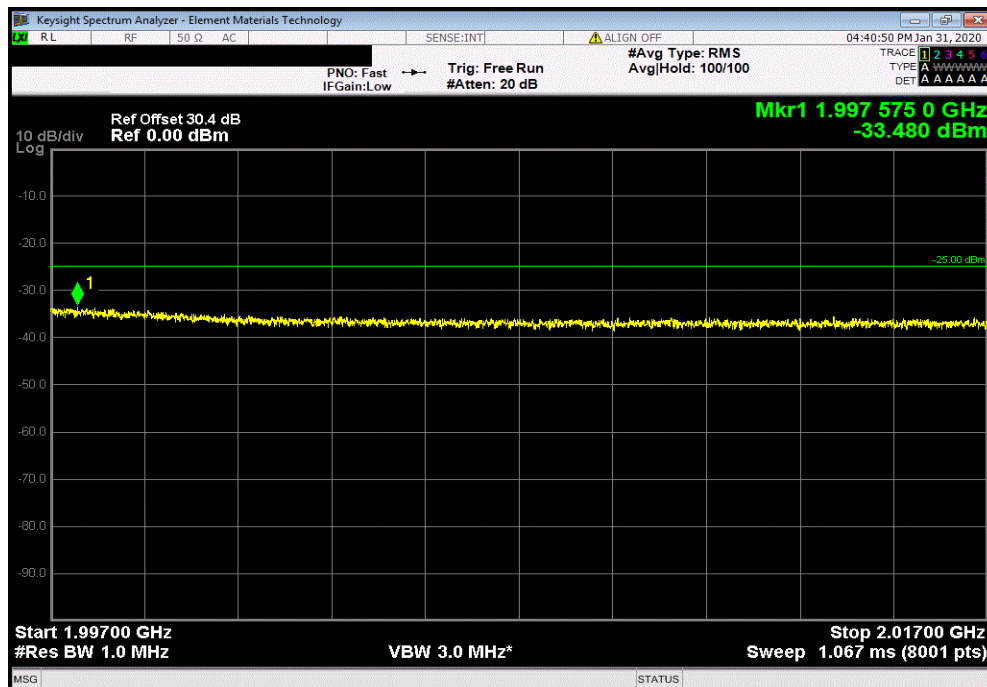
Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, High Channel, 1990 MHz, High Channel Range 2 (1.996 GHz - 1.997 GHz)

	Value	Limit	Result
	-34.85	-25	Pass



Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, High Channel, 1990 MHz, High Channel Range 3 (1.997 GHz - 2.017 GHz)

	Value	Limit	Result
	-33.4	-25	Pass



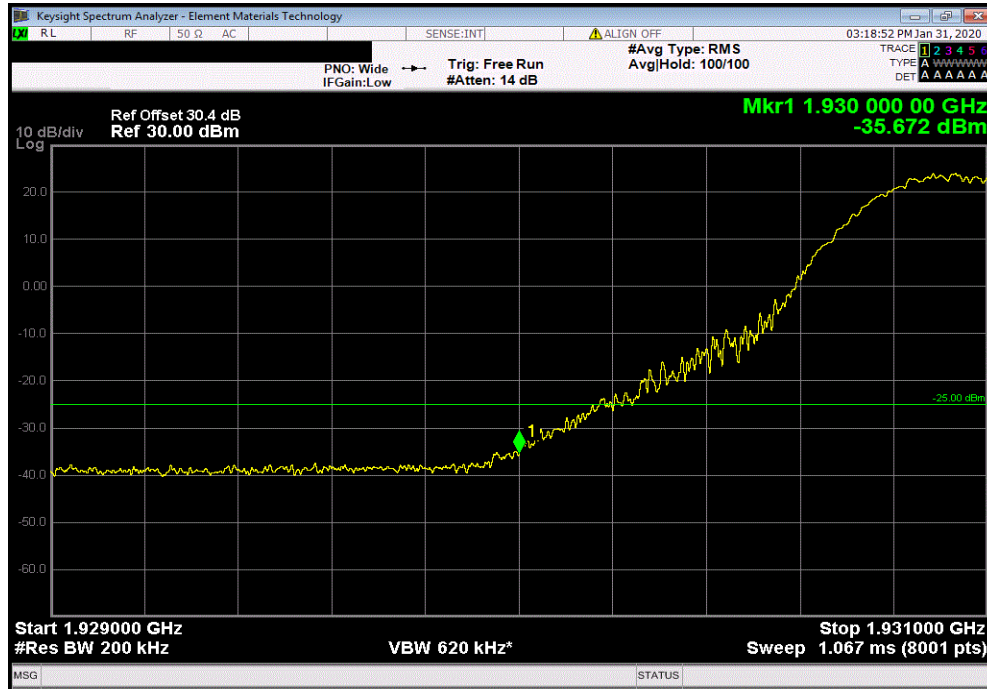
BAND EDGE COMPLIANCE



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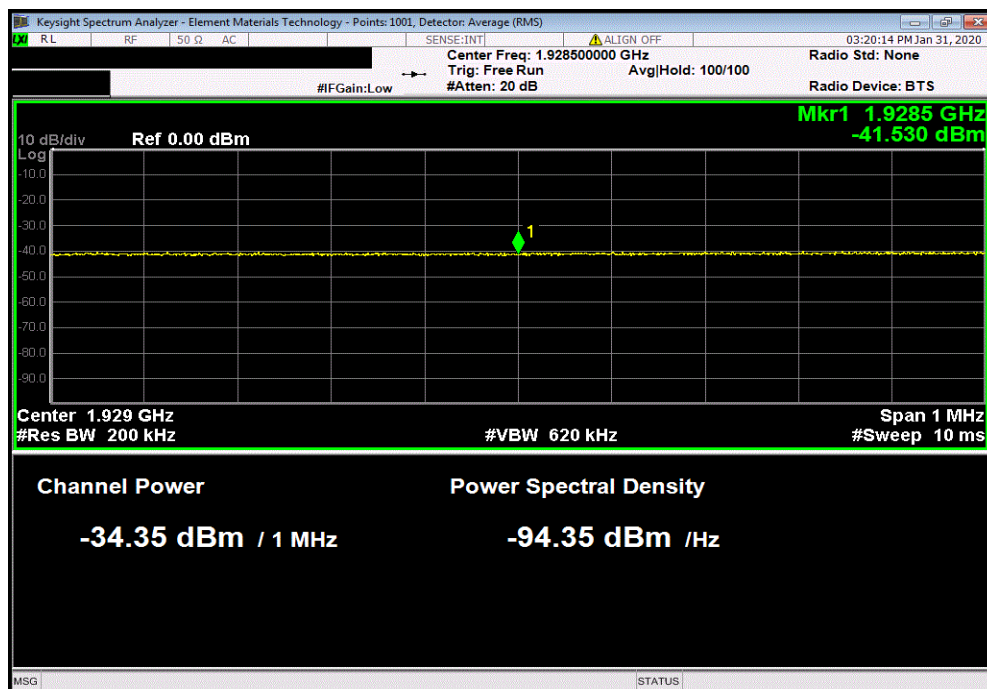
Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, Low Channel, 1935 MHz, Low Channel Range 1 (1.929 GHz - 1.931 GHz)

	Value	Limit	Result
	-35.6	-25	Pass



Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, Low Channel, 1935 MHz, Low Channel Range 2 (1.928 GHz - 1.929 GHz)

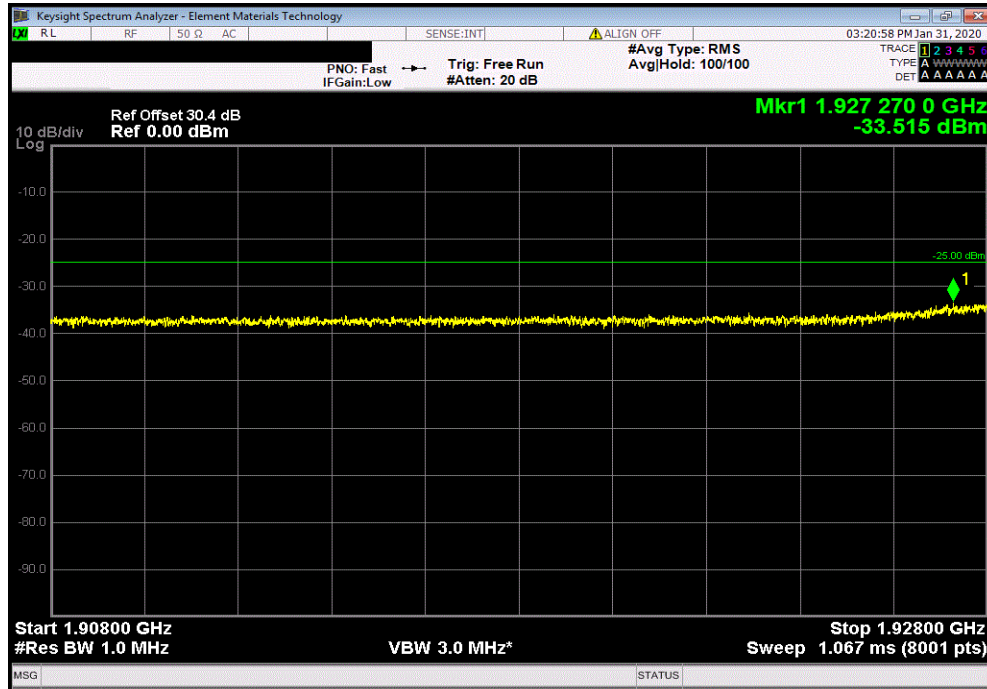
	Value	Limit	Result
	-34.35	-25	Pass



BAND EDGE COMPLIANCE

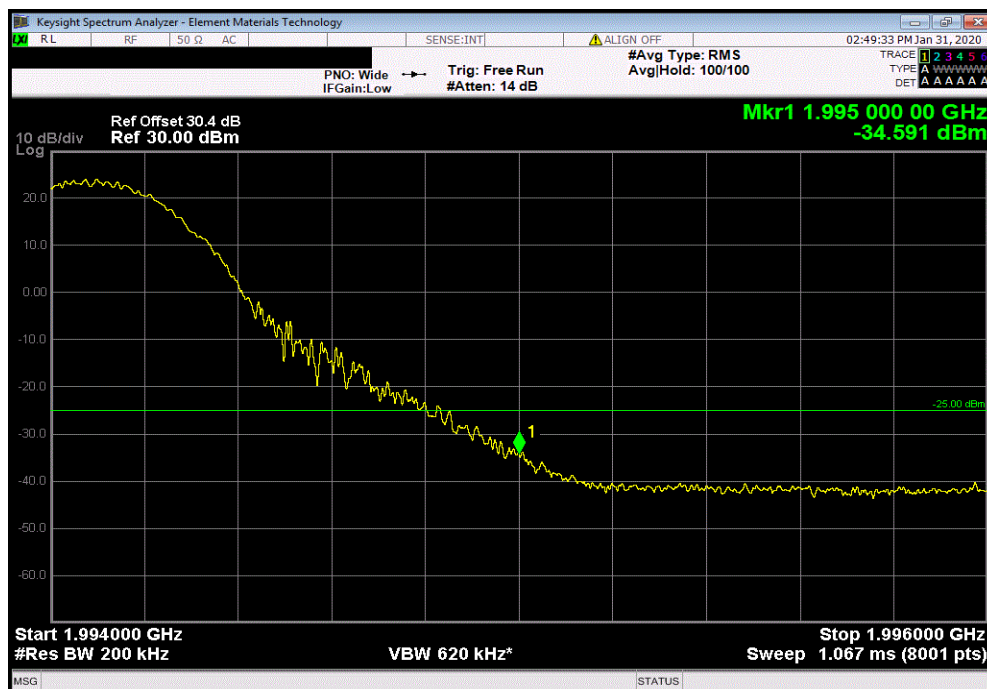
Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, Low Channel, 1935 MHz, Low Channel Range 3 (1.908 GHz - 1.928 GHz)

	Value	Limit	Result
	-33.5	-25	Pass



Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, High Channel, 1990 MHz, High Channel Range 1 (1.994 GHz - 1.996 GHz)

	Value	Limit	Result
	-34.5	-25	Pass



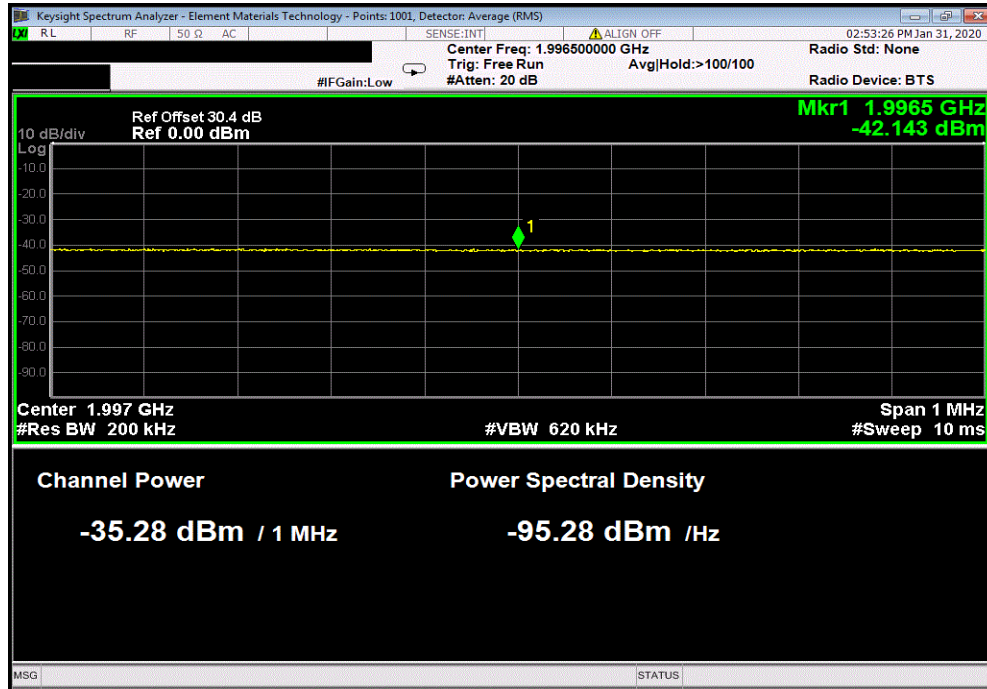
BAND EDGE COMPLIANCE



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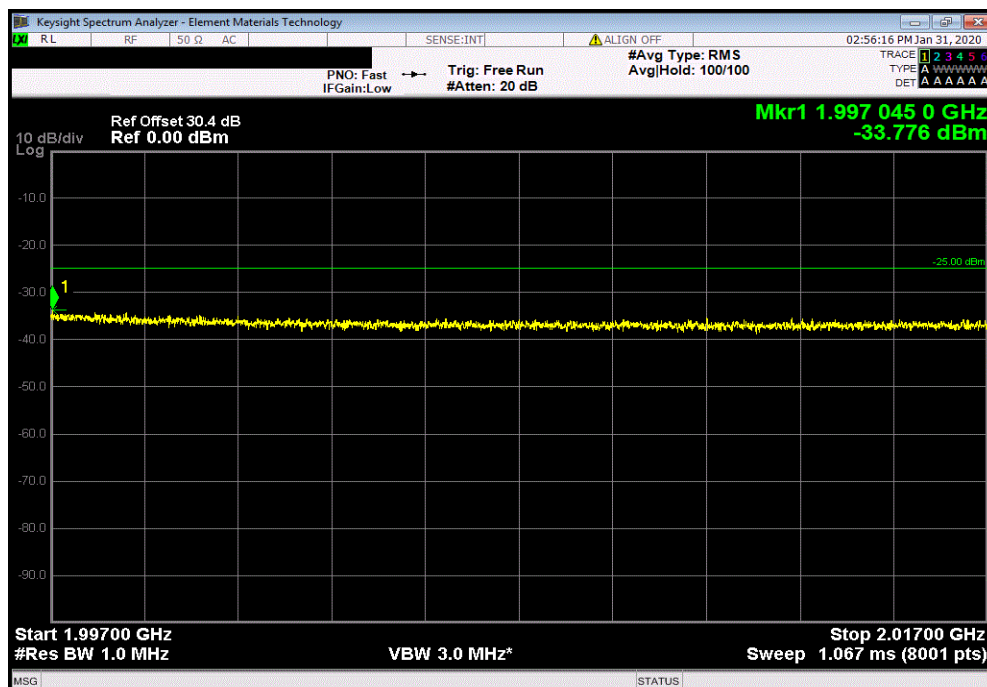
Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, High Channel, 1990 MHz, High Channel Range 2 (1.996 GHz - 1.997 GHz)

	Value	Limit	Result
	-35.28	-25	Pass



Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, High Channel, 1990 MHz, High Channel Range 3 (1.997 GHz - 2.017 GHz)

	Value	Limit	Result
	-33.7	-25	Pass



SPURIOUS CONDUCTED EMISSIONS



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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	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20
Generator - Signal	Keysight	N5183A	TID	26-Apr-19	26-Apr-21

TEST DESCRIPTION

The antenna port spurious emissions were measured at the RF output terminal of the EUT with 30dB of external attenuation on 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 22 GHz. The peak 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 KDB971168 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 frequency band after the first 1.0 MHz bands immediately outside and adjacent to the frequency block.

Per section FCC 24.238(a) and RSS 133 6.5.1 (ii), the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm for a 1 MHz measurement bandwidth. The limit is adjusted to -25 dBm [-13 dBm -10 log (16)] per FCC KDB 662911D01 v02r01 because the BTS operates as a 16 port MIMO transmitter.

The limit for the 9kHz to 150kHz frequency range was adjusted to -55dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 1MHz [i.e.: -55dBm = -25dBm -10log(1MHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to -45dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 1MHz [i.e.: -45dBm = -25dBm -10log(1MHz/10kHz)]. The required limit of -25dBm with a RBW of >1MHz was used for all other frequency ranges.

SPURIOUS CONDUCTED EMISSIONS



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EUT: AAFB		Work Order: NOKI0005	
Serial Number: YK190400217		Date: 31-Jan-20	
Customer: Nokia Solutions and Networks		Temperature: 23.6 °C	
Attendees: Mitch Hill, John Rattavong		Humidity: 39.4% RH	
Project: None		Barometric Pres.: 1014 mbar	
Tested by: Willie Love, Brandon Hobbs		Power: 54VDC	
Job Site: TX09			

TEST SPECIFICATIONS		Test Method	
FCC 24E:2020		ANSI C63.26:2015	
RSS-133:2018		RSS-Gen:2019	

COMMENTS

All losses in the measurement path were accounted for. The highest power port operating at maximum power was used for these measurements. The highest power port was determined by measuring the average power on each of the 16 antenna ports using a 10 MHz channel bandwidth at the middle channel found elsewhere in the report.

DEVIATIONS FROM TEST STANDARD

None

Configuration #	1,2,3	Signature	

	Value	Limit	Result
Band 25 (Single Carrier) Port 1			
10 MHz			
NB-IoT			
Mid Channel, 1962.5 MHz			
9 KHz - 150 KHz	-62.3	-55	Pass
150 KHz - 20 MHz	-56.7	-45	Pass
20 MHz - 3 GHz	-32.5	-25	Pass
3 GHz - 10 GHz	-31.9	-25	Pass
10 GHz - 18 GHz	-29.4	-25	Pass
18 GHz - 22 GHz	-35.1	-25	Pass
15 MHz			
NB-IoT			
Mid Channel, 1962.5 MHz			
9 KHz - 150 KHz	-62.7	-55	Pass
150 KHz - 20 MHz	-55.4	-45	Pass
20 MHz - 3 GHz	-30.4	-25	Pass
3 GHz - 10 GHz	-34.5	-25	Pass
10 GHz - 18 GHz	-29.0	-25	Pass
18 GHz - 22 GHz	-35.0	-25	Pass
20 MHz			
NB-IoT			
Mid Channel, 1962.5 MHz			
9 KHz - 150 KHz	-62.2	-55	Pass
150 KHz - 20 MHz	-55.5	-45	Pass
20 MHz - 3 GHz	-39.1	-25	Pass
3 GHz - 10 GHz	-34.5	-25	Pass
10 GHz - 18 GHz	-29.1	-25	Pass
18 GHz - 22 GHz	-35.1	-25	Pass

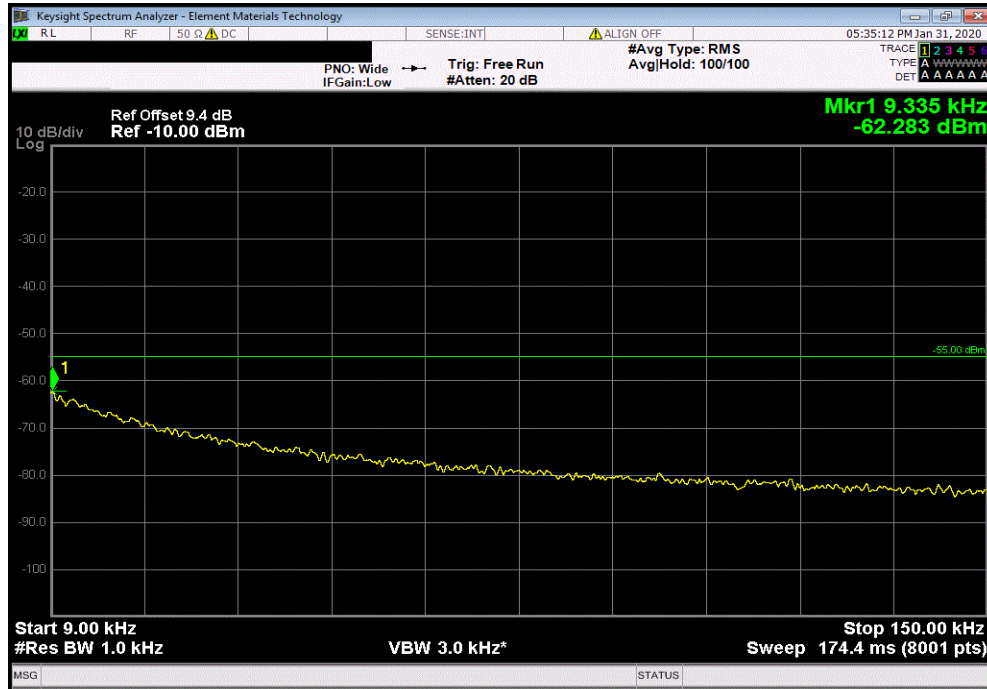
SPURIOUS CONDUCTED EMISSIONS



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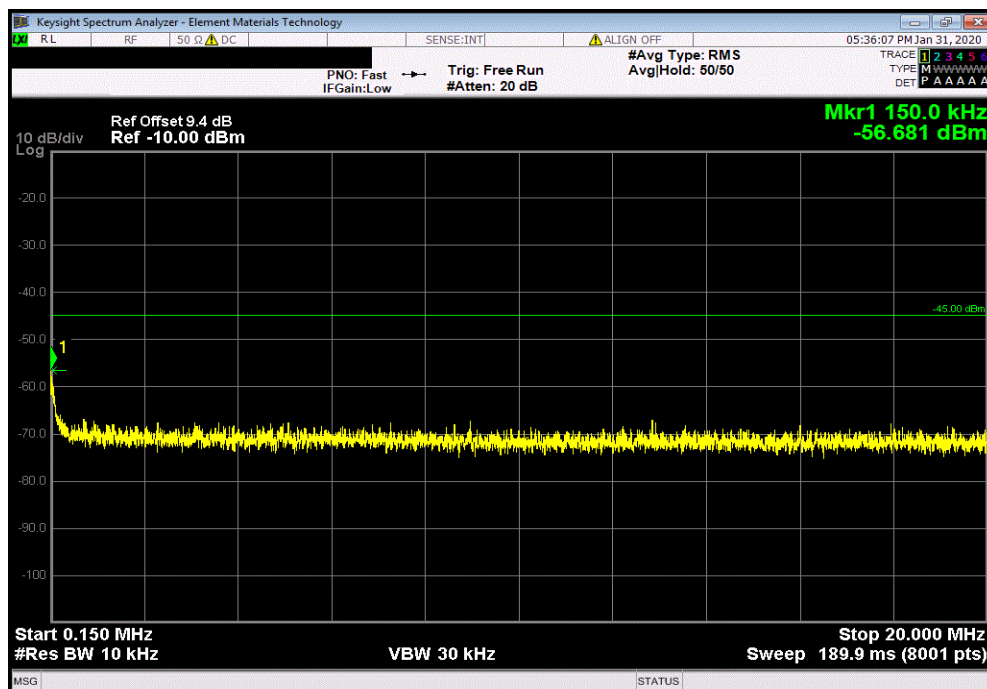
Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 9 KHz - 150 KHz

	Value	Limit	Result
	-62.283	-55	Pass



Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 150 KHz - 20 MHz

	Value	Limit	Result
	-56.681	-45	Pass



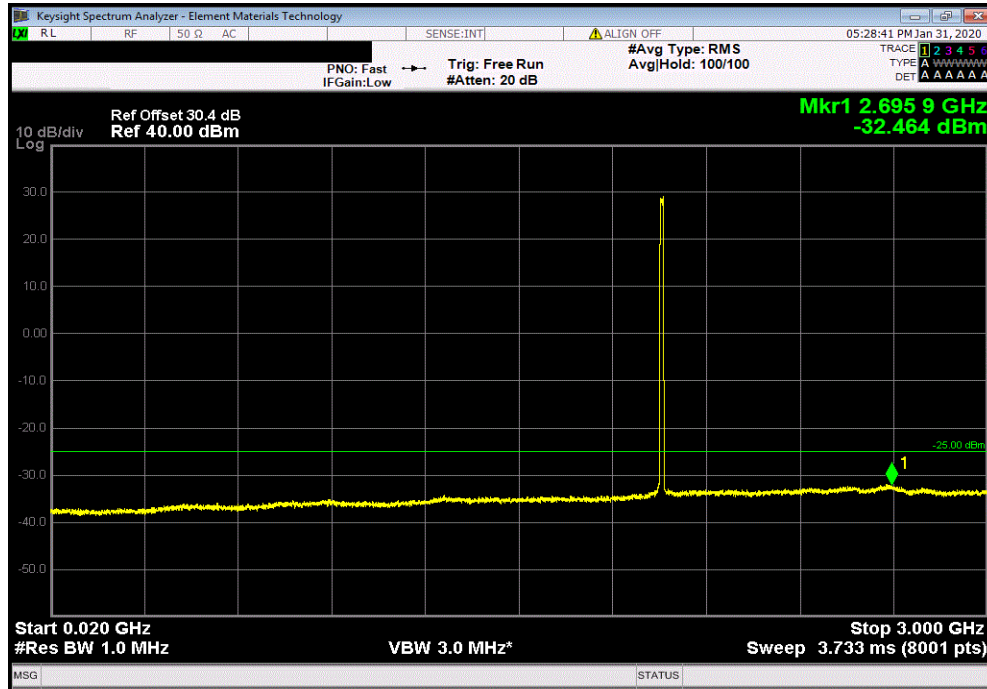
SPURIOUS CONDUCTED EMISSIONS



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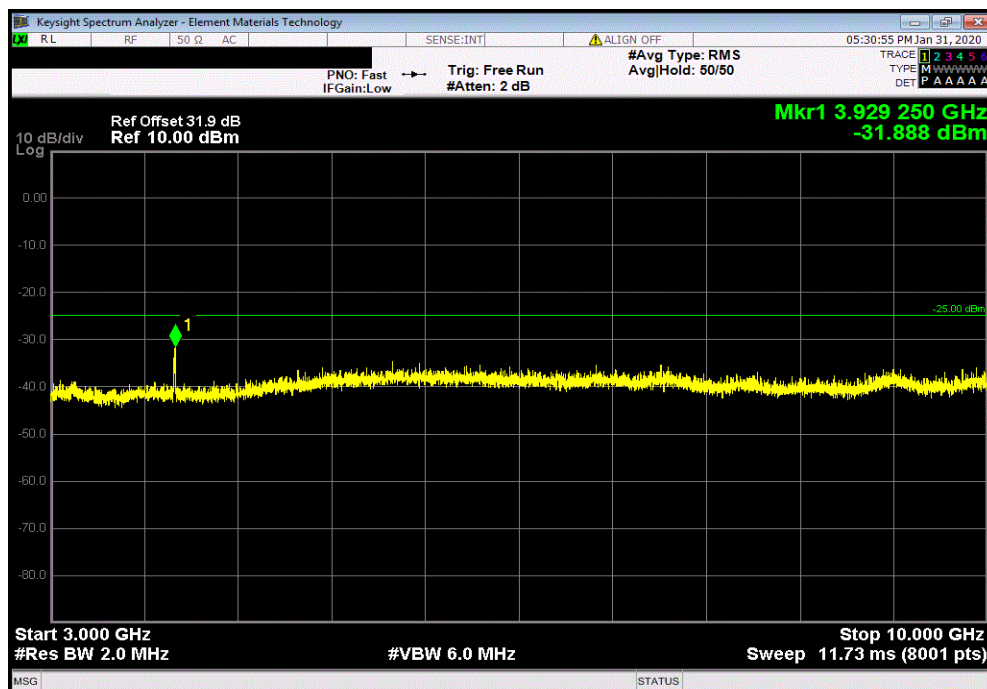
Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 20 MHz - 3 GHz

				Value	Limit	Result
				-32.464	-25	Pass



Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 3 GHz - 10 GHz

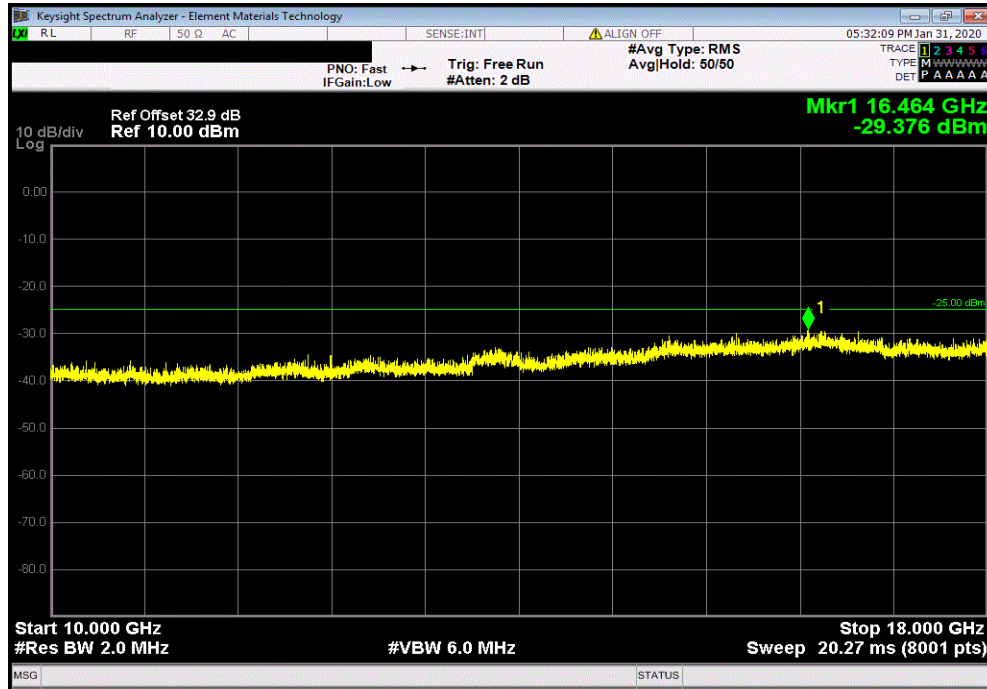
				Value	Limit	Result
				-31.888	-25	Pass



SPURIOUS CONDUCTED EMISSIONS

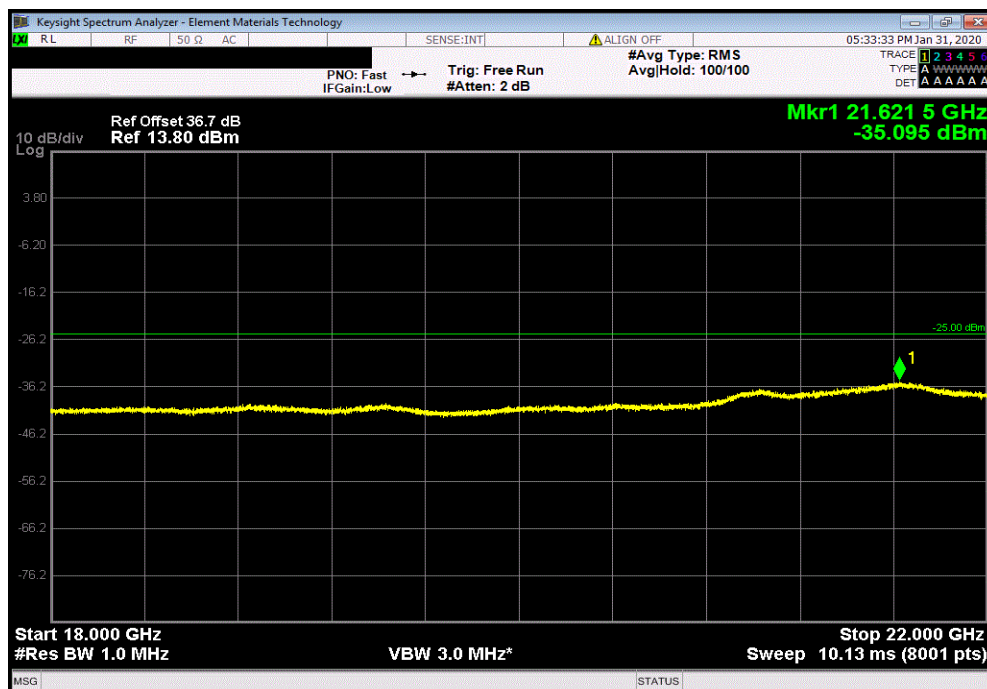
Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 10 GHz - 18 GHz

	Value	Limit	Result
	-29.376	-25	Pass



Band 25 (Single Carrier) Port 1, 10 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 18 GHz - 22 GHz

	Value	Limit	Result
	-35.095	-25	Pass



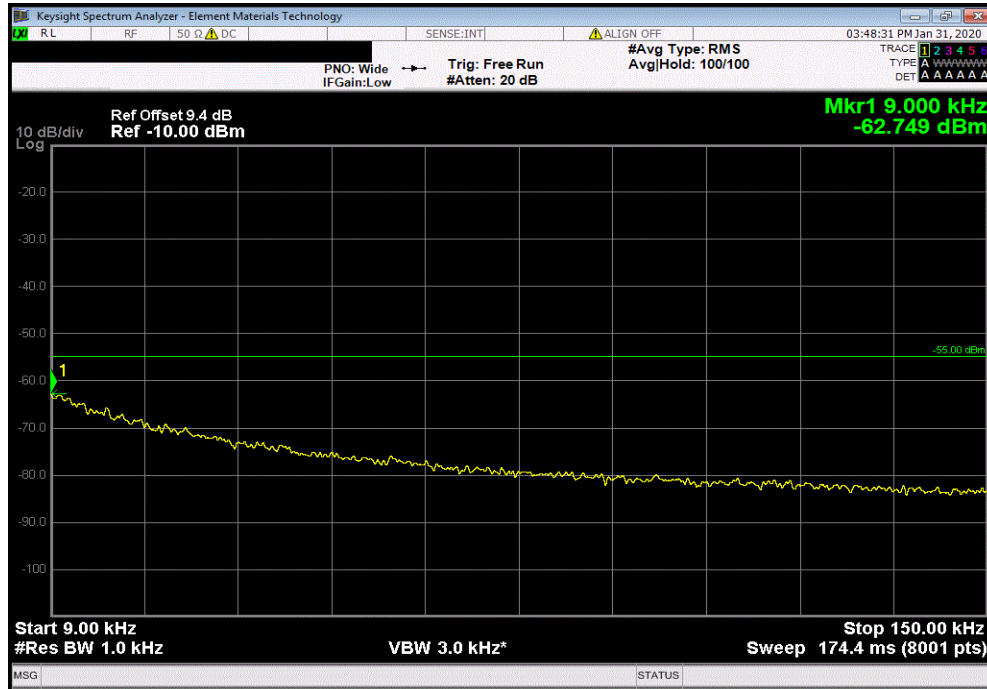
SPURIOUS CONDUCTED EMISSIONS



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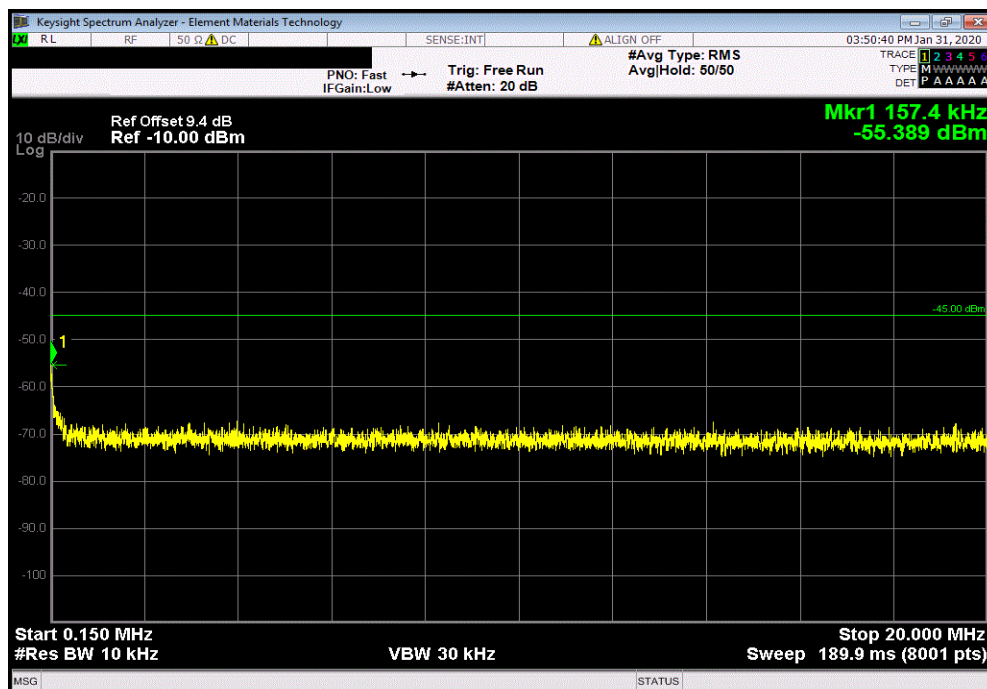
Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 9 KHz - 150 KHz

	Value	Limit	Result
	-62.749	-55	Pass



Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 150 KHz - 20 KHz

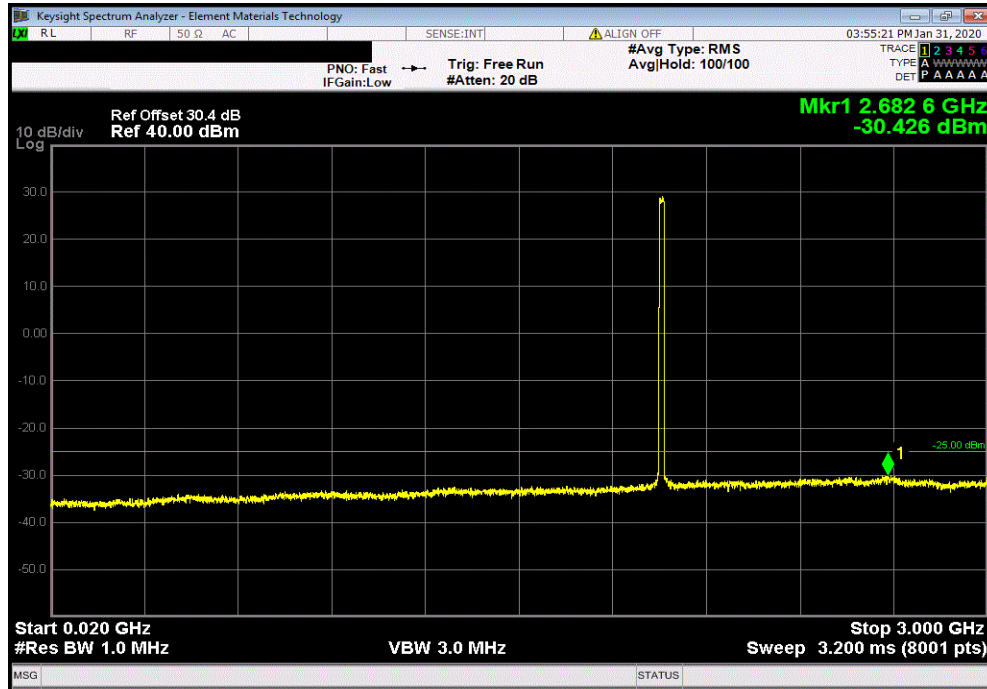
	Value	Limit	Result
	-55.389	-45	Pass



SPURIOUS CONDUCTED EMISSIONS

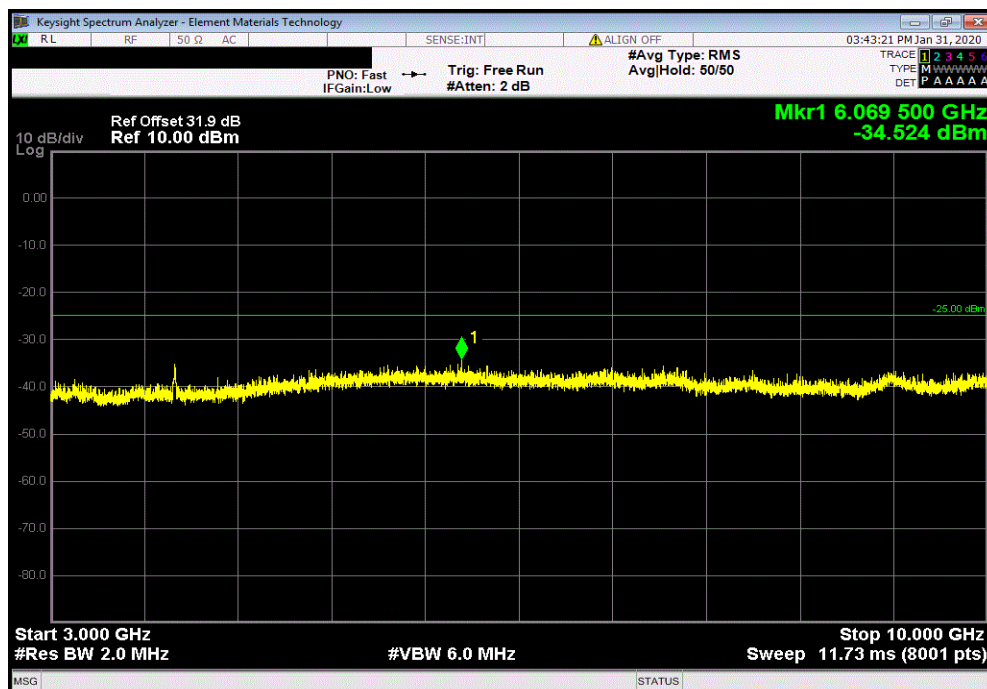
Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 20 MHz - 3 GHz

				Value	Limit	Result
				-30.426	-25	Pass



Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 3 GHz - 10 GHz

				Value	Limit	Result
				-34.524	-25	Pass



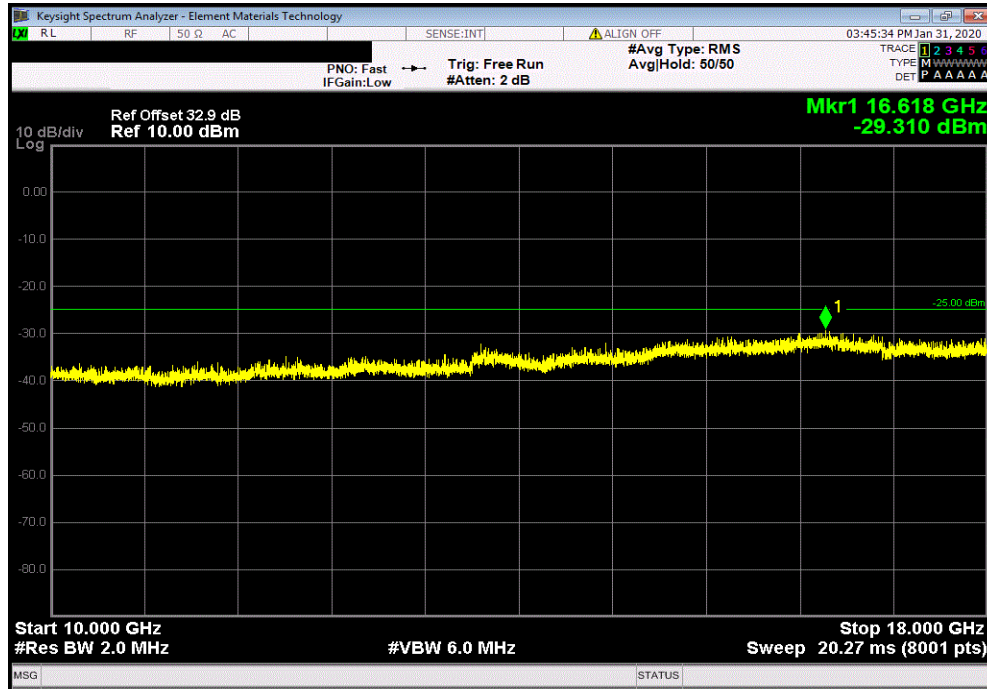
SPURIOUS CONDUCTED EMISSIONS



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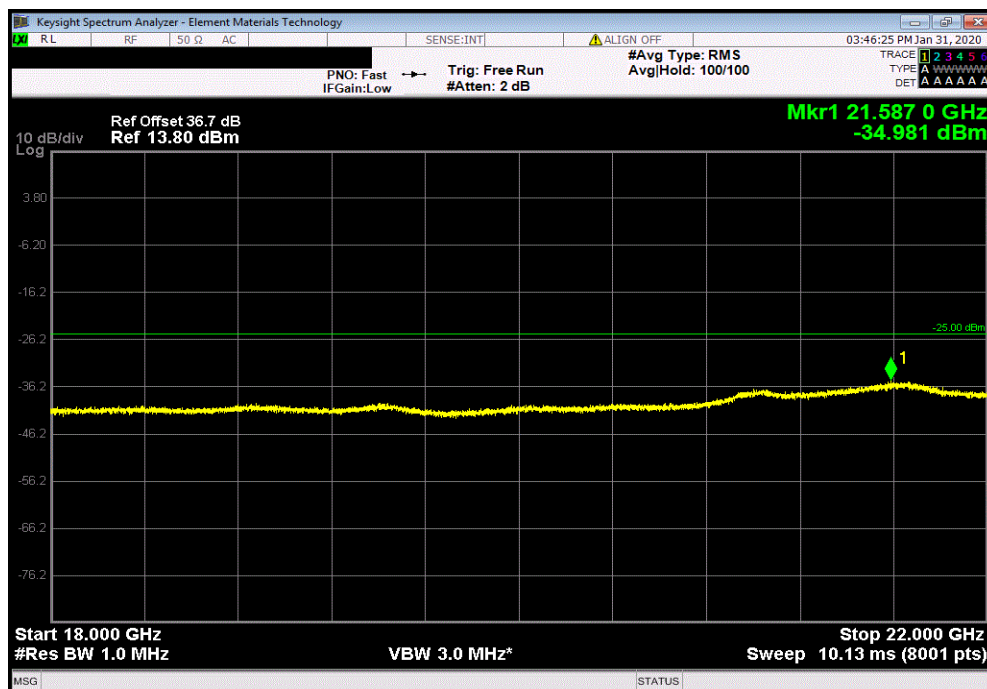
Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 10 GHz - 18 GHz

				Value	Limit	Result
				-29	-25	Pass



Band 25 (Single Carrier) Port 1, 15 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 18 GHz - 22 GHz

				Value	Limit	Result
				-34.981	-25	Pass



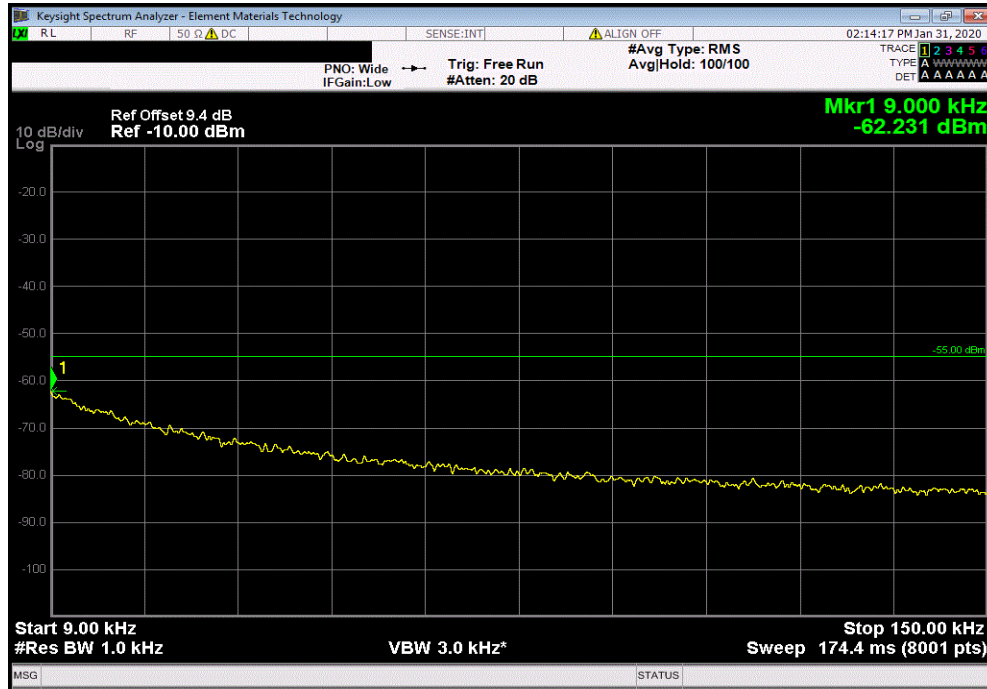
SPURIOUS CONDUCTED EMISSIONS



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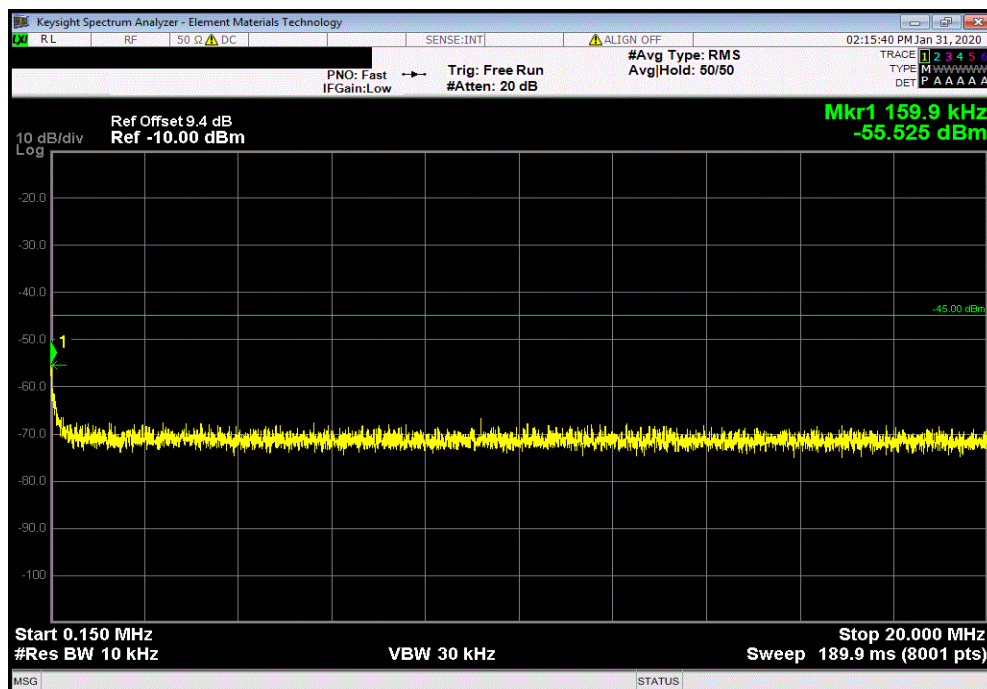
Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 9 KHz - 150 KHz

	Value	Limit	Result
	-62.231	-55	Pass



Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 150 KHz - 20 MHz

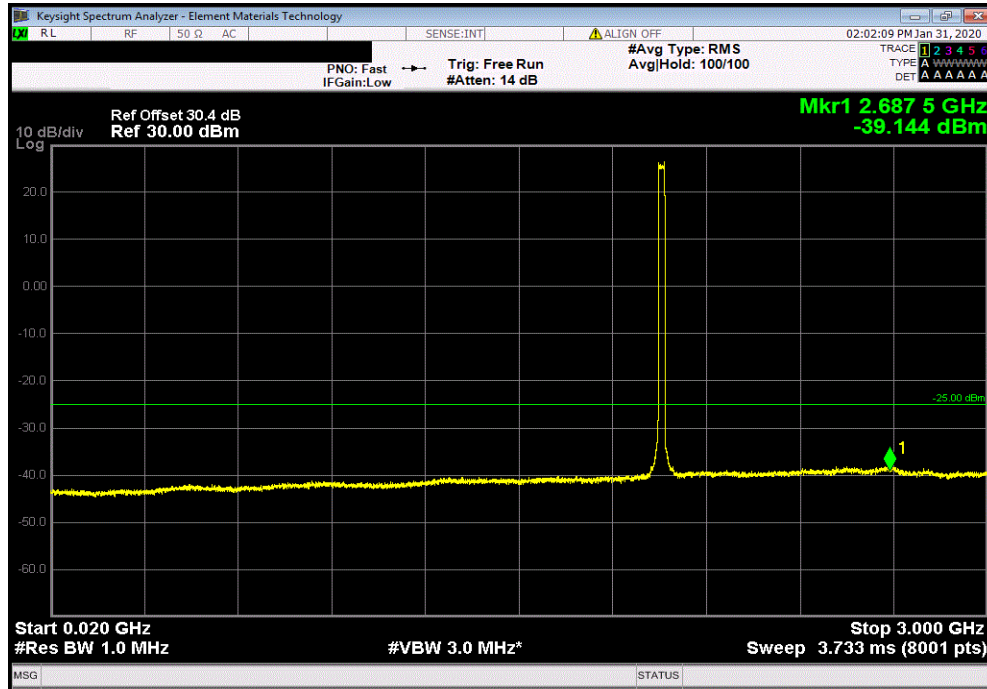
	Value	Limit	Result
	-55.525	-45	Pass



SPURIOUS CONDUCTED EMISSIONS

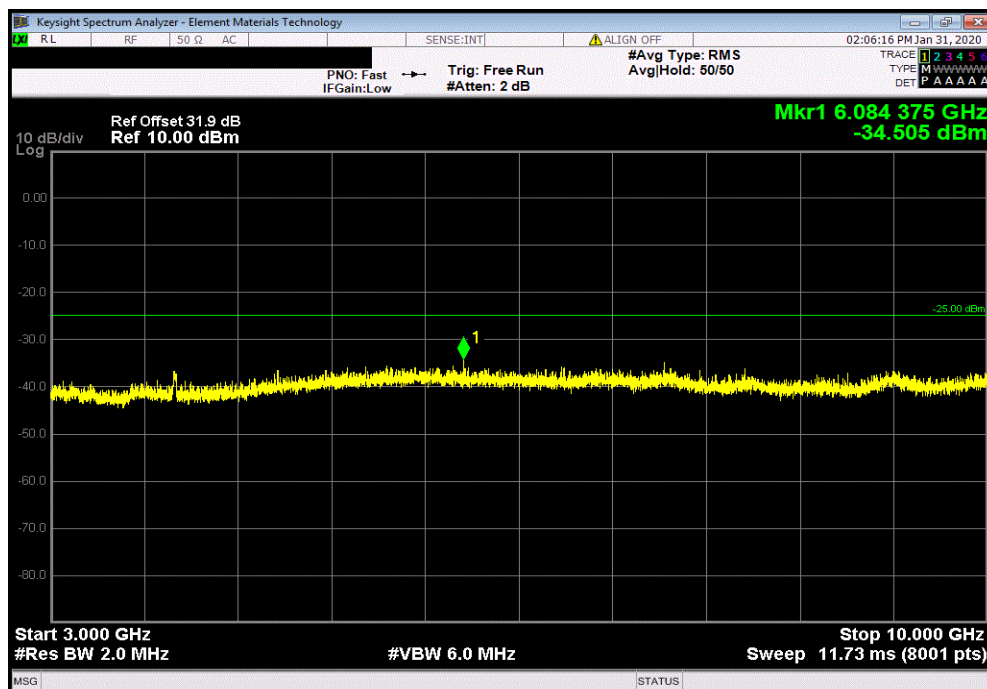
Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 20 MHz - 3 GHz

	Value	Limit	Result
	-39.144	-25	Pass



Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 3 GHz - 10 GHz

	Value	Limit	Result
	-34.505	-25	Pass



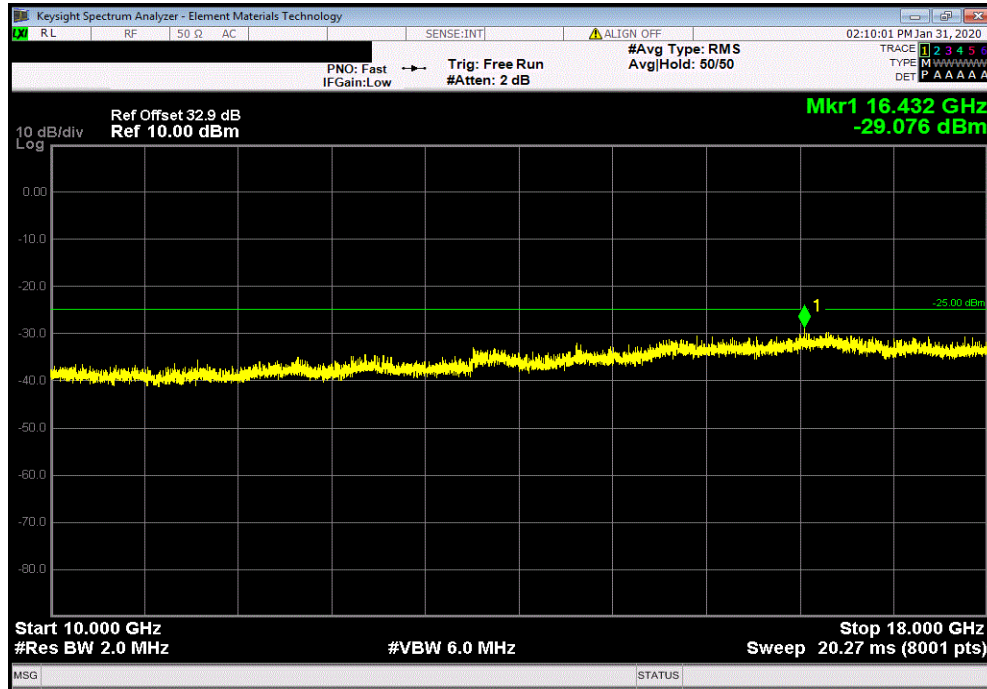
SPURIOUS CONDUCTED EMISSIONS



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Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 10 GHz - 18 GHz

				Value	Limit	Result
				-29.076	-25	Pass



Band 25 (Single Carrier) Port 1, 20 MHz, NB-IoT, Mid Channel, 1962.5 MHz, 18 GHz - 22 GHz

				Value	Limit	Result
				-35.136	-25	Pass

