

# AVERAGE POWER



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 fundamental emission output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

The method in section 5.2.4.4 of ANSI C63.26 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding  $[10 \log (1 / D)]$ , where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

Per FCC sections 27.50(c)(3) and 90.542, the Effective Radiated Power (ERP) of the transceiver cannot exceed 1000 Watts/MHz.

# AVERAGE POWER



TbTx 2019.08.30.0

XMI 2019.08.05

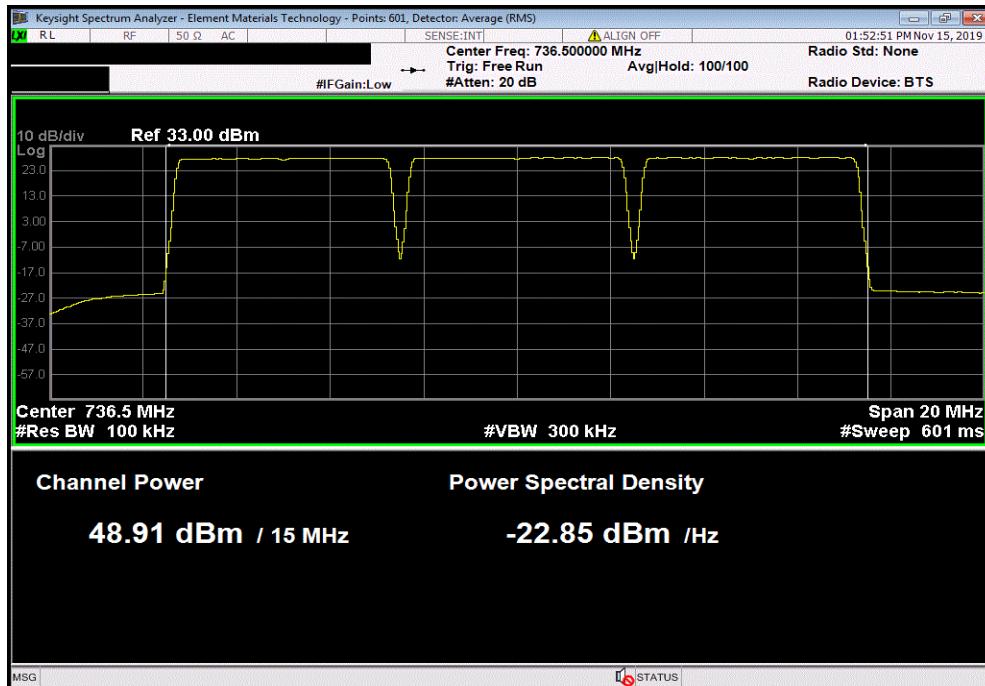
EUT:	AHLBBA RRH		Work Order:	NOKI0004						
Serial Number:	K9193514835		Date:	18-Nov-19						
Customer:	Nokia Solutions and Networks		Temperature:	22.7 °C						
Attendees:	John Rattanavong		Humidity:	29.9% RH						
Project:	None		Barometric Pres.:	1019 mbar						
Tested by:	Jonathan Kiefer	Power:	54VDC	Job Site:	TX09					
TEST SPECIFICATIONS	Test Method									
FCC 27:2019	ANSI C63.26:2015									
COMMENTS										
Band 12 Multicarrier average power measurements. Tested on highest power antenna port (Port 1). EUT is operated at 100% duty cycle. ERP depends on antenna gain, which is unknown. Only the highest dBm value is plotted per customer requirements and a Watt/MHz calculation was not made due to the unknown antenna value. Average power measurements were made for the multicarrier test cases on four modulation types (QPSK, 16QAM, 64QAM, 256QAM):										
The first multicarrier test case is with three Band 12 LTE5 carriers (based upon KDB 971168 D03v01) using two carriers (with minimum spacing between carrier frequencies) at the Band 12 lower band edge [731.5MHz and 736.5MHz] and a third carrier with maximum spacing between the other two carrier frequencies [741.5MHz] at the Band 12 upper band edge.										
The third multicarrier test case is with three Band 29/Band 12 LTE5 carriers (based upon KDB 971168 D03v01) using two carriers (with minimum spacing between carrier frequencies) at the Band 29 lower band edge [720.5MHz and 725.5MHz] and a third carrier with maximum spacing between the other two carrier frequencies [741.5MHz] at the Band 12 upper band edge.										
DEVIATIONS FROM TEST STANDARD										
None										
Configuration #	2	Signature								
			Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP/MHz)	Results			
Band 12										
QPSK Modulation	LTE5 Bandwidth	Multicarrier Test Case 1	Mid Channel, 736.5 MHz	48.91	0	48.9	1000	Pass		
		Multicarrier Test Case 3	Mid Channel, 741.5 MHz	49.03	0	49	1000	Pass		
			Mid Channel, 723.0 MHz	43.57	0	43.6	1000	Pass		
16QAM Modulation	LTE5 Bandwidth	Multicarrier Test Case 1	Mid Channel, 736.5 MHz	48.89	0	48.9	1000	Pass		
		Multicarrier Test Case 3	Mid Channel, 741.5 MHz	49.03	0	49	1000	Pass		
			Mid Channel, 723.0 MHz	43.57	0	43.6	1000	Pass		
64QAM Modulation	LTE5 Bandwidth	Multicarrier Test Case 1	Mid Channel, 736.5 MHz	48.92	0	48.9	1000	Pass		
		Multicarrier Test Case 3	Mid Channel, 741.5 MHz	49.04	0	49	1000	Pass		
			Mid Channel, 723.0 MHz	43.61	0	43.6	1000	Pass		
256QAM Modulation	LTE5 Bandwidth	Multicarrier Test Case 1	Mid Channel, 736.5 MHz	48.92	0	48.9	1000	Pass		
		Multicarrier Test Case 3	Mid Channel, 741.5 MHz	49.03	0	49	1000	Pass		
			Mid Channel, 723.0 MHz	43.51	0	43.5	1000	Pass		

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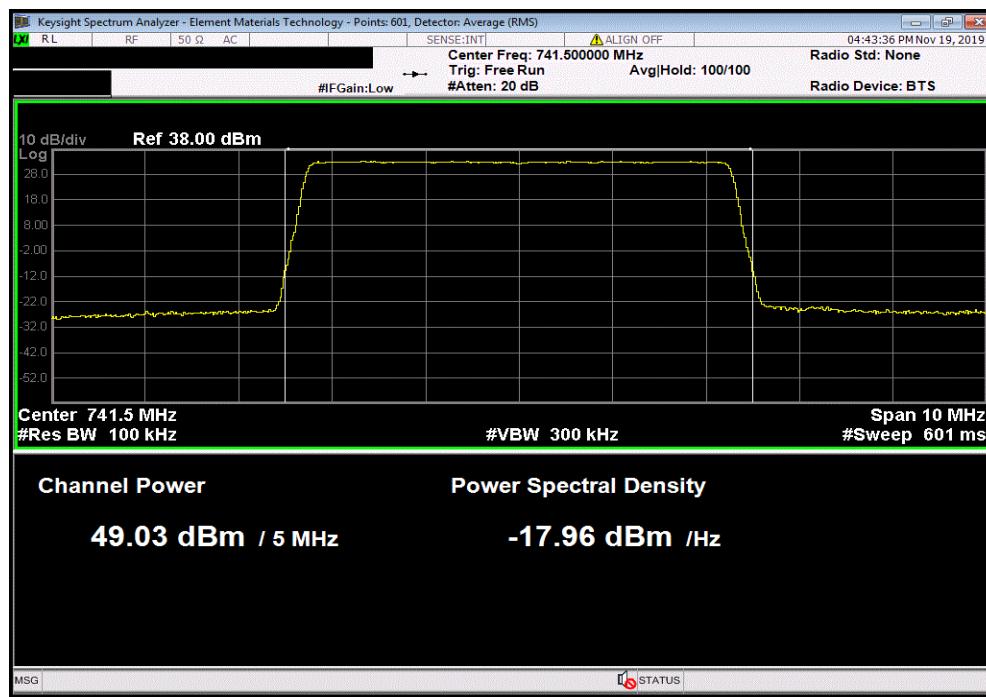


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Band 12, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 736.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
48.91	0	48.9	1000		Pass



Band 12, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 741.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
49.03	0	49	1000		Pass

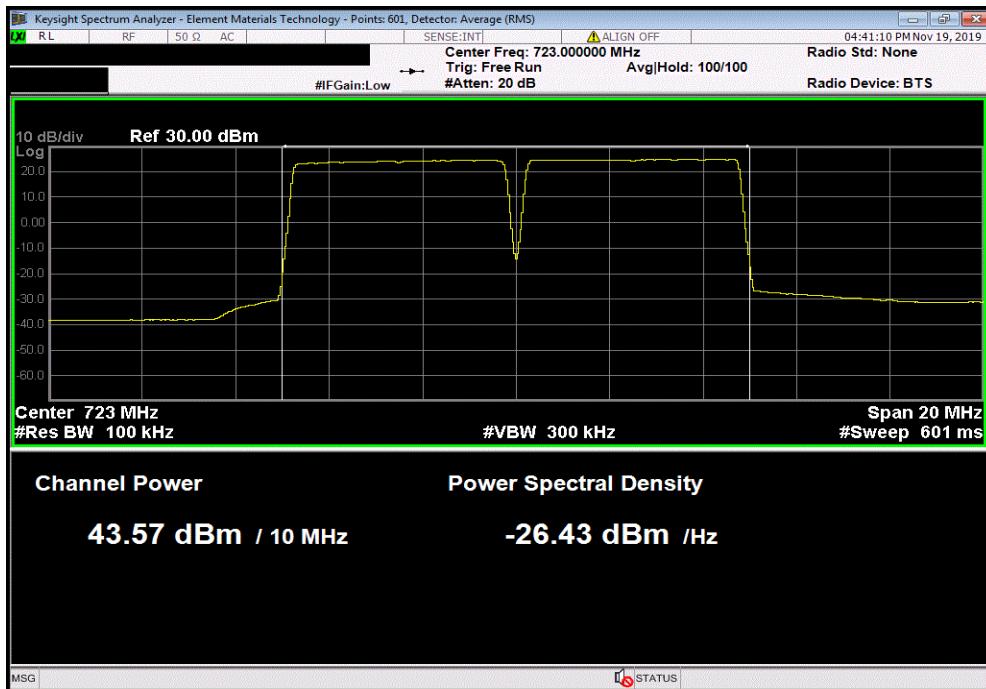


# AVERAGE POWER

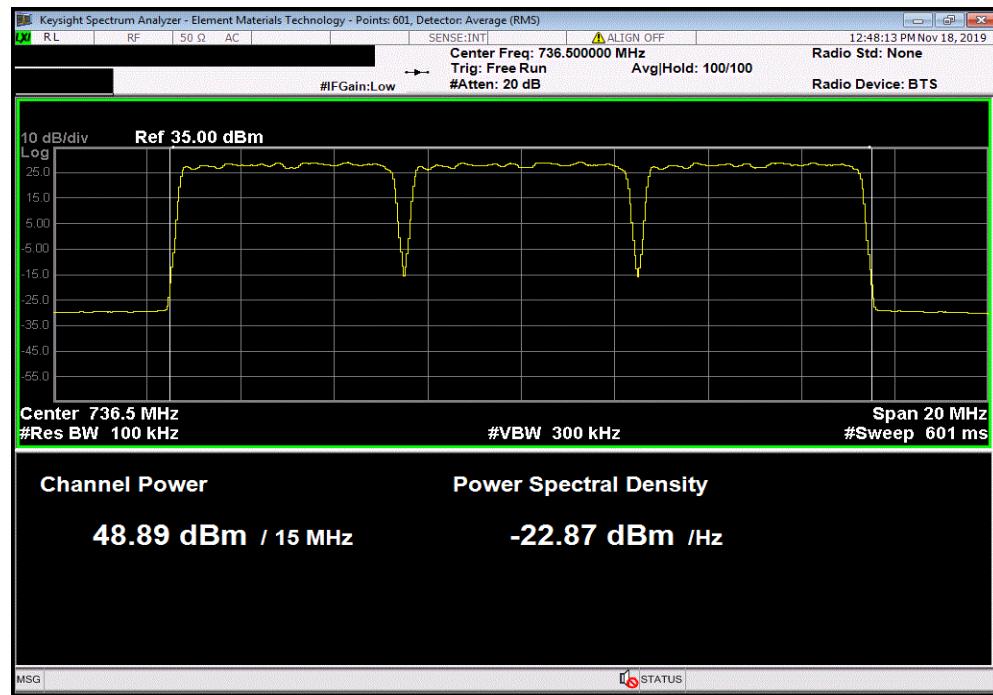


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 29, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 723.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
43.57	0	43.6	1000		Pass



Band 12, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 736.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
48.89	0	48.9	1000		Pass

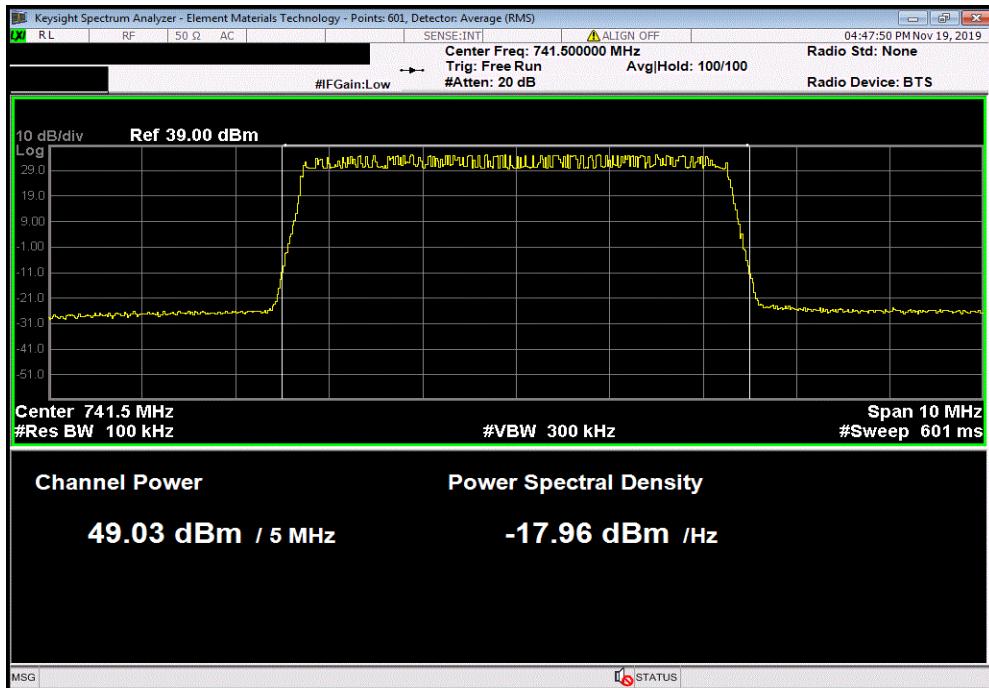


# AVERAGE POWER

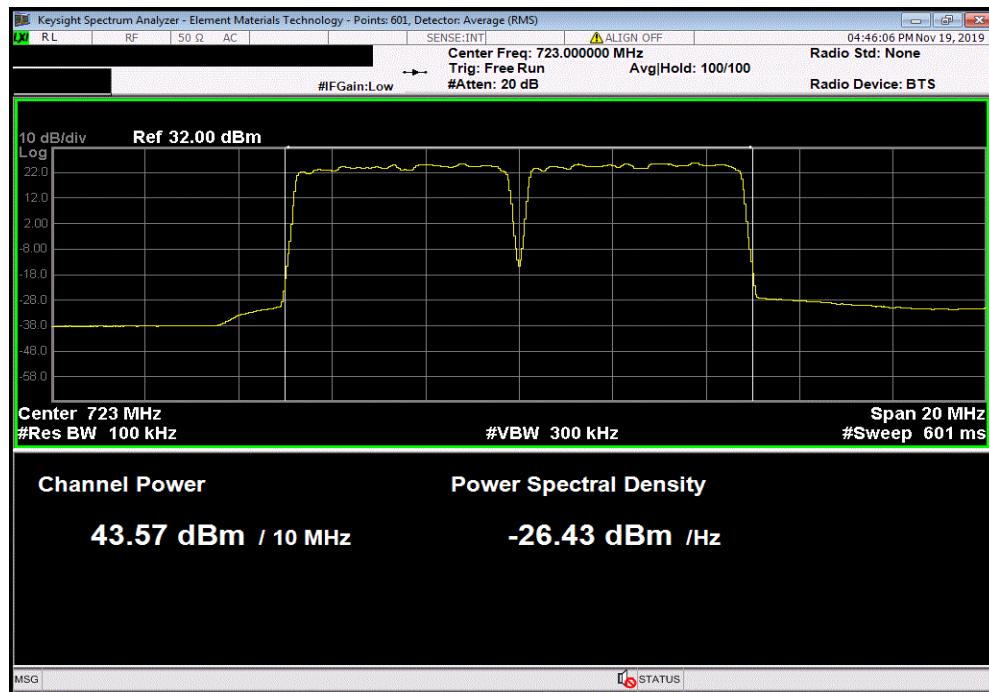


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 12, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 741.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
49.03	0	49	1000	Pass	



Band 29, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 723.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
43.57	0	43.6	1000	Pass	

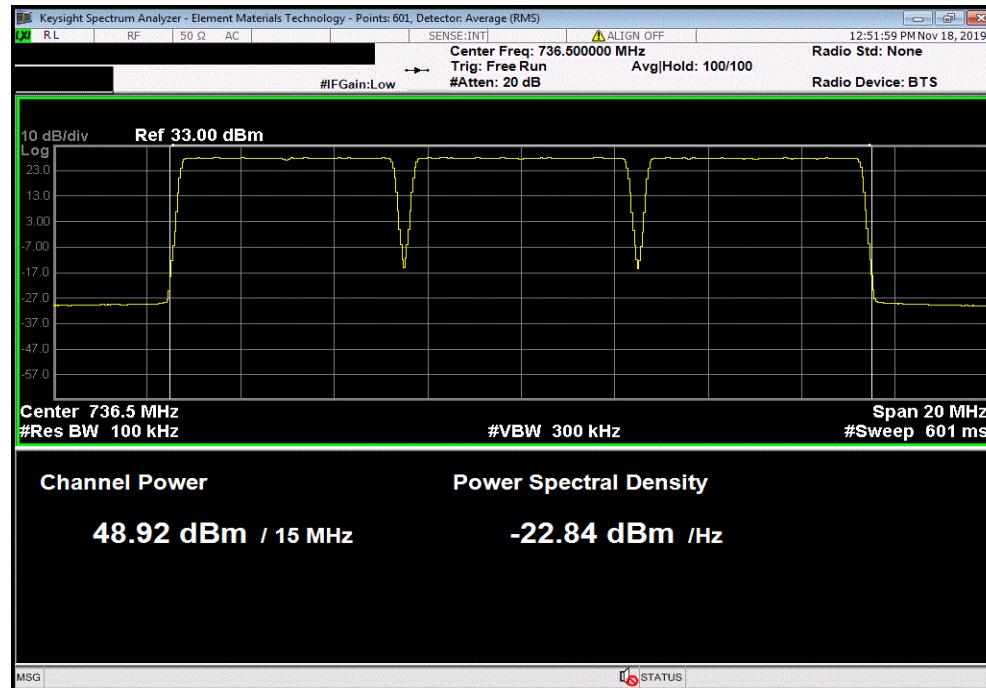


# AVERAGE POWER

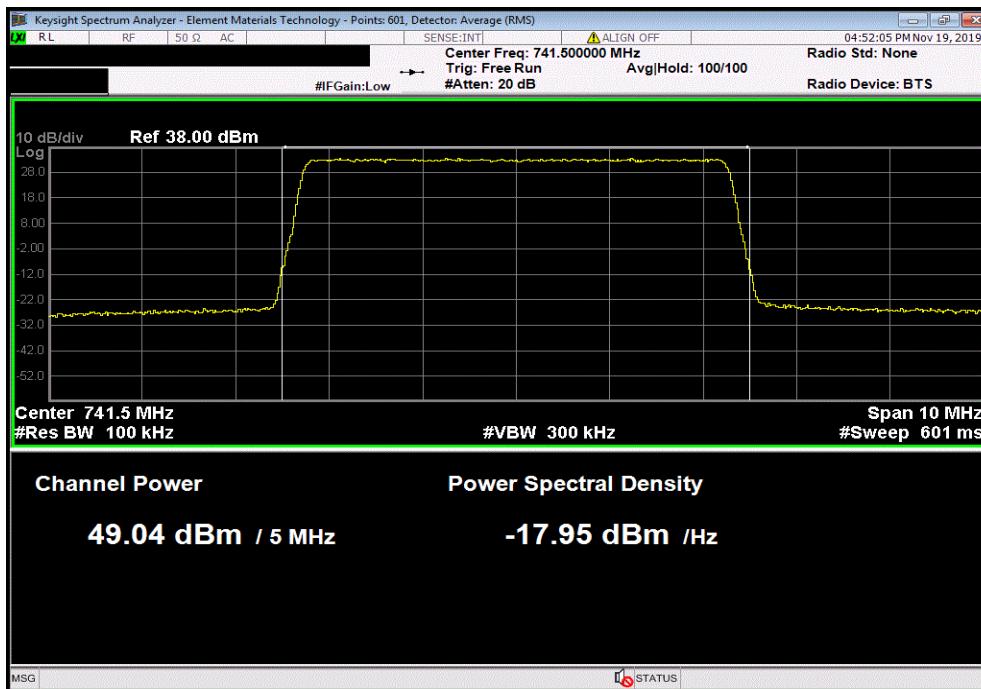


TbTx 2019.08.30.0 XM1 2019.09.05

Band 12, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 736.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
48.92	0	48.9	1000	Pass	



Band 12, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 741.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
49.04	0	49	1000	Pass	

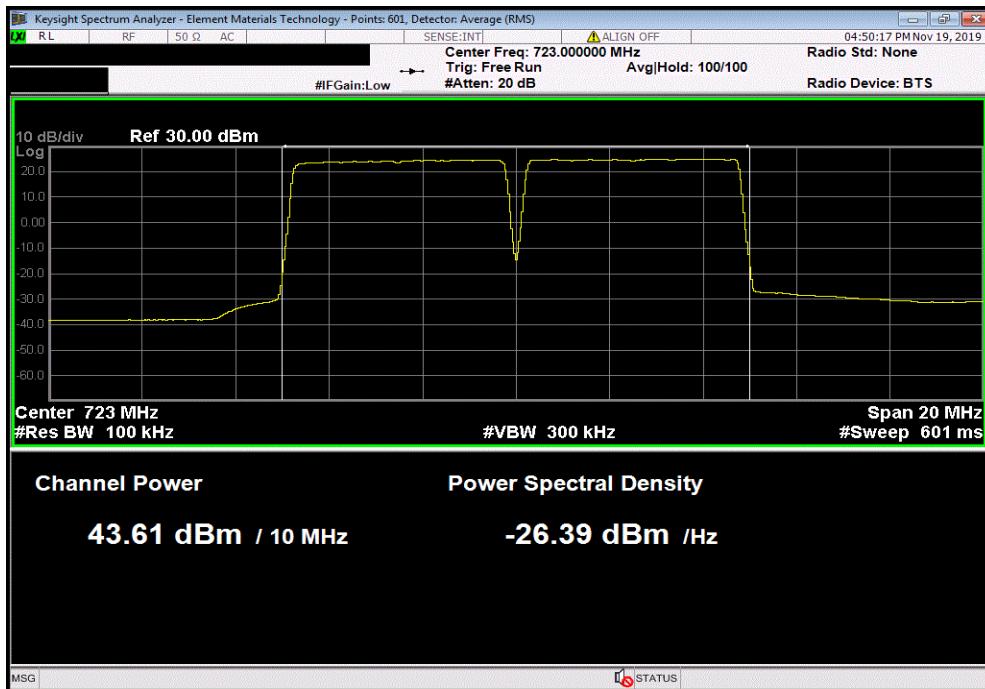


# AVERAGE POWER

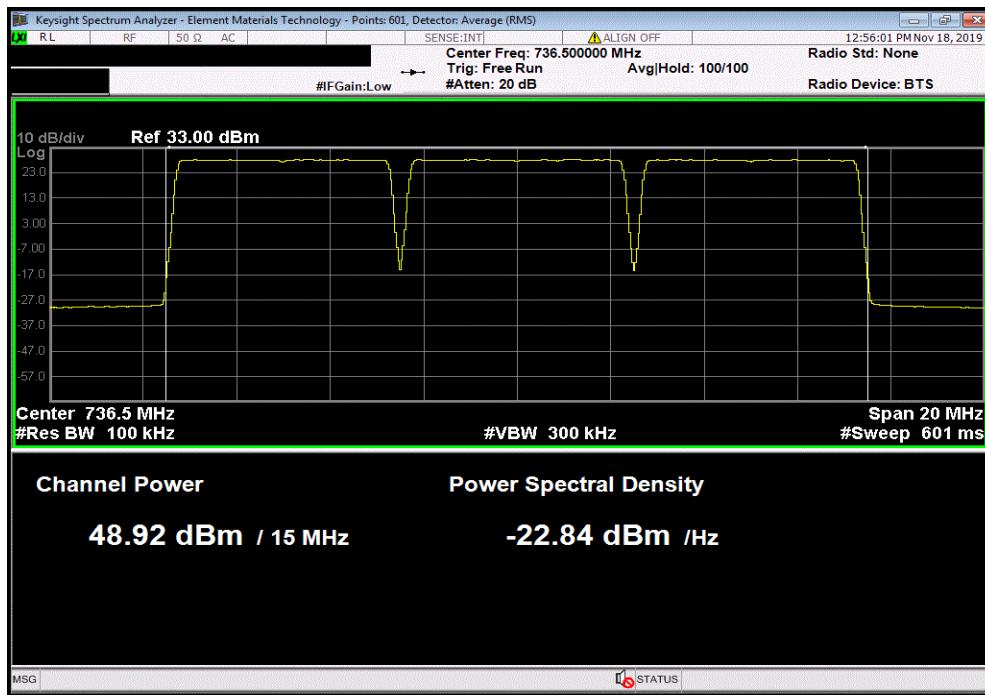


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 29, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 723.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
43.61	0	43.6	1000		Pass



Band 12, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 736.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
48.92	0	48.9	1000		Pass

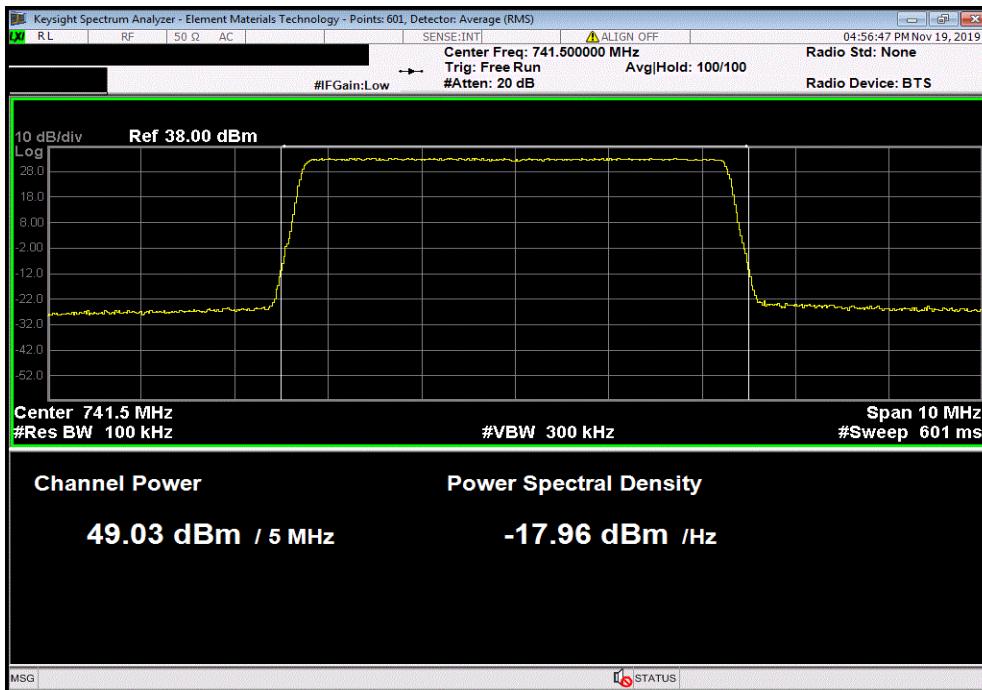


# AVERAGE POWER

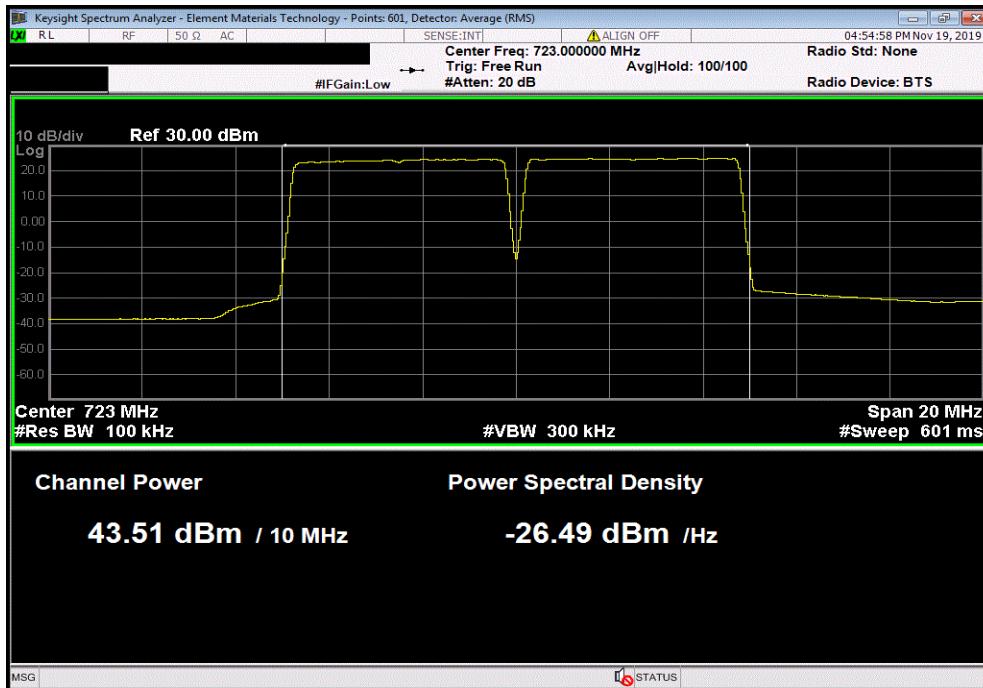


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 12, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 741.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
49.03	0	49	1000		Pass



Band 29, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 723.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
43.51	0	43.5	1000		Pass



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## 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 fundamental emission output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

The method in section 5.2.4.4 of ANSI C63.26 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding  $[10 \log (1 / D)]$ , where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

Per FCC sections 27.50(c)(3) and 90.542, the Effective Radiated Power (ERP) of the transceiver cannot exceed 1000 Watts/MHz.

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TbTx 2019.08.30.0

XMI 2019.05

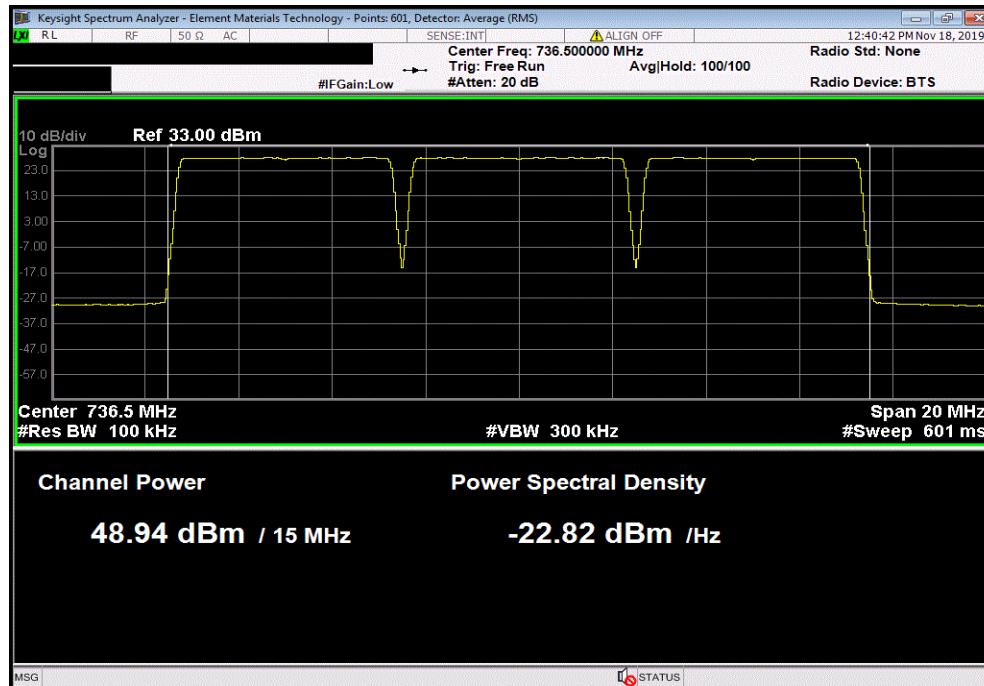
EUT:	AHLBBA RRH		Work Order:	NOKI0004					
Serial Number:	K9193514835		Date:	18-Nov-19					
Customer:	Nokia Solutions and Networks		Temperature:	22.7 °C					
Attendees:	John Rattanavong		Humidity:	29.9% RH					
Project:	None		Barometric Pres.:	1019 mbar					
Tested by:	Jonathan Kiefer	Power:	54VDC	Job Site:	TX09				
<b>TEST SPECIFICATIONS</b>			Test Method						
FCC 27:2019	ANSI C63.26:2015		FCC 90:2019	ANSI C63.26:2015					
<b>COMMENTS</b>									
Band 12 Multicarrier average power measurements. Tested on highest power antenna port (Port 2). EUT is operated at 100% duty cycle. ERP depends on antenna gain, which is unknown. Only the highest dBm value is plotted per customer requirements and a Watt/MHz calculation was not made due to the unknown antenna value. Average power measurements were made for the multicarrier test cases on four modulation types (QPSK, 16QAM, 64QAM, 256QAM):									
The first multicarrier test case is with three Band 12 LTE5 carriers (based upon KDB 971168 D03v01) using two carriers (with minimum spacing between carrier frequencies) at the Band 12 lower band edge [731.5MHz and 736.5MHz] and a third carrier with maximum spacing between the other two carrier frequencies [741.5MHz] at the Band 12 upper band edge.									
The second multicarrier test case is with three Band 12/Band 14 LTE5 carriers (based upon KDB 971168 D03v01) using two carriers (with minimum spacing between carrier frequencies) at the Band 12 lower band edge [731.5MHz and 736.5MHz] and a third carrier with maximum spacing between the other two carrier frequencies [765.5MHz] at the Band 14 upper band edge.									
<b>DEVIATIONS FROM TEST STANDARD</b>									
None									
Configuration #	2	Signature							
			Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP/MHz)	Results		
Band 12									
QPSK Modulation									
LTE5 Bandwidth									
Multicarrier Test Case 1									
Mid Channel, 736.5 MHz						48.9	1000		
Multicarrier Test Case 2						0	Pass		
Mid Channel, 734.0 MHz						47.08	1000		
Mid Channel, 765.5 MHz						43.58	1000		
16QAM Modulation									
LTE5 Bandwidth									
Multicarrier Test Case 1									
Mid Channel, 736.5 MHz						48.93	1000		
Multicarrier Test Case 2						0	Pass		
Mid Channel, 734.0 MHz						47.22	1000		
Mid Channel, 765.5 MHz						43.6	1000		
64QAM Modulation									
LTE5 Bandwidth									
Multicarrier Test Case 1									
Mid Channel, 736.5 MHz						48.93	1000		
Multicarrier Test Case 2						0	Pass		
Mid Channel, 734.0 MHz						47.09	1000		
Mid Channel, 765.5 MHz						43.6	1000		
256QAM Modulation									
LTE5 Bandwidth									
Multicarrier Test Case 1									
Mid Channel, 736.5 MHz						48.91	1000		
Multicarrier Test Case 2						0	Pass		
Mid Channel, 734.0 MHz						47.2	1000		
Mid Channel, 765.5 MHz						43.58	1000		

# AVERAGE POWER

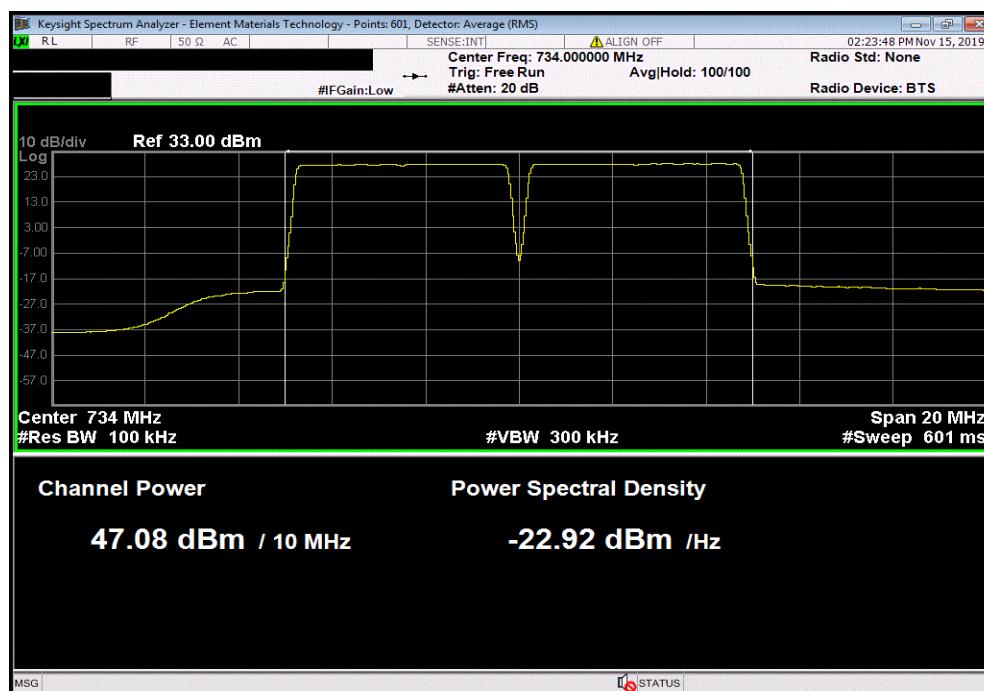


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 12, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 736.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
48.94	0	48.9	1000		Pass



Band 12, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 734.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
47.08	0	47.1	1000		Pass

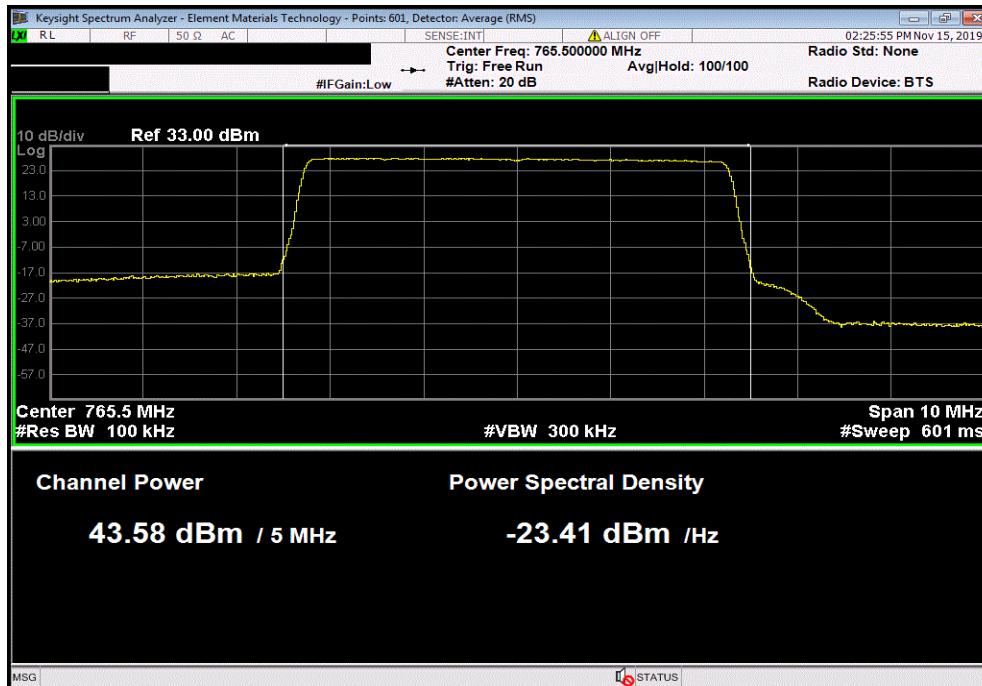


# AVERAGE POWER

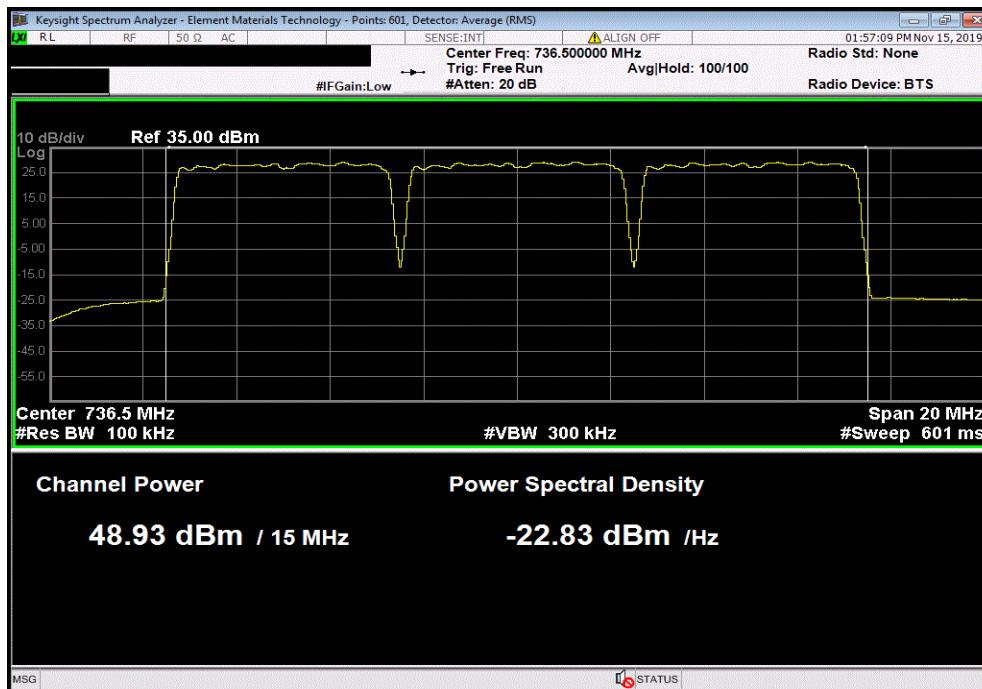


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 14, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
43.58	0	43.6	1000		Pass



Band 12, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 736.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
48.93	0	48.9	1000		Pass

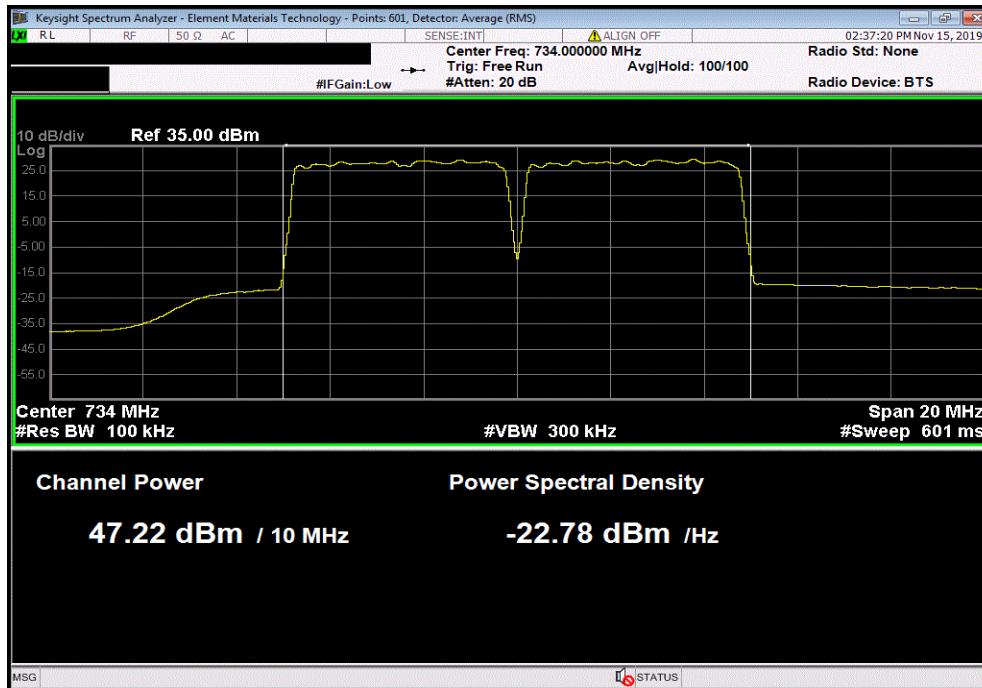


# AVERAGE POWER

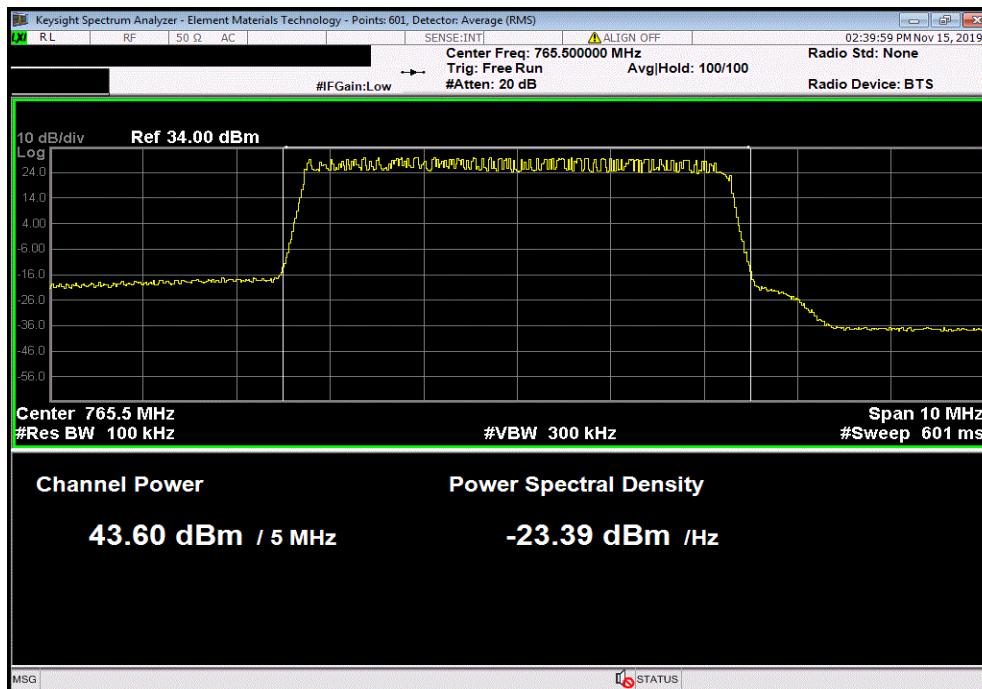


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 12, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 734.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
47.22	0	47.2	1000	Pass	



Band 14, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
43.6	0	43.6	1000	Pass	

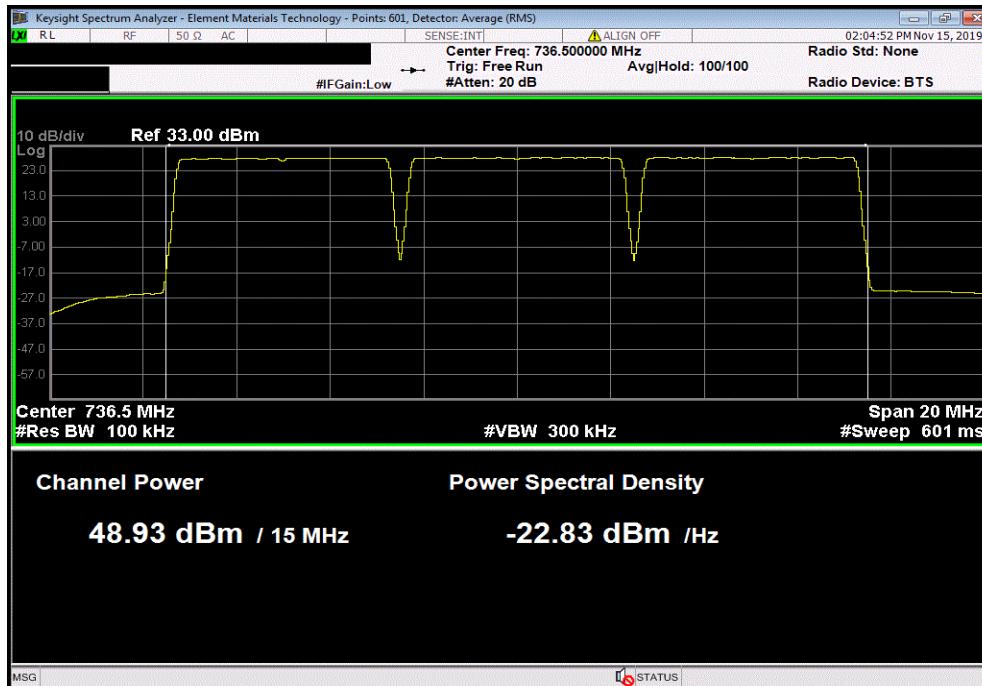


# AVERAGE POWER

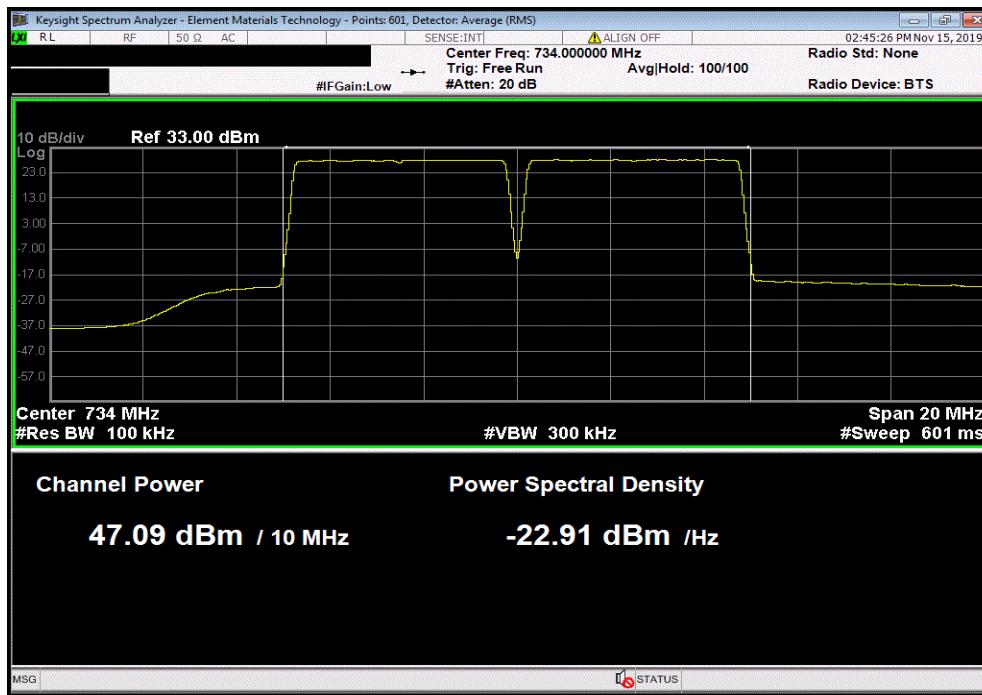


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 12, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 736.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
48.93	0	48.9	1000	Pass	



Band 12, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 734.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
47.09	0	47.1	1000	Pass	

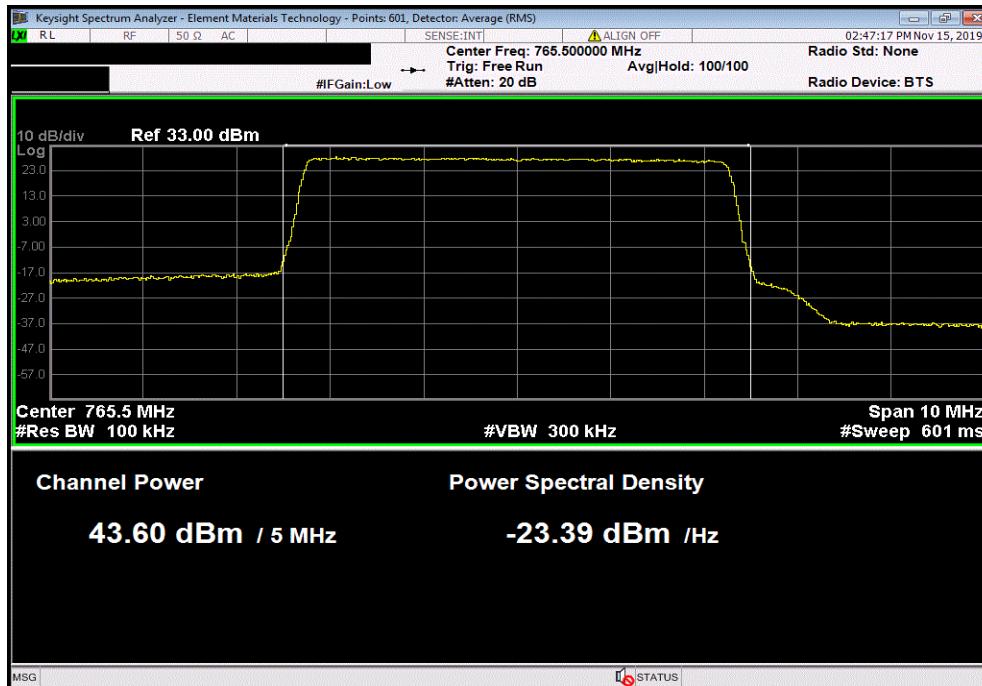


# AVERAGE POWER

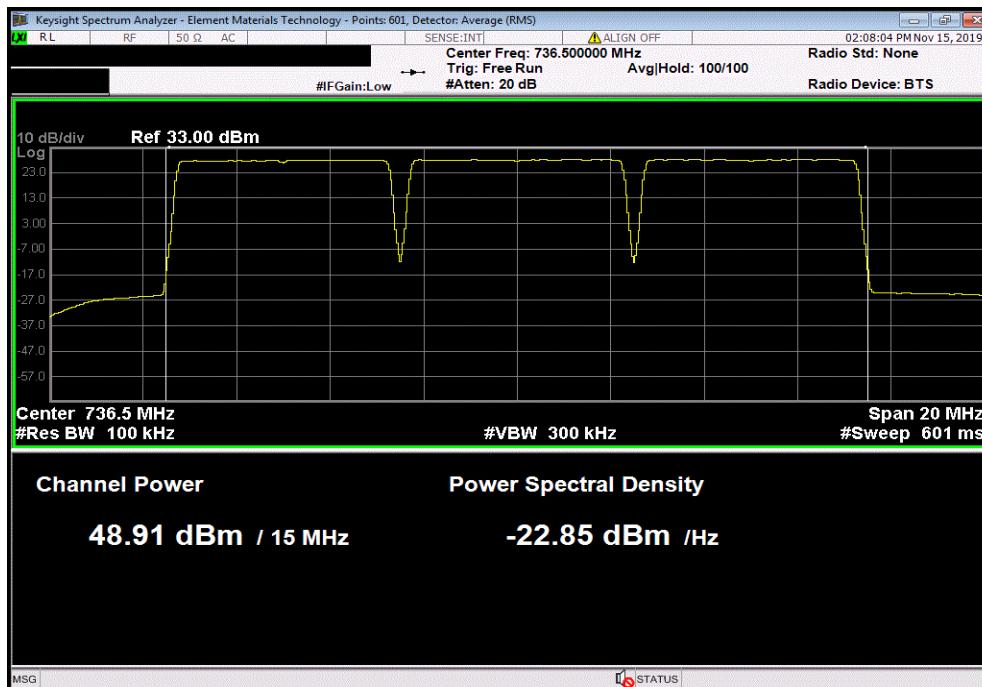


TbTx 2019.08.30.0 XMI 2019.09.05

Band 14, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
43.6	0	43.6	1000		Pass



Band 12, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 736.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
48.91	0	48.9	1000		Pass

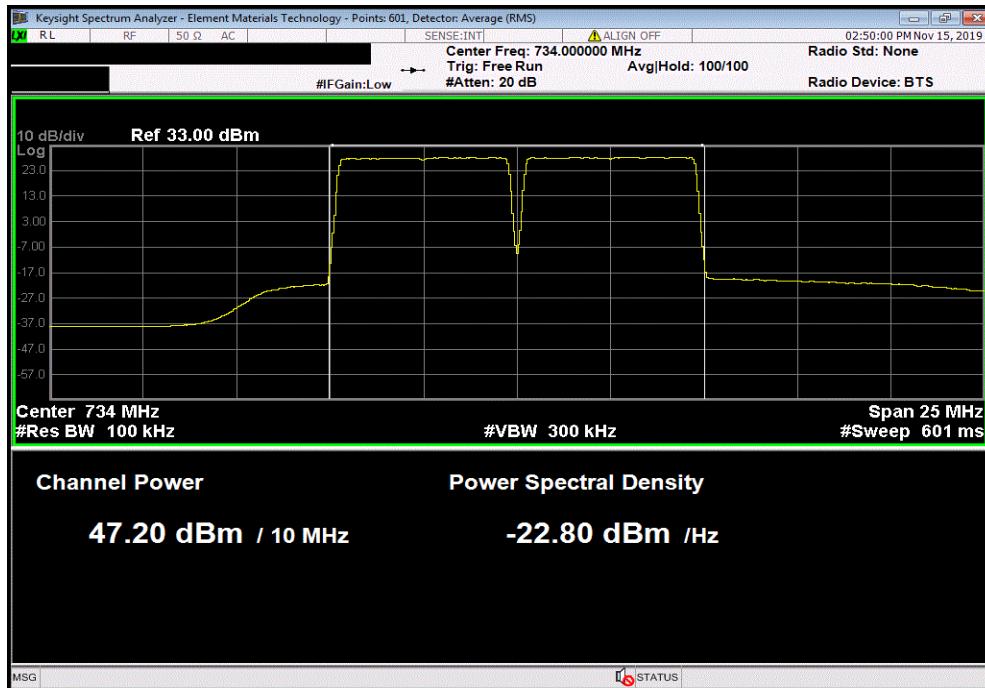


# AVERAGE POWER

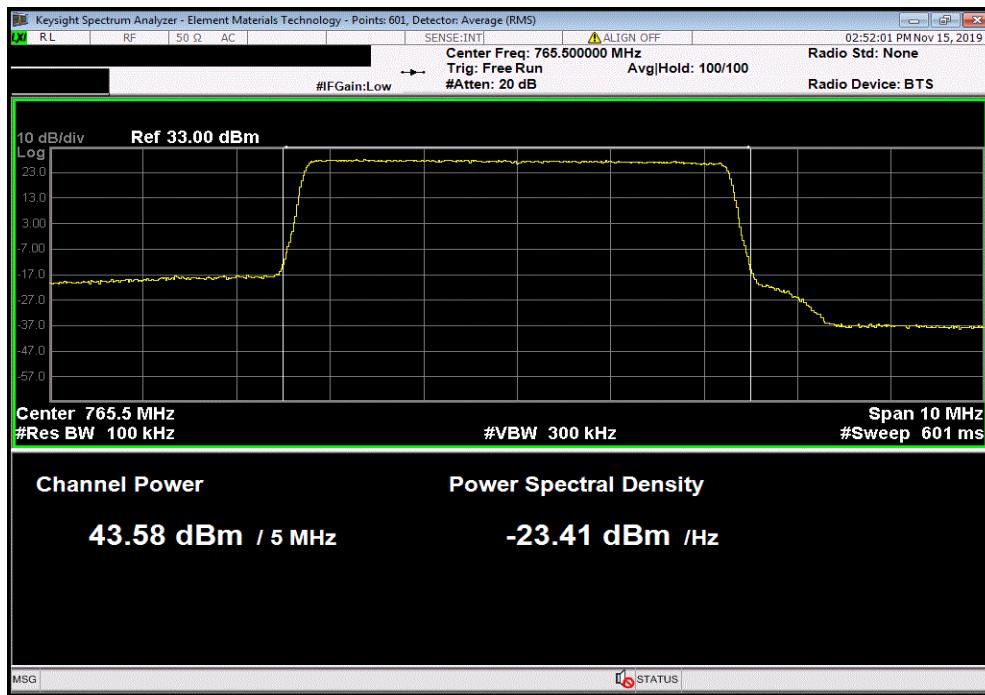


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 12, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Chanel, 734.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
47.2	0	47.2	1000		Pass



Band 14, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
43.58	0	43.6	1000		Pass



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# AVERAGE POWER



TxRx 2019.08.30.0

XMI 2019.08.05

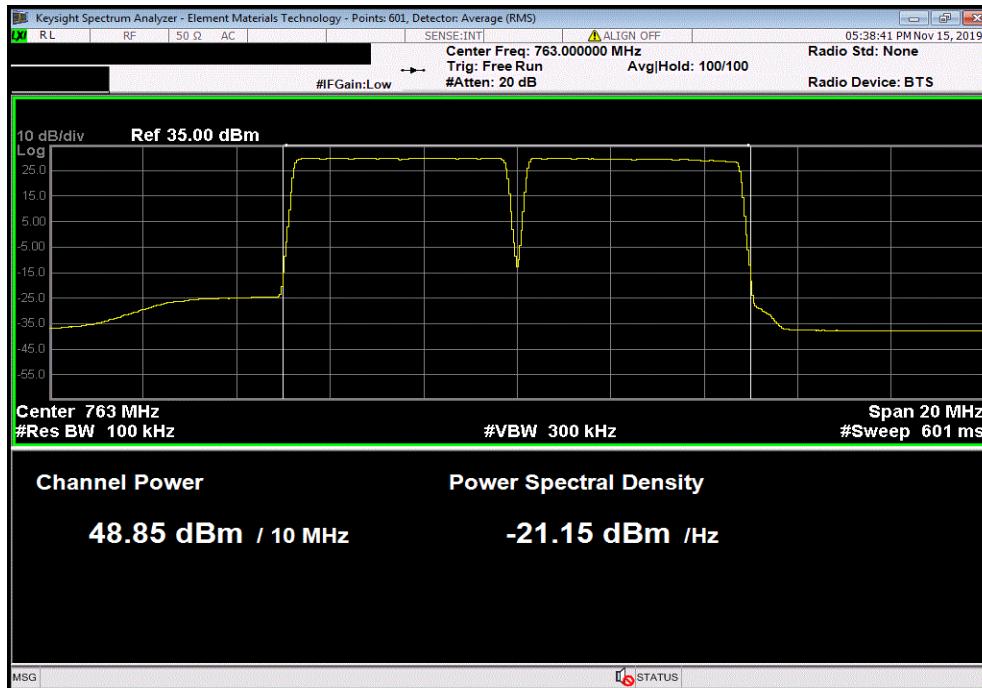
EUT:	AHLBBA RRH	Work Order:	NOKI0004				
Serial Number:	K9193514835	Date:	19-Nov-19				
Customer:	Nokia Solutions and Networks	Temperature:	24 °C				
Attendees:	John Rattanavong	Humidity:	31.9% RH				
Project:	None	Barometric Pres.:	1015 mbar				
Tested by:	Jonathan Kiefer	Power:	54VDC				
TEST SPECIFICATIONS		Test Method	Job Site: TX09				
FCC 27:2019		ANSI C63.26:2015					
FCC 90:2019		ANSI C63.26:2015					
COMMENTS	Band 14 Multicarrier average power measurements. Tested on highest power antenna port (Port 1). EUT is operated at 100% duty cycle. ERP depends on antenna gain, which is unknown. Only the highest dBm value is plotted per customer requirements and a Watt/MHz calculation was not made due to the unknown antenna value. Average power measurements were made for the multicarrier test cases on four modulation types (QPSK, 16QAM, 64QAM, 256QAM): The first multicarrier test case is with two Band 14 LTE5 carriers at the lower and upper band edge channels [760.5MHz and 765.5MHz]. Two carriers cover the entire Band 14 channel bandwidth so three carrier operation is not available. The second multicarrier test case is with three Band 12/Band 14 LTE5 carriers (based upon KDB 971168 D03v01) using two carriers (with minimum spacing between carrier frequencies) at the Band 12 lower band edge [731.5MHz and 736.5MHz] and a third carrier with maximum spacing between the other two carrier frequencies [765.5MHz] at the Band 14 upper band edge. The third multicarrier test case is with three Band 29/Band 14 LTE5 carriers (based upon KDB 971168 D03v01) using two carriers (with minimum spacing between carrier frequencies) at the Band 29 lower band edge [720.5MHz and 725.5MHz] and a third carrier with maximum spacing between the other two carrier frequencies [765.5MHz] at the Band 14 upper band edge.						
DEVIATIONS FROM TEST STANDARD	None						
Configuration #	2	Signature	<i>Jonathan Kiefer</i>				
Band 14		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP/MHz)	Results	
QPSK Modulation	LTE5 Bandwidth						
	Multicarrier Test Case 1	Mid Channel, 763.0 MHz	48.848	0	48.8	1000	Pass
	Multicarrier Test Case 2	Mid Channel, 734.0 MHz	47.305	0	47.3	1000	Pass
		Mid Channel, 765.5 MHz	43.57	0	43.6	1000	Pass
	Multicarrier Test Case 3	Mid Channel, 765.5 MHz	48.45	0	48.45	1000	Pass
		Mid Channel, 723.0 MHz	43.81	0	43.81	1000	Pass
16QAM Modulation	LTE5 Bandwidth						
	Multicarrier Test Case 1	Mid Channel, 763.0 MHz	48.84	0	48.8	1000	Pass
	Multicarrier Test Case 2	Mid Channel, 734.0 MHz	47.29	0	47.3	1000	Pass
		Mid Channel, 765.5 MHz	43.57	0	43.6	1000	Pass
	Multicarrier Test Case 3	Mid Channel, 765.5 MHz	48.44	0	48.44	1000	Pass
		Mid Channel, 723.0 MHz	43.7	0	43.7	1000	Pass
64QAM Modulation	LTE5 Bandwidth						
	Multicarrier Test Case 1	Mid Channel, 763.0 MHz	48.85	0	48.8	1000	Pass
	Multicarrier Test Case 2	Mid Channel, 734.0 MHz	47.31	0	47.3	1000	Pass
		Mid Channel, 765.5 MHz	43.58	0	43.6	1000	Pass
	Multicarrier Test Case 3	Mid Channel, 765.5 MHz	48.44	0	48.44	1000	Pass
		Mid Channel, 723.0 MHz	43.69	0	43.69	1000	Pass
256QAM Modulation	LTE5 Bandwidth						
	Multicarrier Test Case 1	Mid Channel, 763.0 MHz	48.82	0	48.8	1000	Pass
	Multicarrier Test Case 2	Mid Channel, 734.0 MHz	47.33	0	47.3	1000	Pass
		Mid Channel, 765.5 MHz	43.59	0	43.6	1000	Pass
	Multicarrier Test Case 3	Mid Channel, 765.5 MHz	48.43	0	48.43	1000	Pass
		Mid Channel, 723.0 MHz	43.76	0	43.76	1000	Pass

# AVERAGE POWER

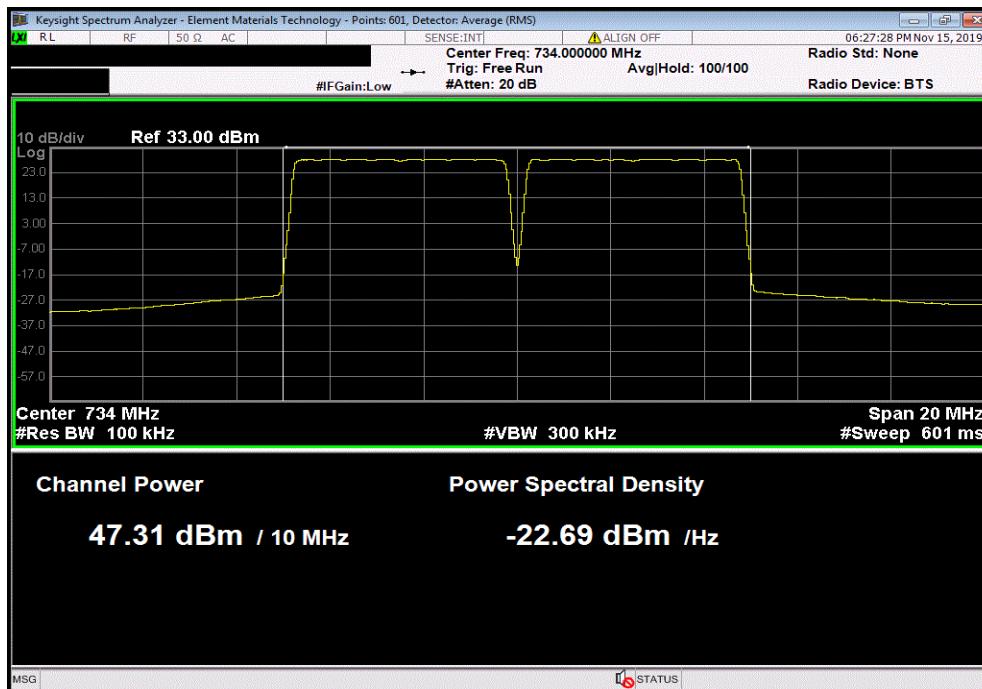


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 14, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 763.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
48.85	0	48.8	1000		Pass



Band 12, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 734.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
47.31	0	47.3	1000		Pass

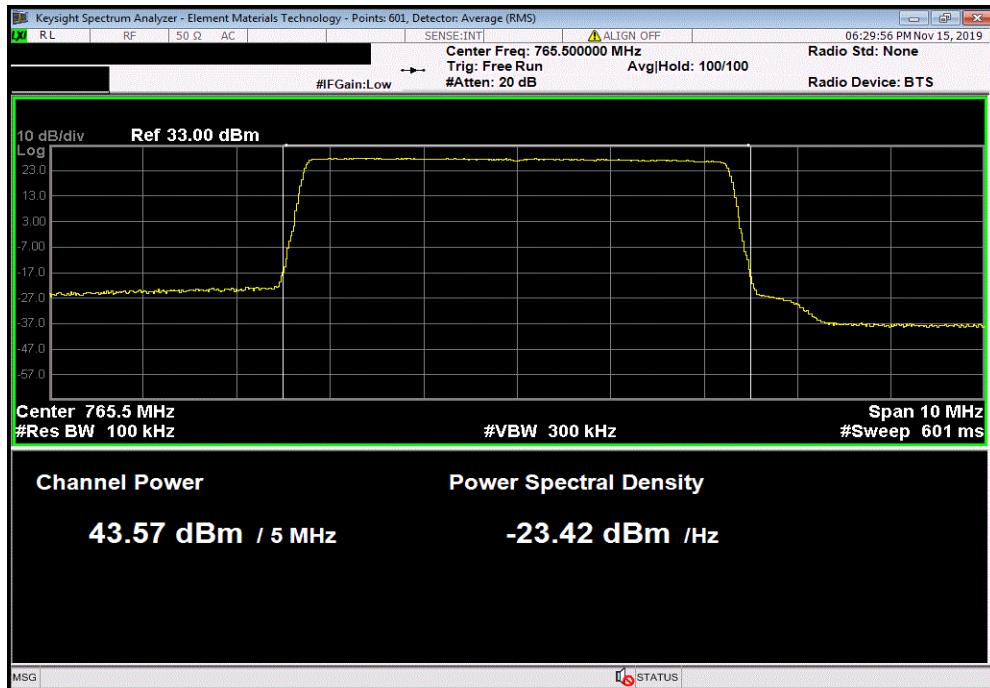


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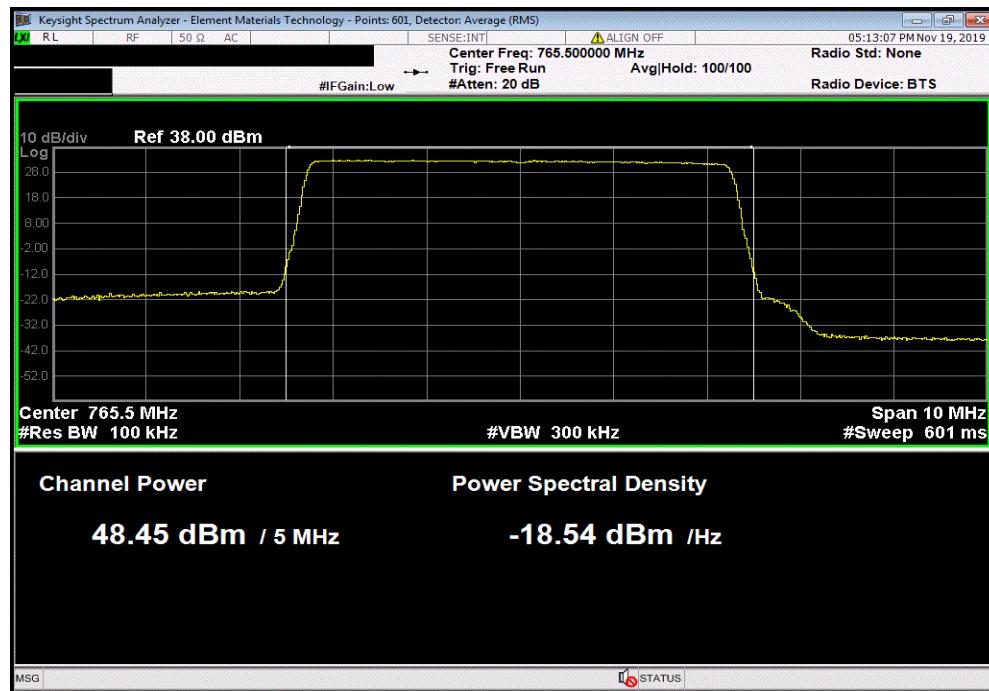


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 14, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
43.57	0	43.6	1000		Pass



Band 14, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
48.45	0	48.45	1000		Pass

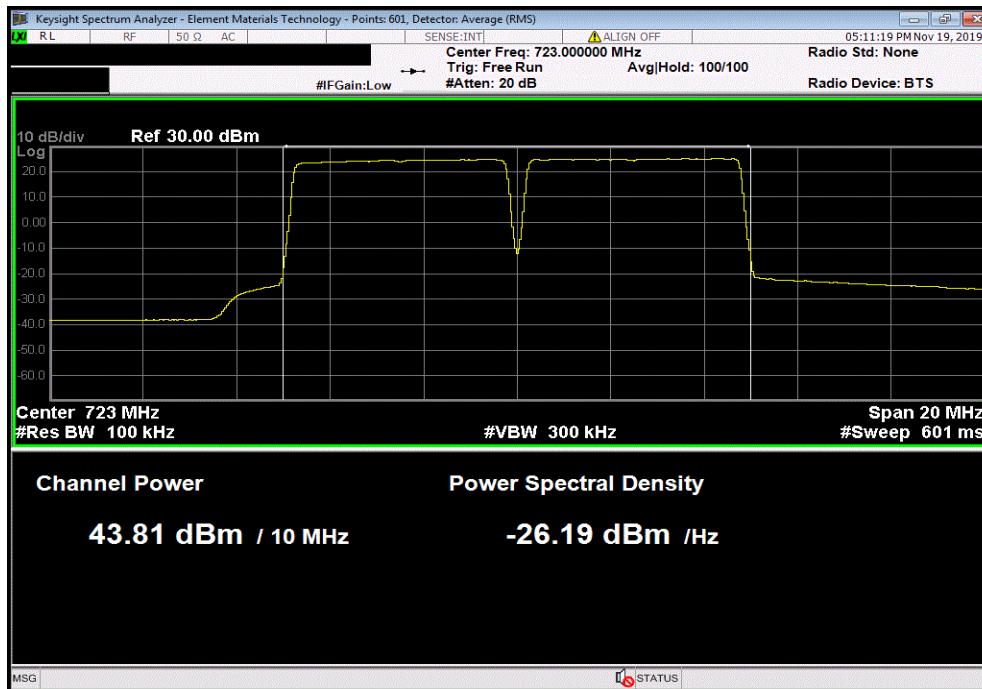


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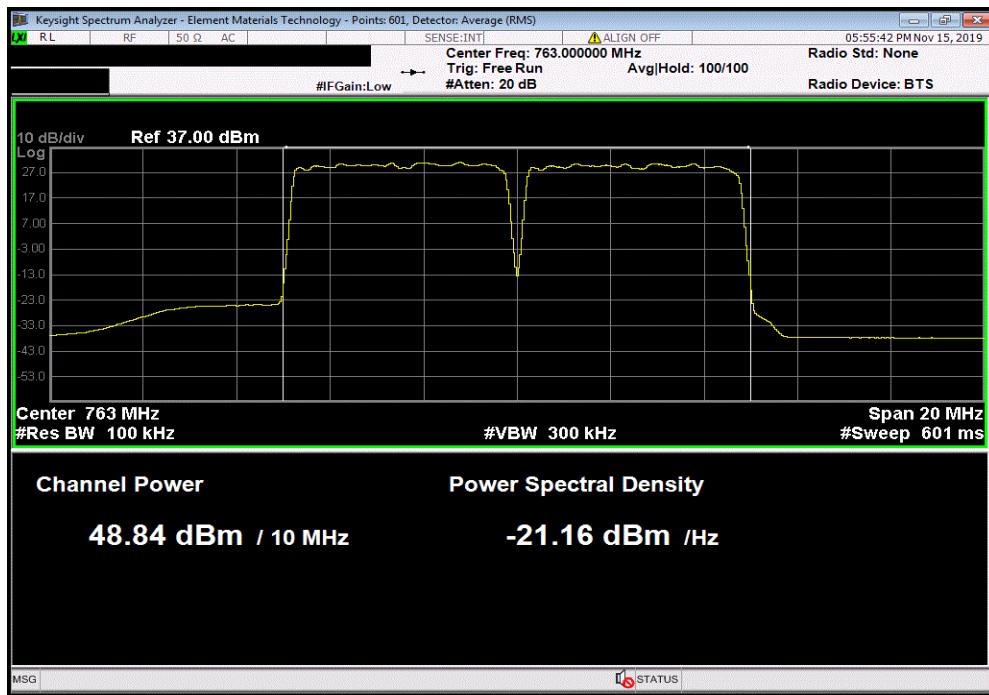


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 29, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 723.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
43.81	0	43.81	1000		Pass



Band 14, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 763.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
48.84	0	48.8	1000		Pass

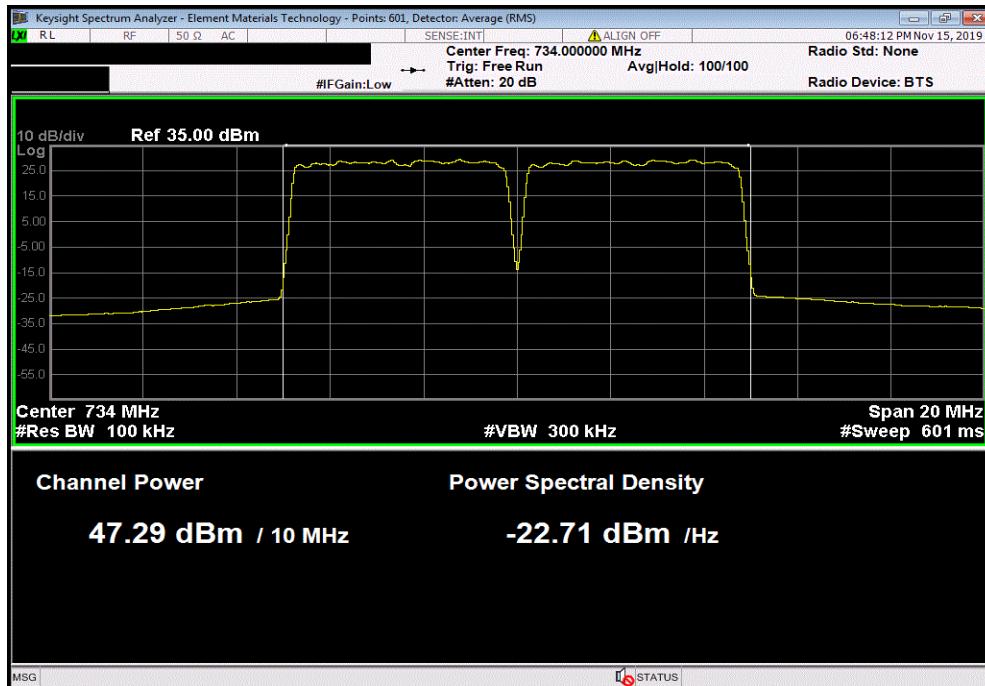


# AVERAGE POWER

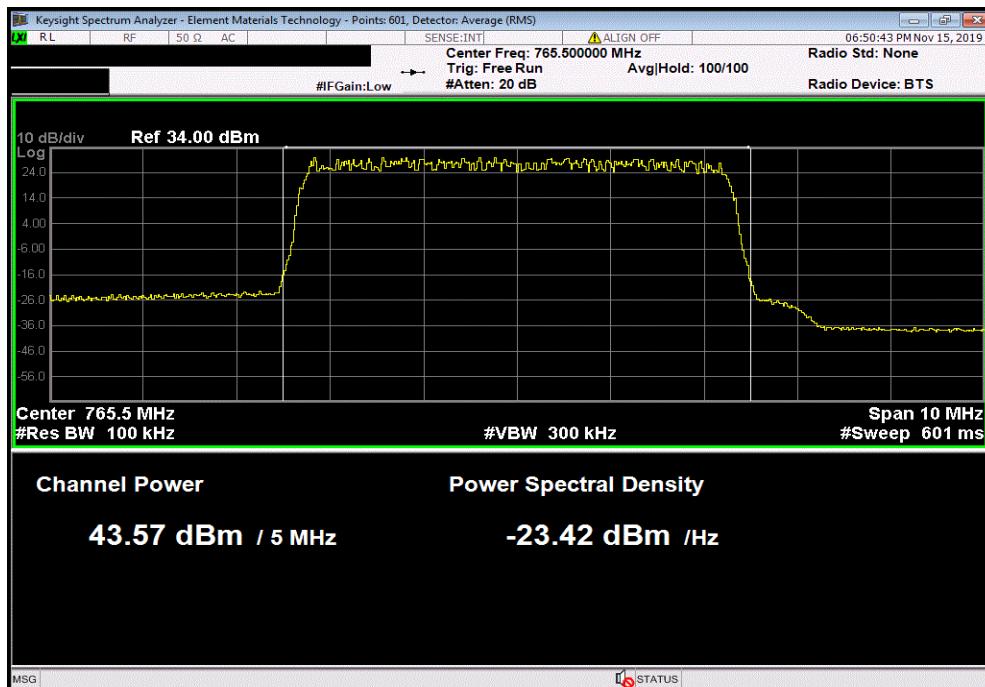


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 12, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 734.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
47.29	0	47.3	1000		Pass



Band 14, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
43.57	0	43.6	1000		Pass

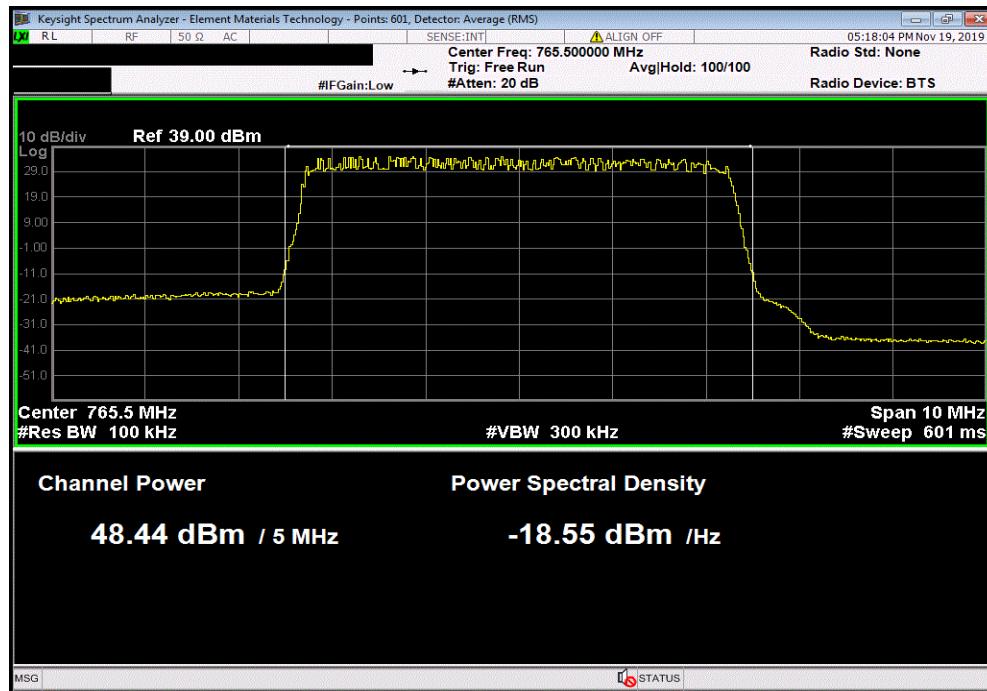


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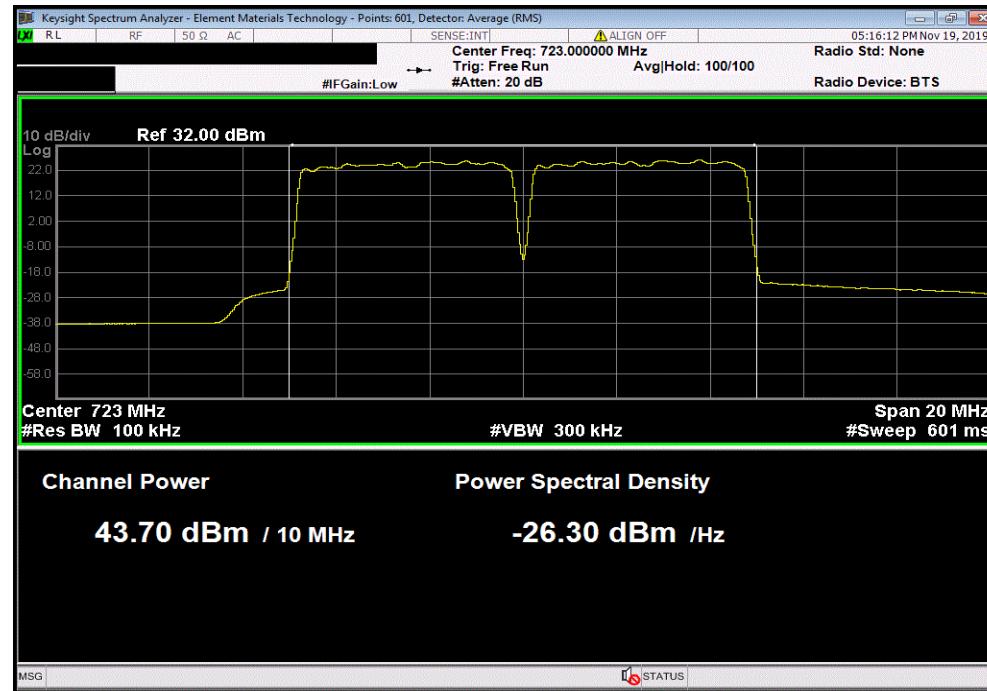


TbTx 2019.08.30.0 XMI 2019.09.05

Band 14, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
48.44	0	48.44	1000		Pass



Band 29, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 723.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
43.7	0	43.7	1000		Pass

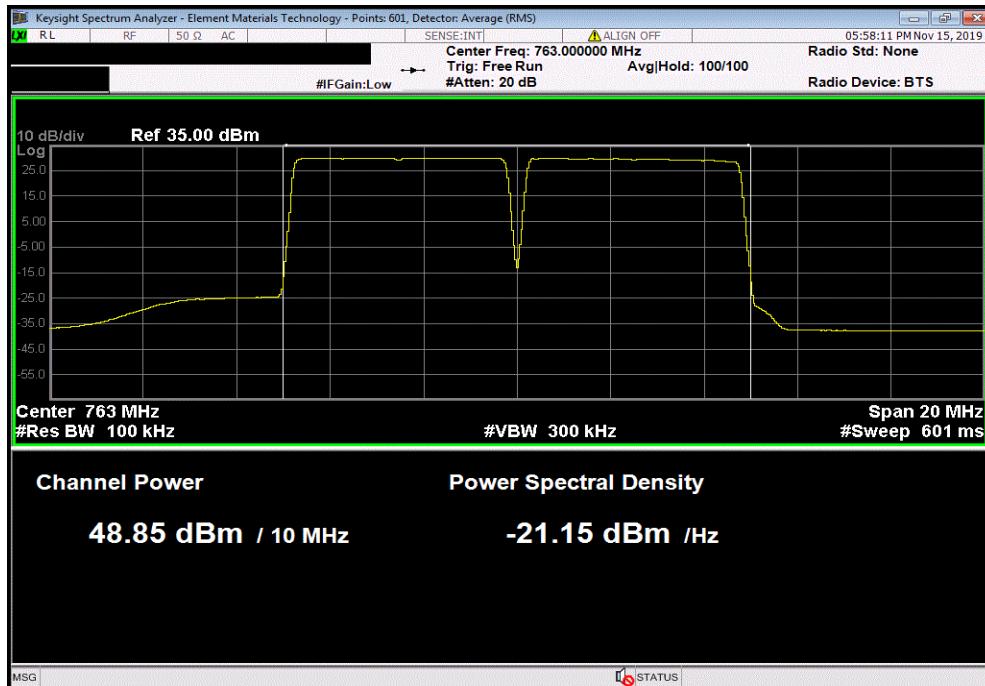


# AVERAGE POWER

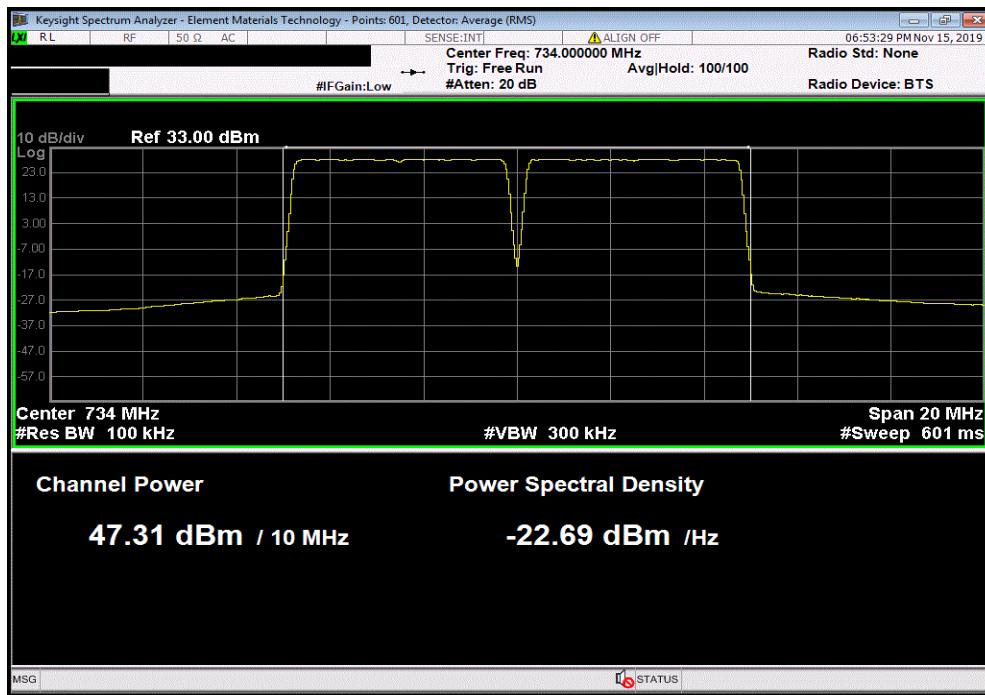


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 14, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 763.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
48.85	0	48.8	1000	Pass	



Band 12, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 734.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
47.31	0	47.3	1000	Pass	

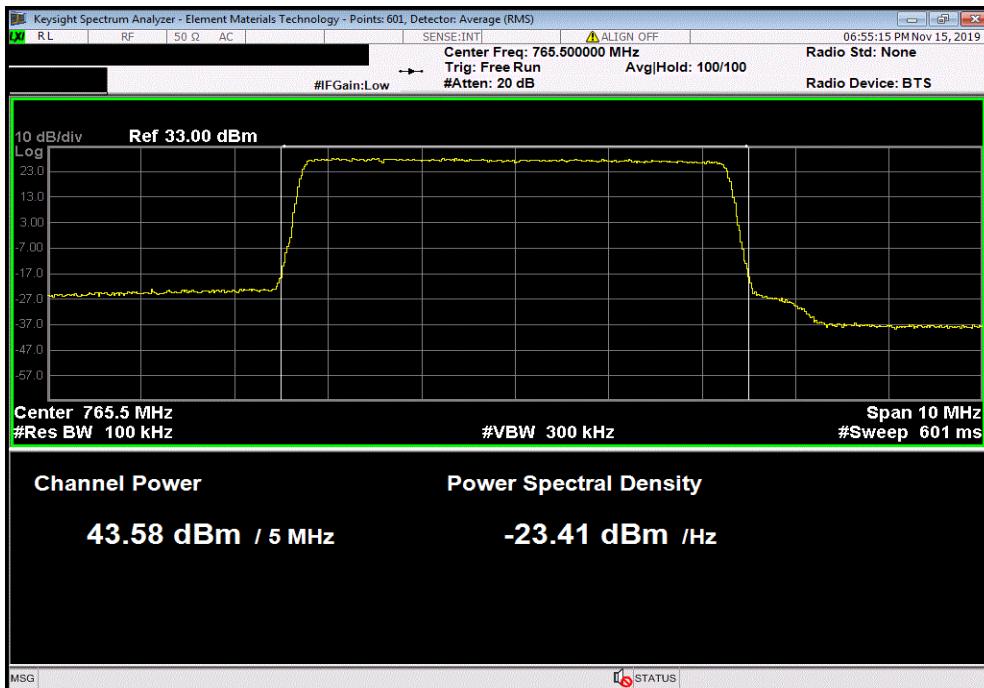


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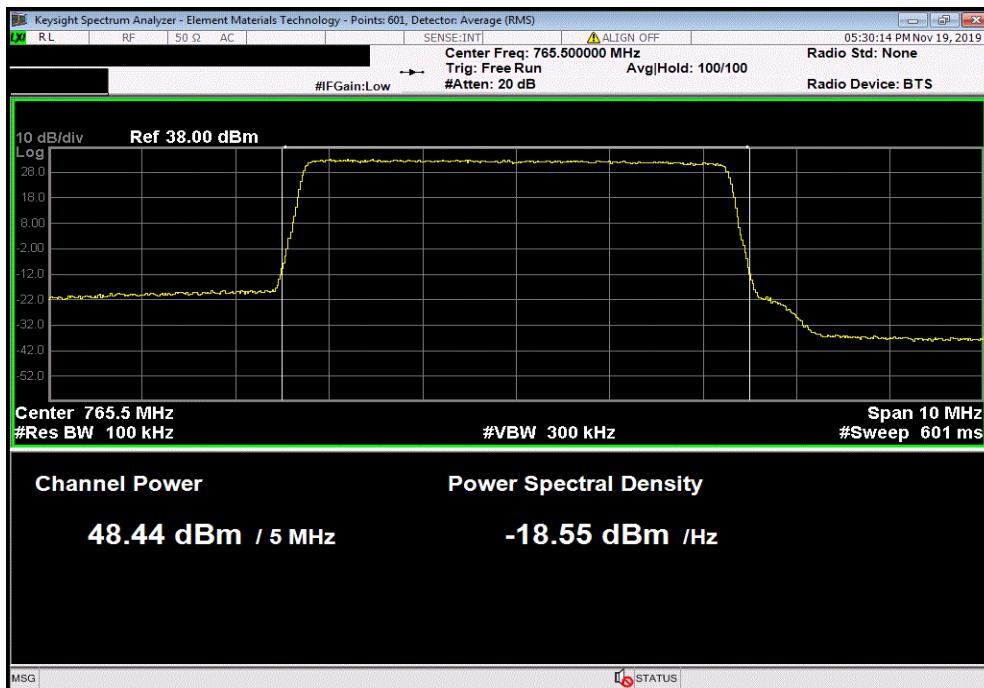


TbtTx 2019.08.30.0 XMU 2019.09.05

Band 14, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
43.58	0	43.6	1000		Pass



Band 14, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
48.44	0	48.44	1000		Pass

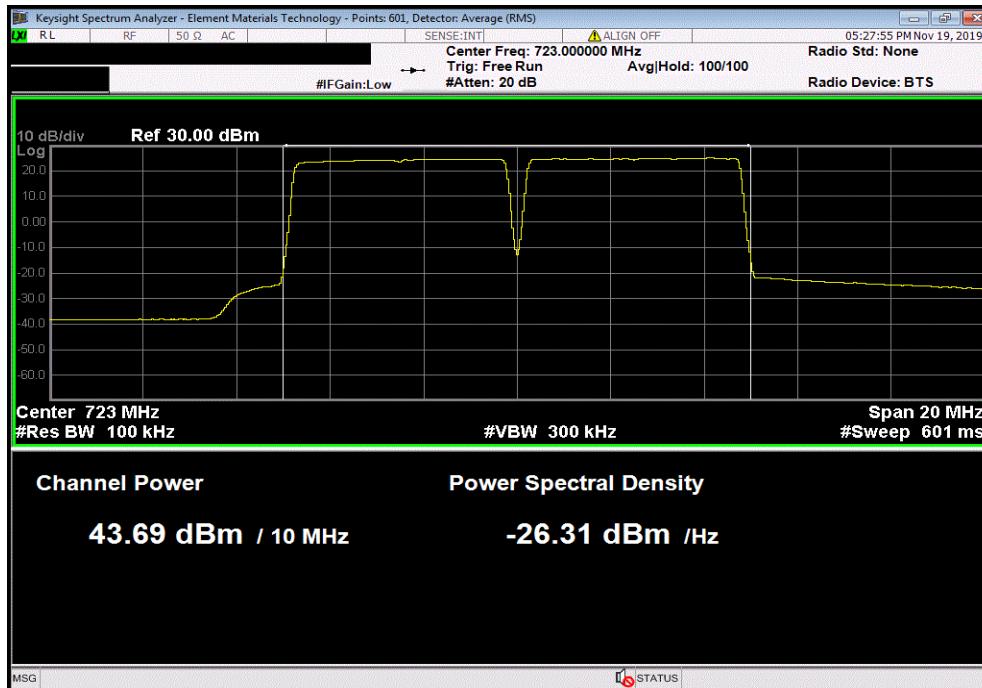


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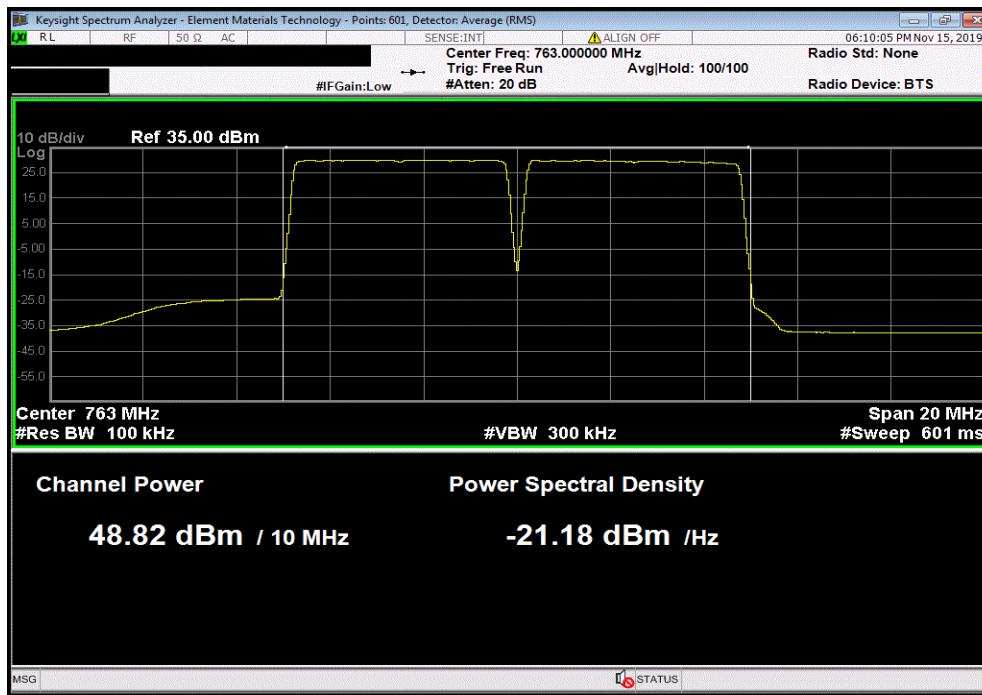


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 29, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 723.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
43.69	0	43.69	1000		Pass



Band 14, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 763.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
48.82	0	48.8	1000		Pass

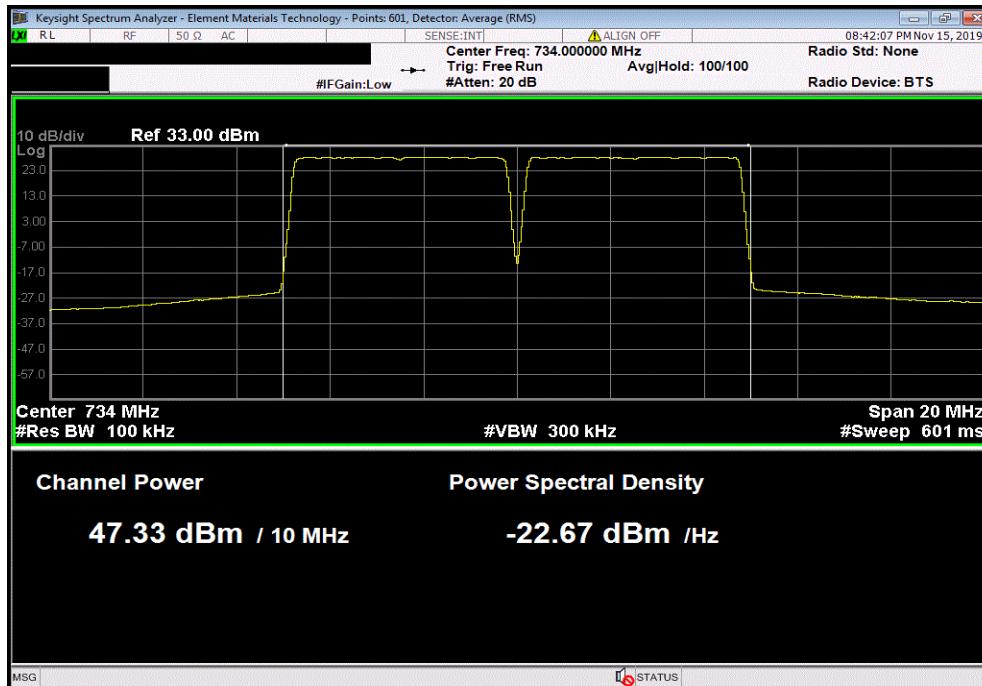


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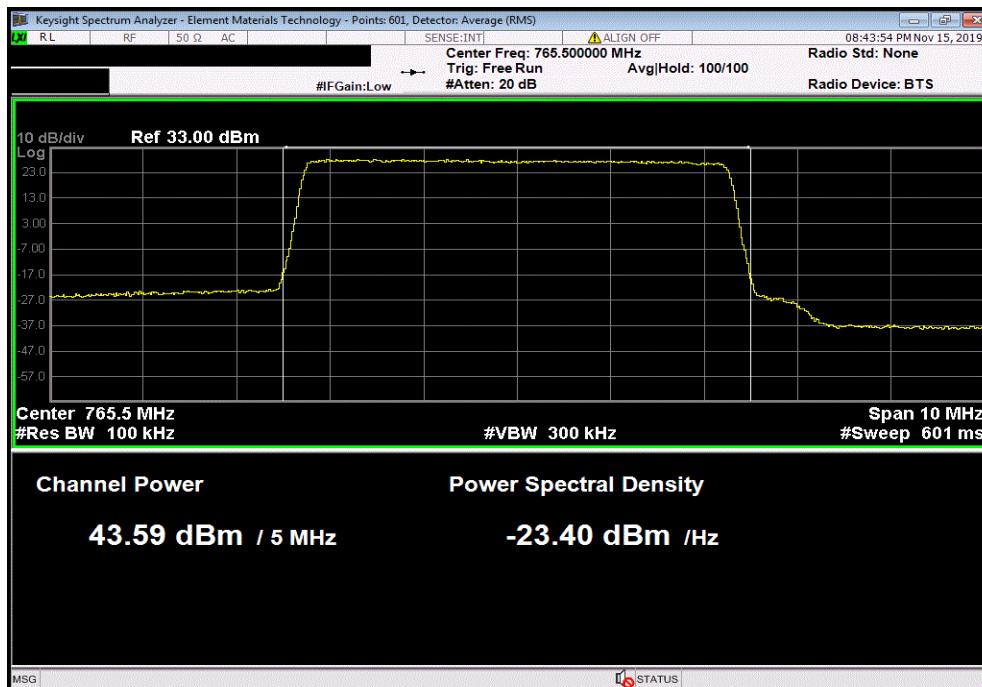


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 12, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 734.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
47.33	0	47.3	1000	Pass	



Band 14, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
43.59	0	43.6	1000	Pass	

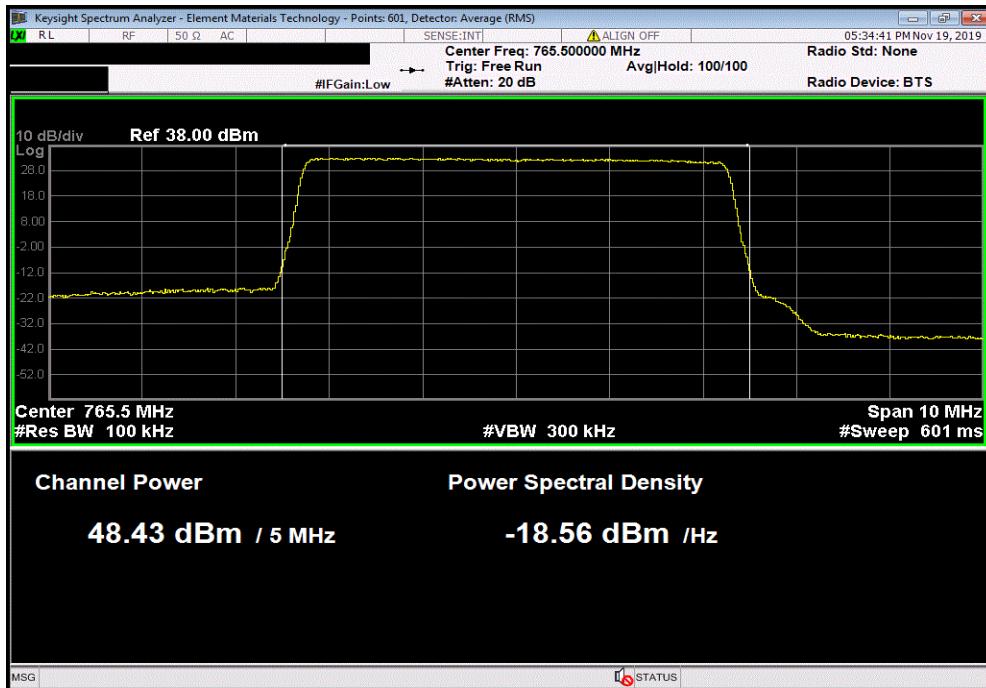


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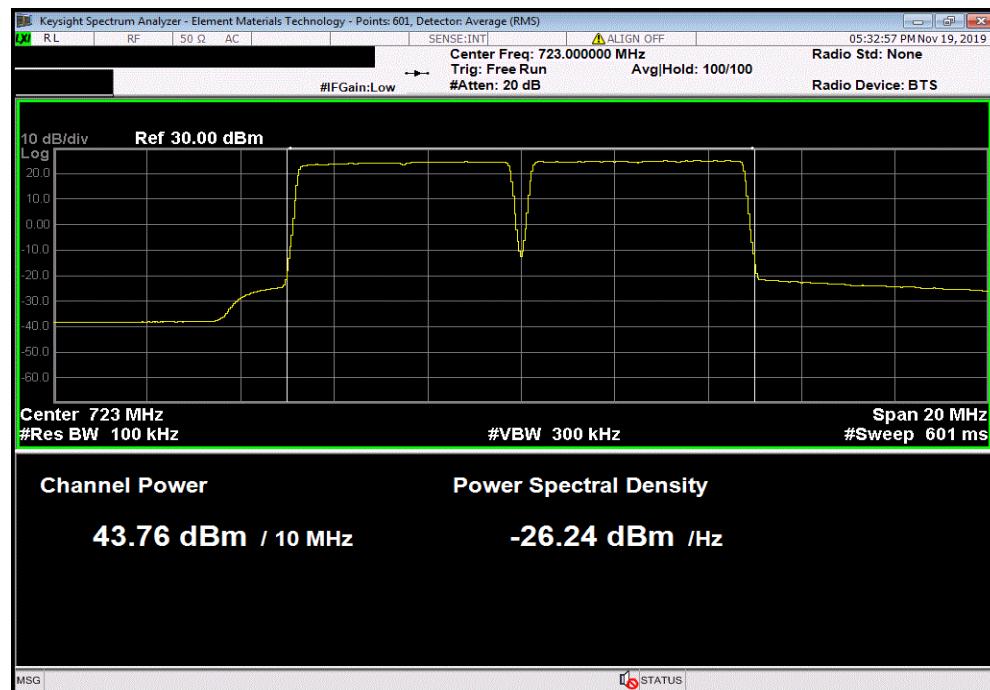


TbTx 2019.08.30.0 XMI 2019.09.05

Band 14, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
48.43	0	48.43	1000		Pass



Band 29, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 3, Mid Channel, 723.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
43.76	0	43.76	1000		Pass



# AVERAGE POWER



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 fundamental emission output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

The method in section 5.2.4.4 of ANSI C63.26 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding  $[10 \log (1 / D)]$ , where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

Per FCC sections 27.50(c)(3) and 90.542, the Effective Radiated Power (ERP) of the transceiver cannot exceed 1000 Watts/MHz.

# AVERAGE POWER



TbTx 2019.08.30.0

XMI 2019.05

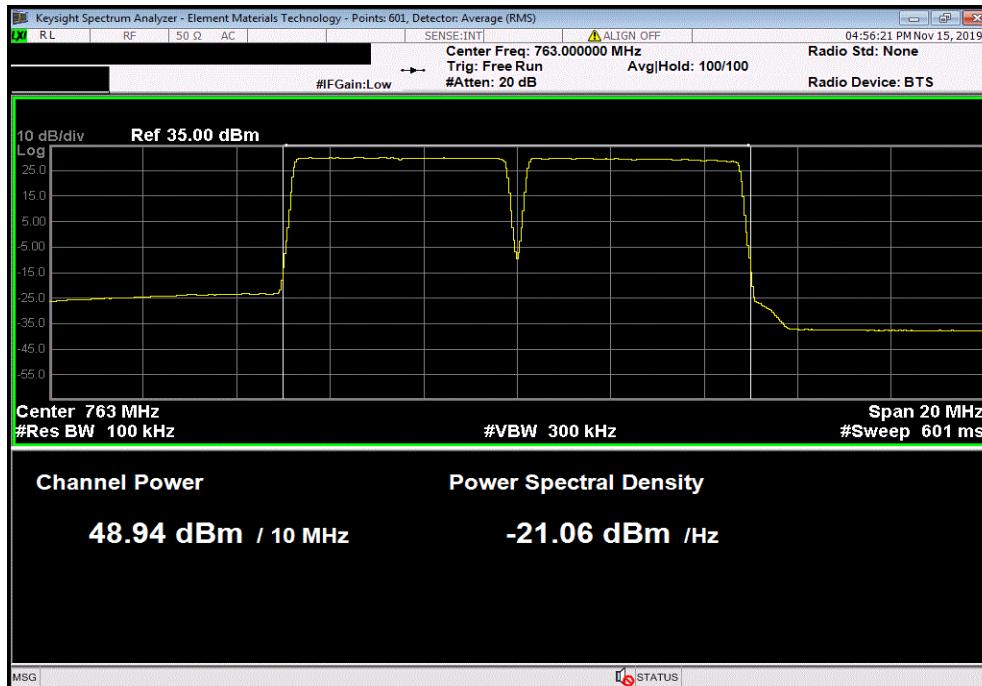
EUT:	AHLBBA RRH	Work Order:	NOKI0004			
Serial Number:	K9193514835	Date:	18-Nov-19			
Customer:	Nokia Solutions and Networks	Temperature:	22.6 °C			
Attendees:	John Rattanavong	Humidity:	29.9% RH			
Project:	None	Barometric Pres.:	1019 mbar			
Tested by:	Jonathan Kiefer	Power:	54VDC			
Job Site:	TX09	Test Method:				
TEST SPECIFICATIONS		FCC 90i:2019	ANSI C63.26:2015			
		FCC 27:2019	ANSI C63.26:2015			
COMMENTS						
Band 14 Multicarrier average power measurements. Tested on highest power antenna port (Port 2). EUT is operated at 100% duty cycle. ERP depends on antenna gain, which is unknown. Only the highest dBm value is plotted per customer requirements and a Watt/MHz calculation was not made due to the unknown antenna value. Average power measurements were made for the multicarrier test cases on four modulation types (QPSK, 16QAM, 64QAM, 256QAM): The first multicarrier test case is with two Band 14 LTE5 carriers at the lower and upper band edge channels [760.5MHz and 765.5MHz]. Two carriers cover the entire Band 14 channel bandwidth so three carrier operation is not available. The second multicarrier test case is with three Band 12/Band 14 LTE5 carriers (based upon KDB 971168 D03v01) using two carriers (with minimum spacing between carrier frequencies) at the Band 12 lower band edge [731.5MHz and 736.5MHz] and a third carrier with maximum spacing between the other two carrier frequencies [765.5MHz] at the Band 14 upper band edge.						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	2	Signature				
		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Value (dBm)	Limit (W ERP/MHz)	Results
Band 14						
QPSK Modulation						
LTE5 Bandwidth						
Multicarrier Test Case 1						
Mid Channel, 763.0 MHz				48.94	0	48.9
Mid Channel, 734.0 MHz				47.06	0	47.1
Mid Channel, 765.5 MHz				43.59	0	43.6
Multicarrier Test Case 2						
Mid Channel, 763.0 MHz				48.86	0	48.9
Mid Channel, 734.0 MHz				47.07	0	47.1
Mid Channel, 765.5 MHz				43.59	0	43.6
16QAM Modulation						
LTE5 Bandwidth						
Multicarrier Test Case 1						
Mid Channel, 763.0 MHz				48.88	0	48.9
Mid Channel, 734.0 MHz				47.16	0	47.2
Mid Channel, 765.5 MHz				43.59	0	43.6
Multicarrier Test Case 2						
Mid Channel, 763.0 MHz				48.72	0	48.7
Mid Channel, 734.0 MHz				47.05	0	47
Mid Channel, 765.5 MHz				43.58	0	43.6
64QAM Modulation						
LTE5 Bandwidth						
Multicarrier Test Case 1						
Mid Channel, 763.0 MHz				48.72	0	48.7
Mid Channel, 734.0 MHz				47.05	0	47
Mid Channel, 765.5 MHz				43.58	0	43.6
256QAM Modulation						
LTE5 Bandwidth						
Multicarrier Test Case 1						
Mid Channel, 763.0 MHz				48.72	0	48.7
Mid Channel, 734.0 MHz				47.05	0	47
Mid Channel, 765.5 MHz				43.58	0	43.6

# AVERAGE POWER

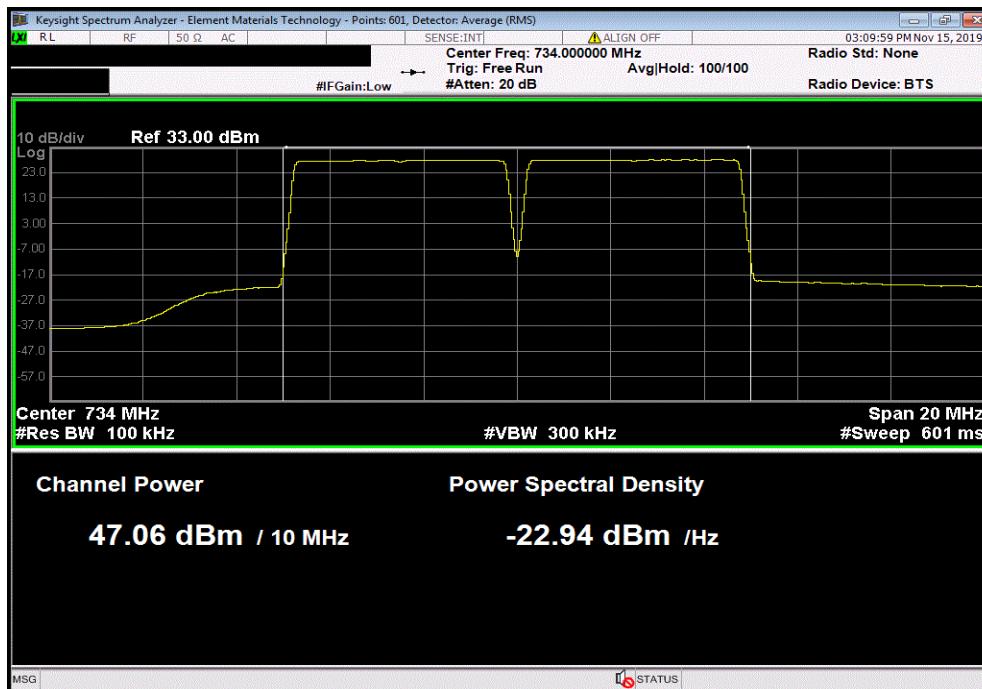


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 14, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 763.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
48.94	0	48.9	1000		Pass



Band 12, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 734.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
47.06	0	47.1	1000		Pass

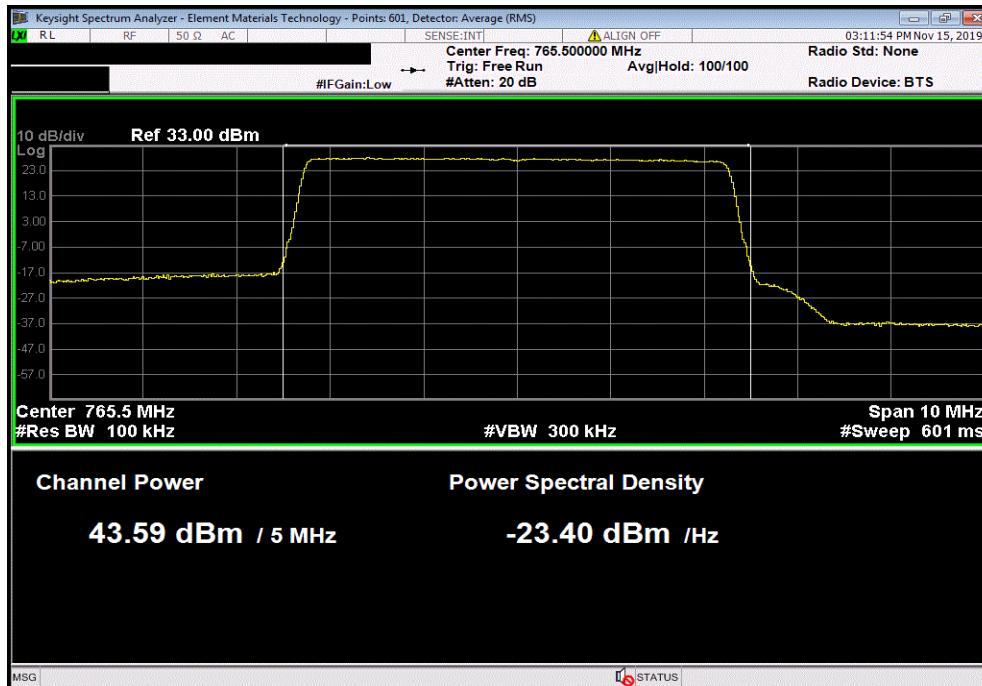


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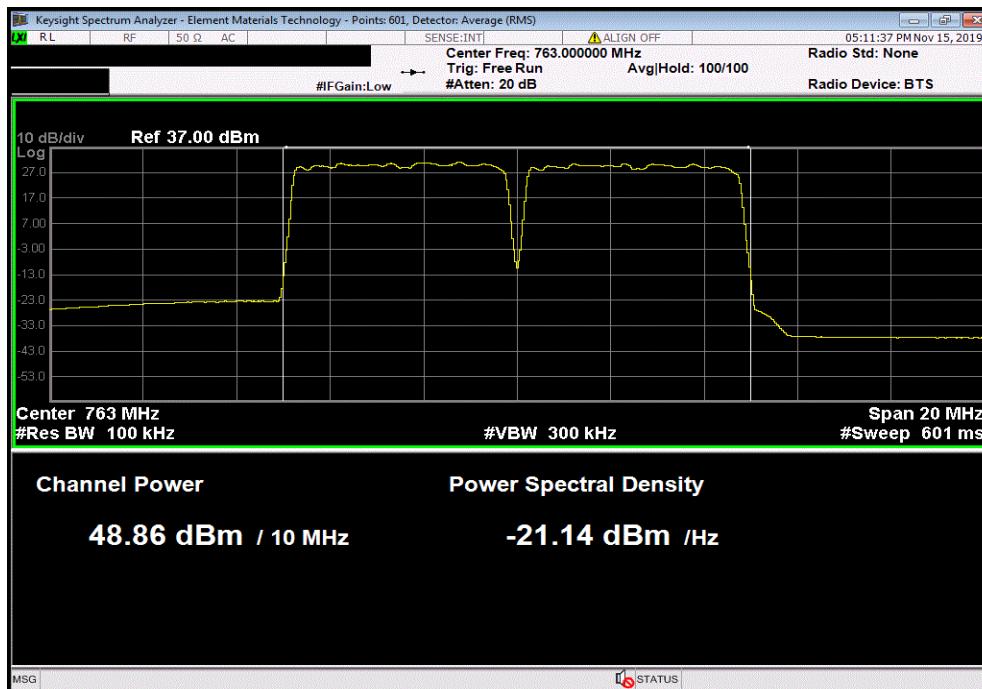


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 14, QPSK Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
43.59	0	43.6	1000		Pass



Band 14, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 763.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		Results
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)		
48.86	0	48.9	1000		Pass

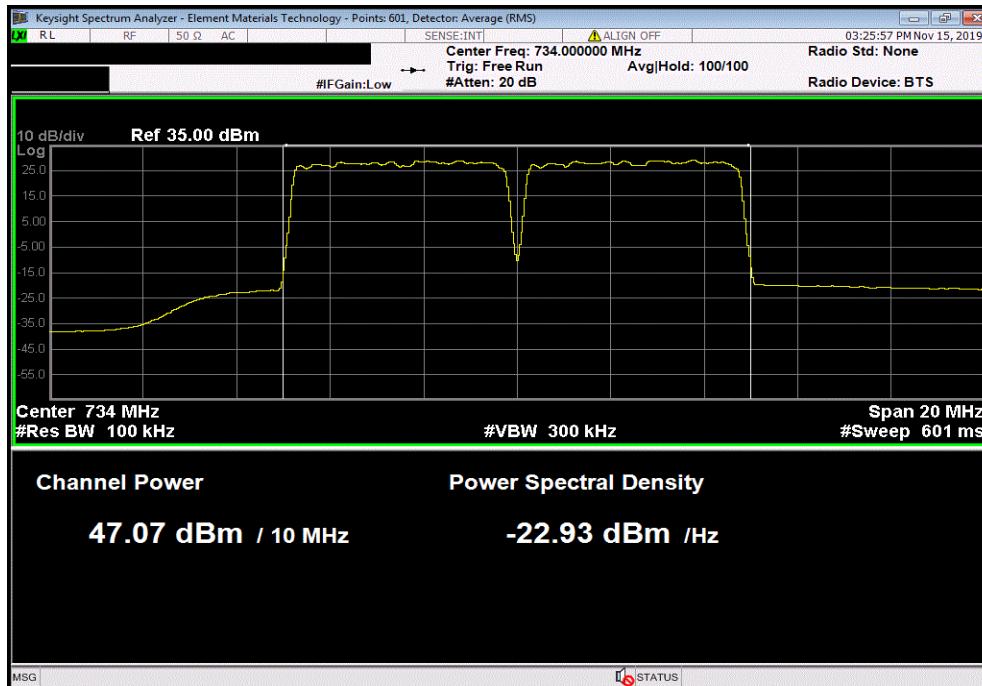


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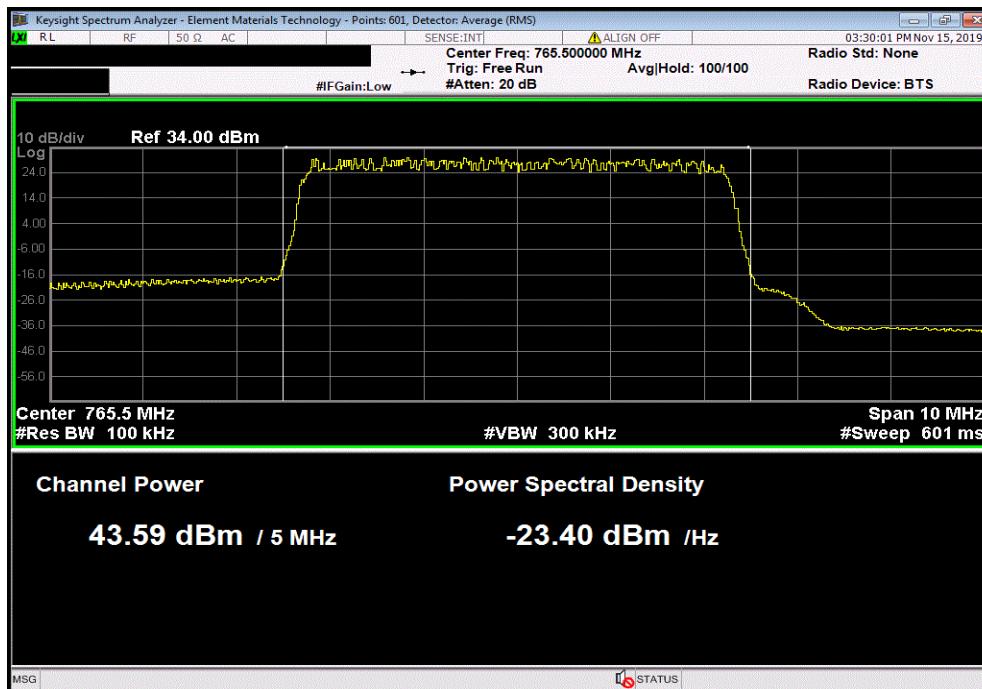


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 12, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 734.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
47.07	0	47.1	1000	Pass	



Band 14, 16QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
43.59	0	43.6	1000	Pass	

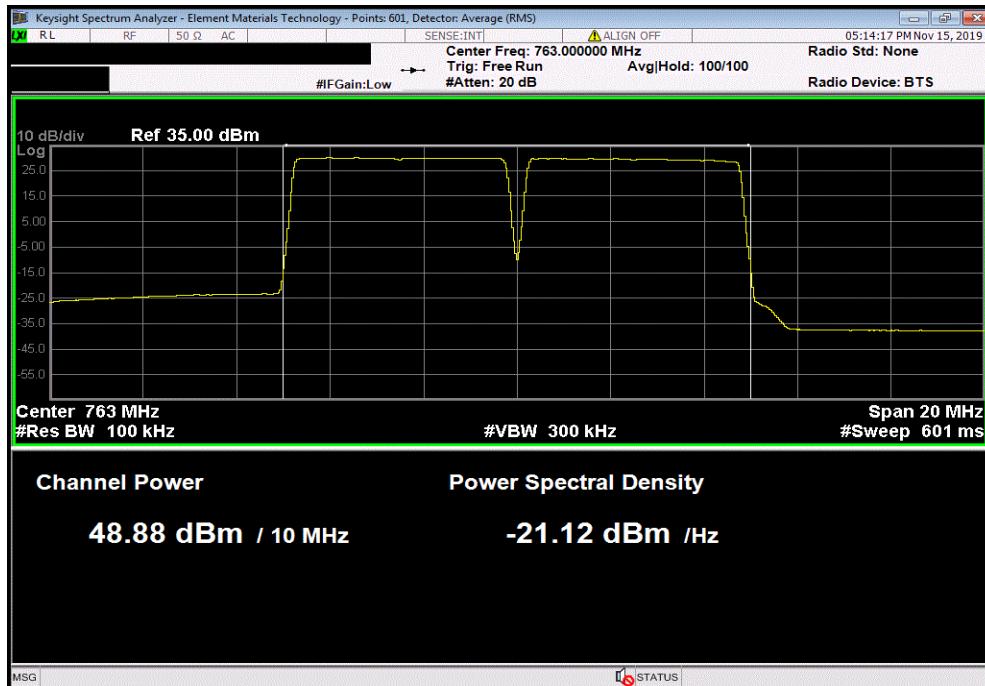


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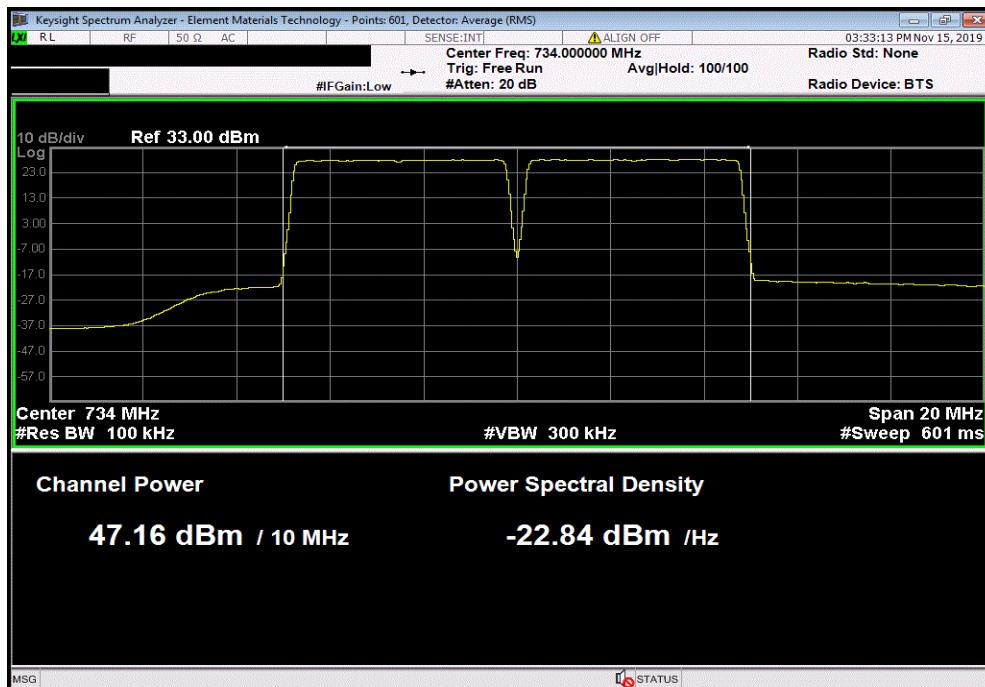


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 14, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 763.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
48.88	0	48.9	1000	Pass	



Band 12, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 734.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
47.16	0	47.2	1000	Pass	

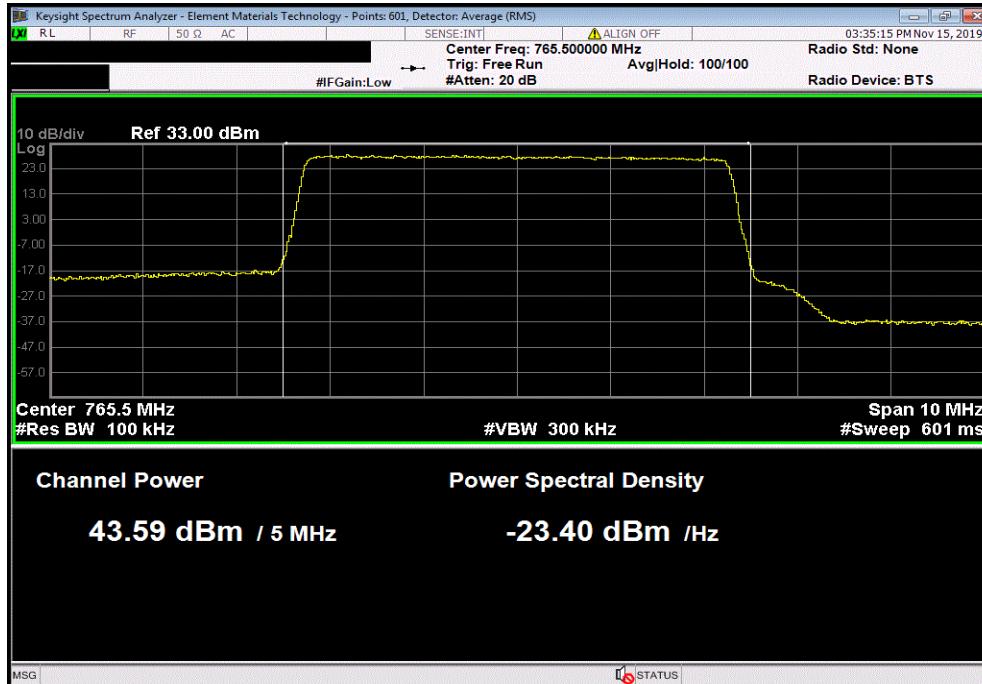


# AVERAGE POWER

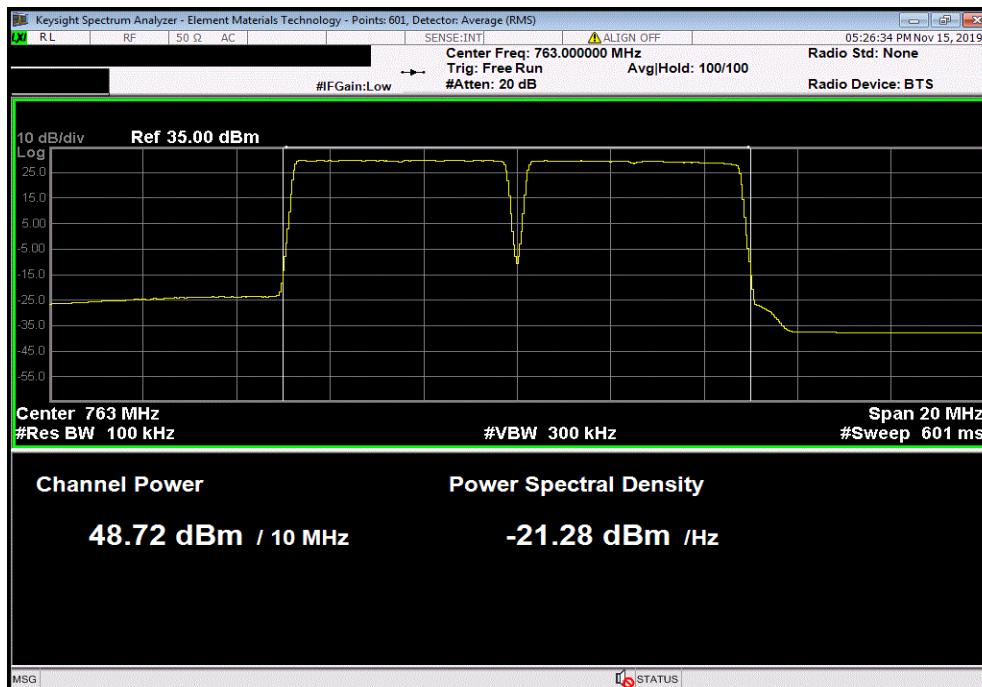


TbTx 2019.08.30.0 XMI 2019.09.05

Band 14, 64QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
43.59	0	43.6	1000	Pass	



Band 14, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 1, Mid Channel, 763.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
48.72	0	48.7	1000	Pass	

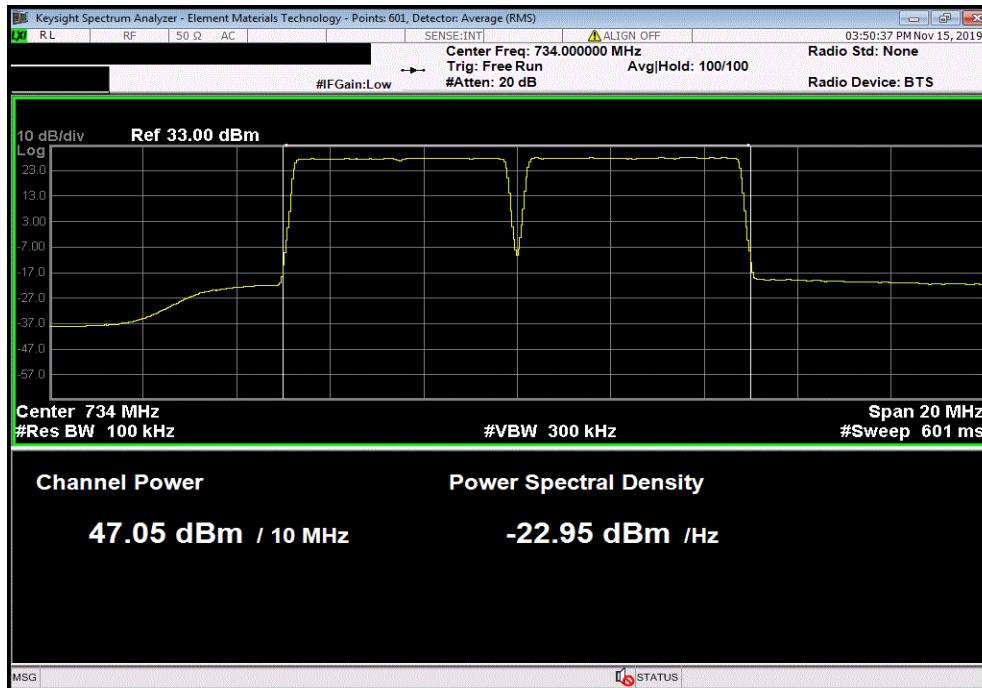


# AVERAGE POWER

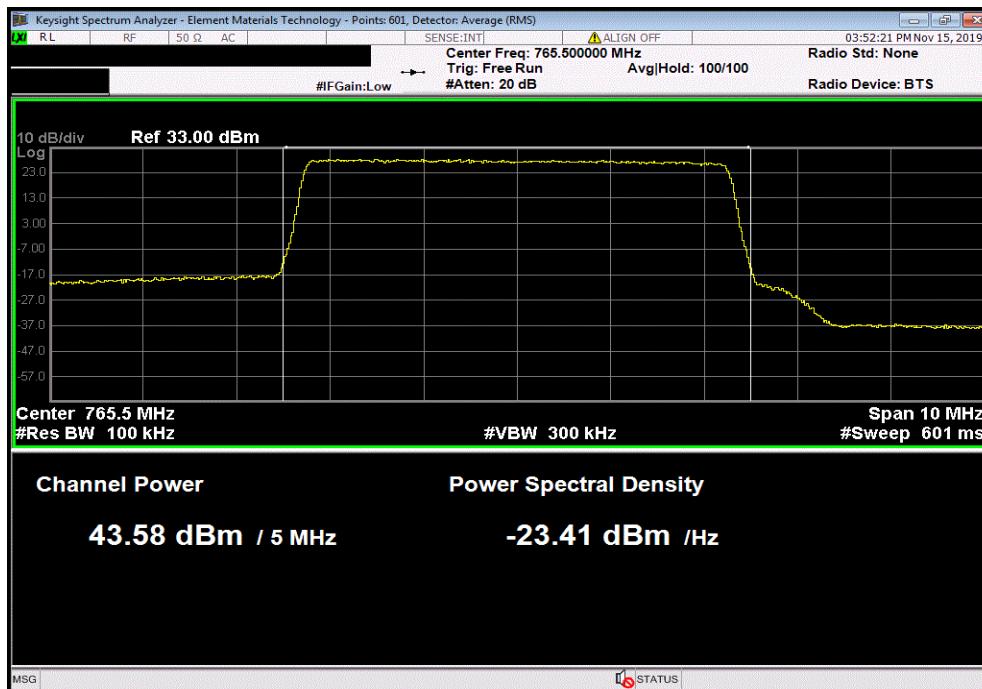


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 12, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 734.0 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
47.05	0	47	1000	Pass	



Band 14, 256QAM Modulation, LTE5 Bandwidth, Multicarrier Test Case 2, Mid Channel, 765.5 MHz					
Avg Cond	Duty Cycle	Value	Limit		
Pwr (dBm)	Factor (dB)	(dBm)	(W ERP/MHz)	Results	
43.58	0	43.6	1000	Pass	



# PEAK-TO-AVERAGE POWER RATIO (PAPR)



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.

Because the conducted Output Power was measured using a RMS Average detector, the Peak to Average Power Ratio (PAPR) was measured to show that the maximum peak-max-hold spectrum to the maximum of the average spectrum does not exceed 13 dB.

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4.

The PAPR was measured using the CCDF function of the spectrum analyzer.

# PEAK-TO-AVERAGE POWER RATIO (PAPR)



TbTx 2019.08.30.0

XMI 2019.08.05

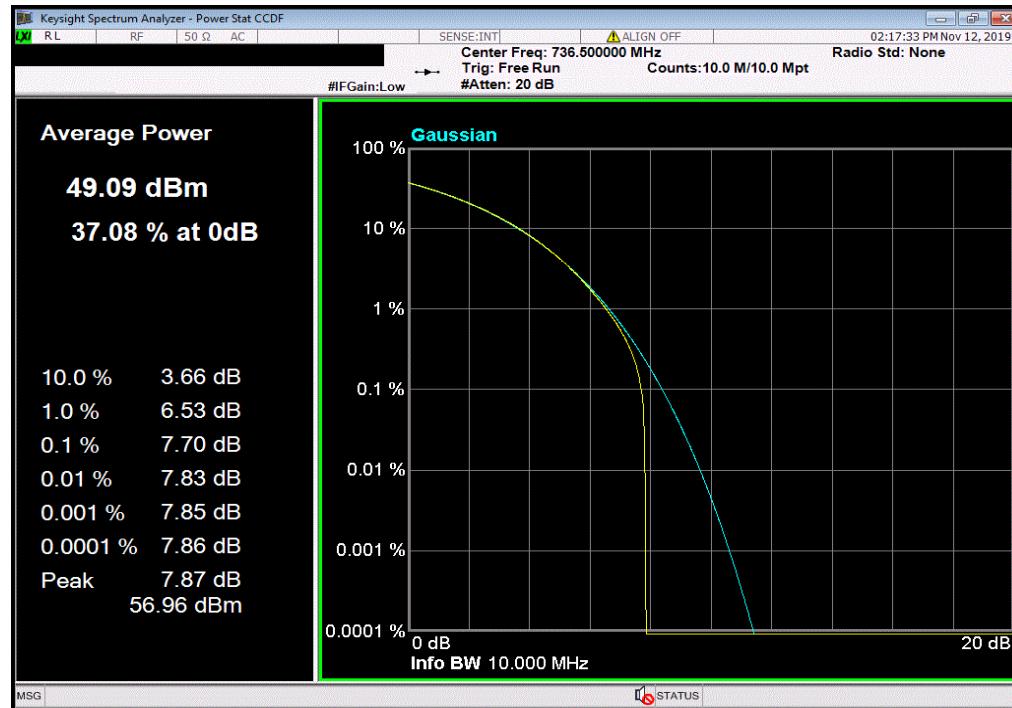
EUT:	AHLBBA RRH		Work Order:	NOKI0004																																					
Serial Number:	K9193514835		Date:	18-Nov-19																																					
Customer:	Nokia Solutions and Networks		Temperature:	22.4 °C																																					
Attendees:	John Rattanavong		Humidity:	29.7% RH																																					
Project:	None		Barometric Pres.:	1019 mbar																																					
Tested by:	Jonathan Kiefer	Power:	54VDC	Job Site:	TX09																																				
TEST SPECIFICATIONS			Test Method																																						
FCC 27:2019			ANSI C63.26:2015																																						
COMMENTS																																									
Band 12 PAPR measurements for LTE5 channel bandwidth at Mid channel using 256QAM on all four antenna ports. EUT is operated at 100% duty cycle.																																									
DEVIATIONS FROM TEST STANDARD																																									
None																																									
Configuration #	2	Signature																																							
		<i>Jonathan Kiefer</i>	PAPR Value (dB)	Limit (dB)	Results																																				
Band 12																																									
256QAM Modulation																																									
LTE5 Bandwidth																																									
Mid Channel, 736.5 MHz																																									
<table border="1"> <thead> <tr> <th></th> <th>Antenna Port 1</th> <th>Antenna Port 2</th> <th>Antenna Port 3</th> <th>Antenna Port 4</th> <th></th> </tr> </thead> <tbody> <tr> <td></td> <td>7.7</td> <td>6.7</td> <td>6.71</td> <td>7.71</td> <td>13</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Pass</td> </tr> </tbody> </table>							Antenna Port 1	Antenna Port 2	Antenna Port 3	Antenna Port 4			7.7	6.7	6.71	7.71	13						Pass																		
	Antenna Port 1	Antenna Port 2	Antenna Port 3	Antenna Port 4																																					
	7.7	6.7	6.71	7.71	13																																				
					Pass																																				
					Pass																																				
					Pass																																				
					Pass																																				

# PEAK-TO-AVERAGE POWER RATIO (PAPR)

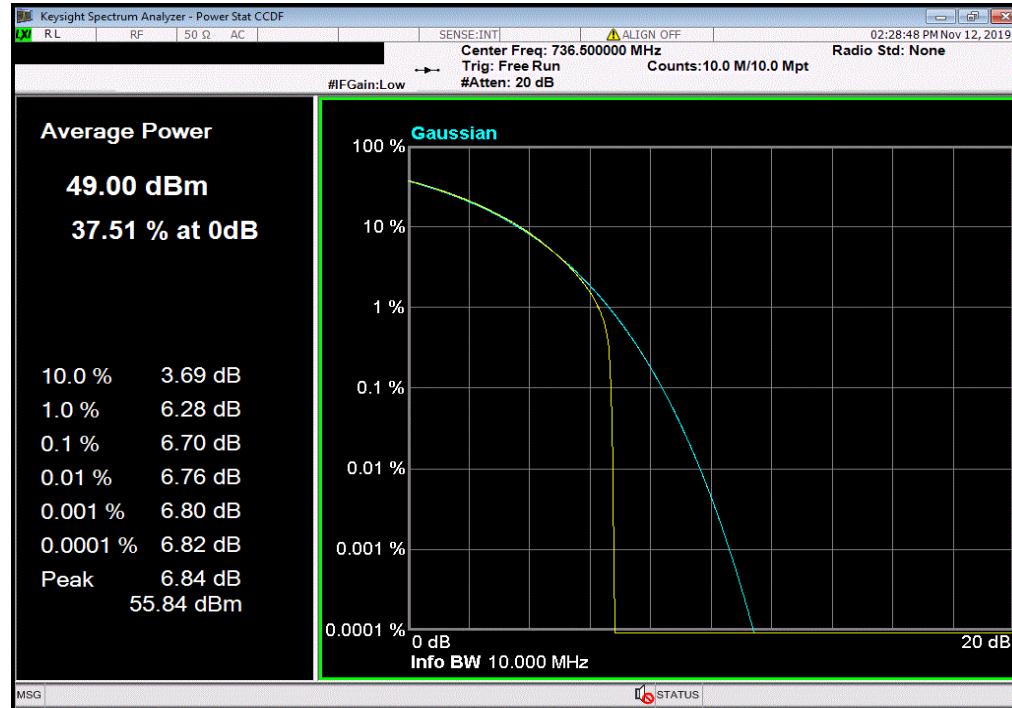


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 12, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 736.5 MHz, Antenna Port 1			
PAPR Value (dB)	Limit (dB)	Results	
7.7	13	Pass	



Band 12, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 736.5 MHz, Antenna Port 2			
PAPR Value (dB)	Limit (dB)	Results	
6.7	13	Pass	

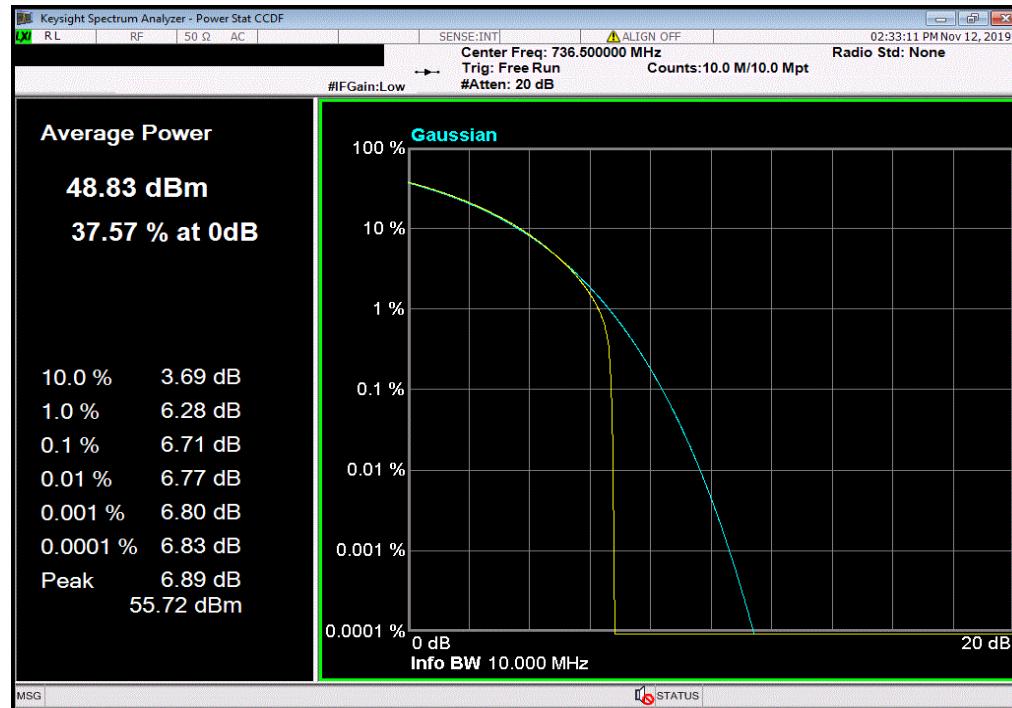


# PEAK-TO-AVERAGE POWER RATIO (PAPR)

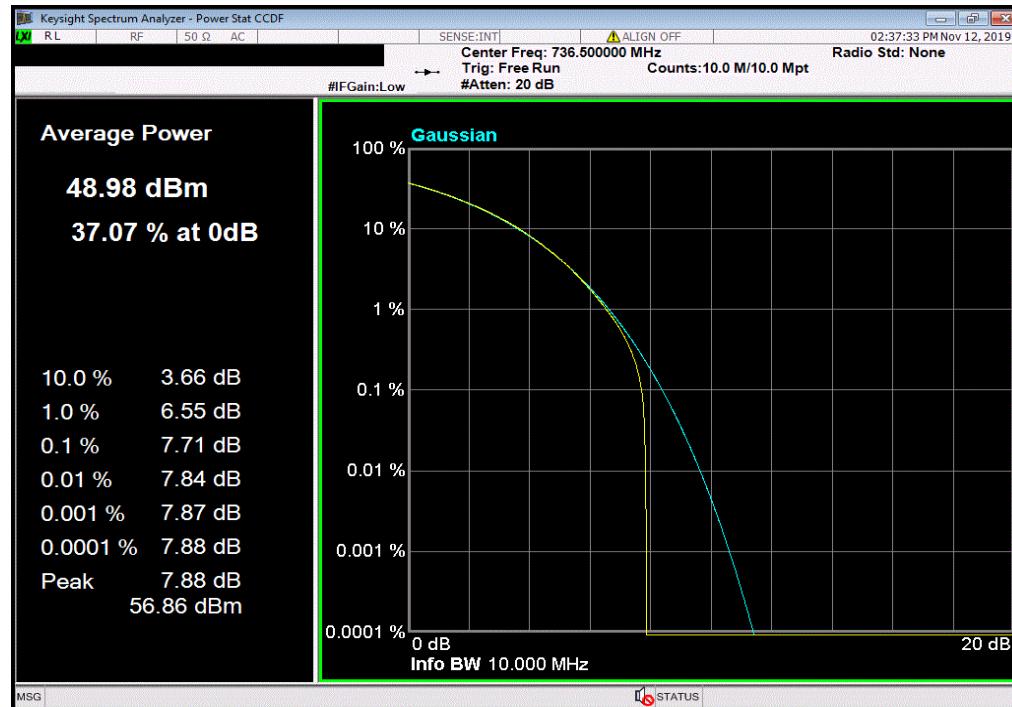


TbTx 2019.08.30.0 XMI 2019.09.05

Band 12, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 736.5 MHz, Antenna Port 3			
PAPR Value (dB)	Limit (dB)	Results	
6.71	13	Pass	



Band 12, 256QAM Modulation, LTE5 Bandwidth, Mid Channel, 736.5 MHz, Antenna Port 4			
PAPR Value (dB)	Limit (dB)	Results	
7.71	13	Pass	



# PEAK-TO-AVERAGE POWER RATIO (PAPR)



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.

Because the conducted Output Power was measured using a RMS Average detector, the Peak to Average Power Ratio (PAPR) was measured to show that the maximum peak-max-hold spectrum to the maximum of the average spectrum does not exceed 13 dB.

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4.

The PAPR was measured using the CCDF function of the spectrum analyzer.

# PEAK-TO-AVERAGE POWER RATIO (PAPR)



TbTx 2019.08.30.0

XMI 2019.08.05

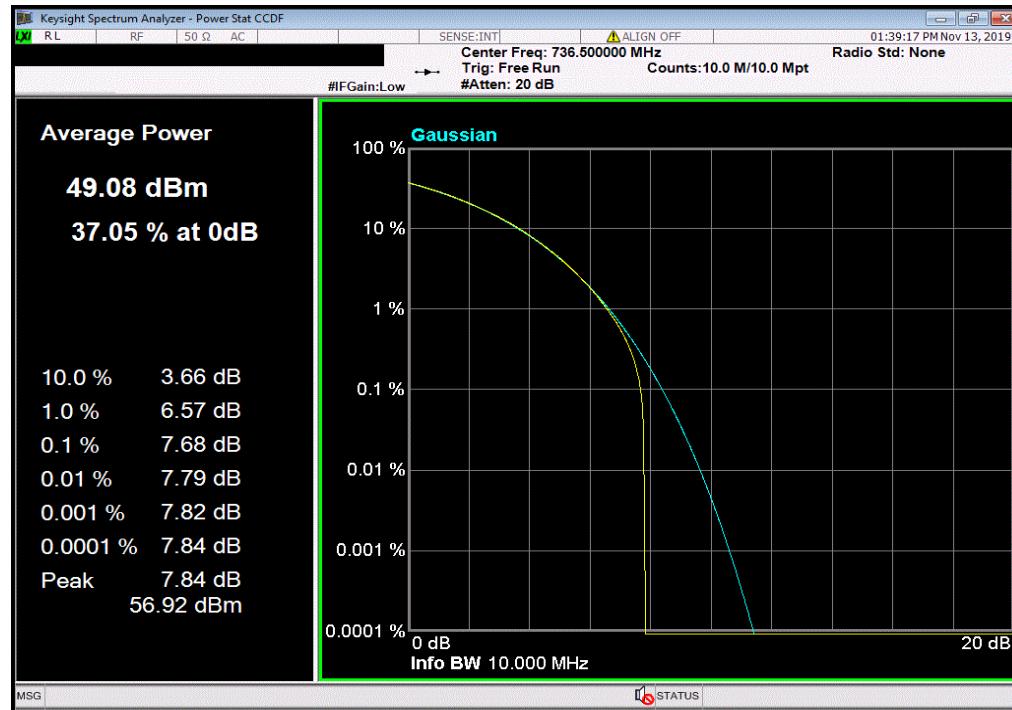
EUT:	AHLBBA RRH	Work Order:	NOKI0004			
Serial Number:	K9193514835	Date:	18-Nov-19			
Customer:	Nokia Solutions and Networks	Temperature:	22.4 °C			
Attendees:	John Rattanavong	Humidity:	29.6% RH			
Project:	None	Barometric Pres.:	1019 mbar			
Tested by:	Jonathan Kiefer	Power:	54VDC			
TEST SPECIFICATIONS		Test Method	ANSI C63.26:2015			
FCC 27:2019						
COMMENTS	Band 12 PAPR measurements for LTE5 channel bandwidth at Mid channel 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	Signature				
		<i>Jonathan Kiefer</i>				
		PAPR Value (dB)	Limit (dB)			
		Results				
Band 12						
QPSK Modulation						
LTE5 Bandwidth		7.68	13			
Mid Channel, 736.5 MHz			Pass			
16QAM Modulation		7.69	13			
LTE5 Bandwidth			Pass			
Mid Channel, 736.5 MHz						
64QAM Modulation		7.69	13			
LTE5 Bandwidth			Pass			
Mid Channel, 736.5 MHz						

# PEAK-TO-AVERAGE POWER RATIO (PAPR)

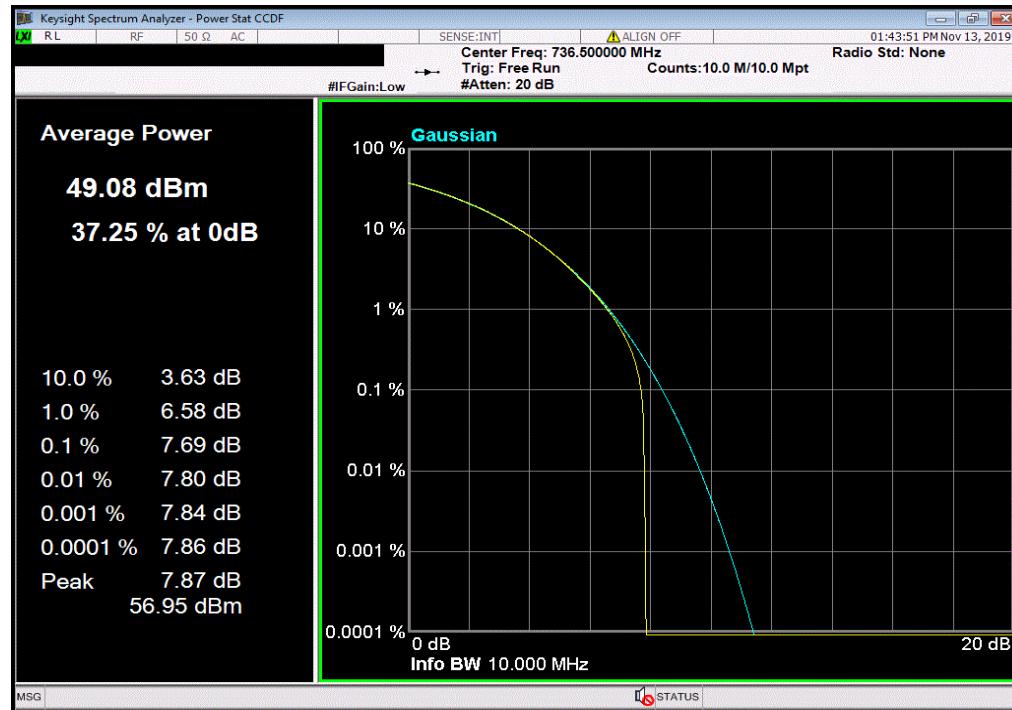


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 12, QPSK Modulation, LTE5 Bandwidth, Mid Channel, 736.5 MHz			
PAPR Value (dB)	Limit (dB)	Results	
7.68	13	Pass	



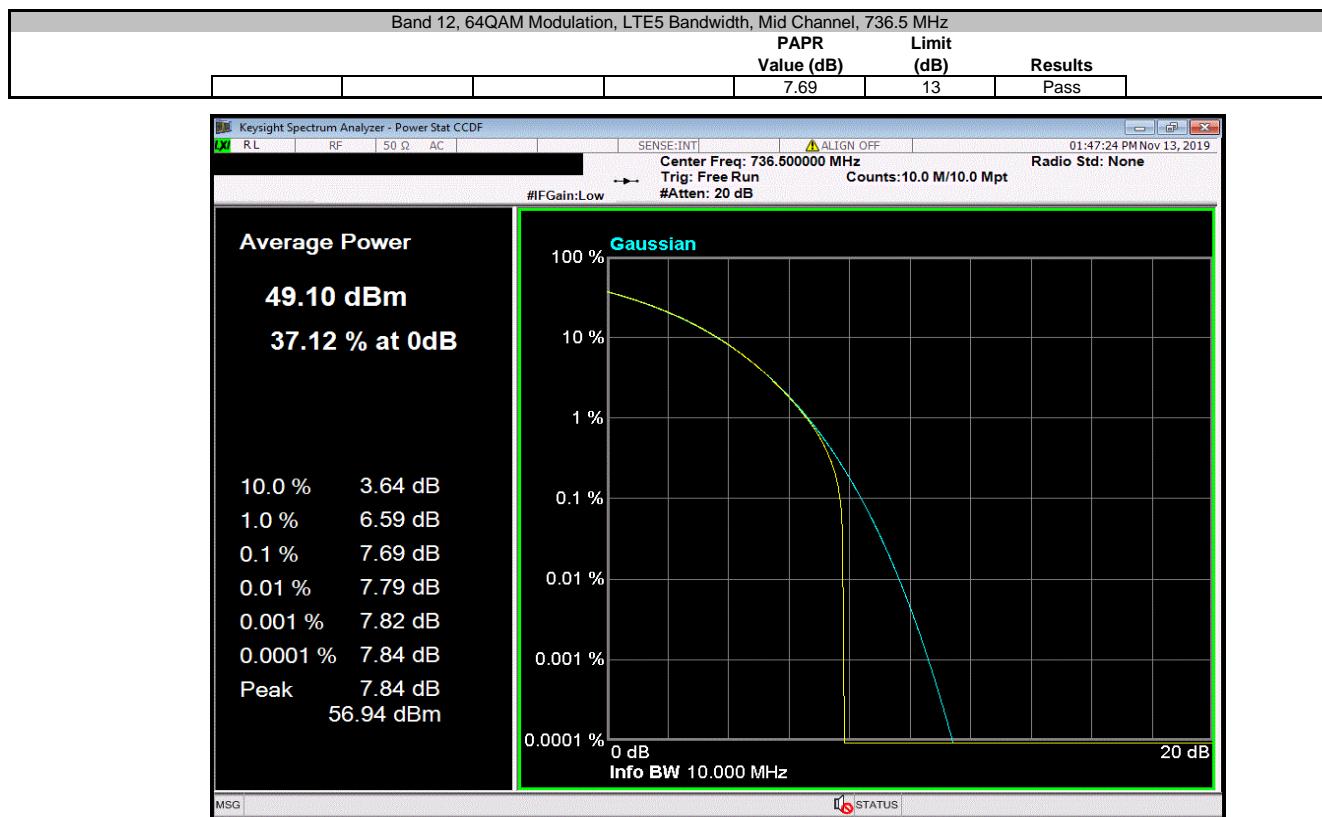
Band 12, 16QAM Modulation, LTE5 Bandwidth, Mid Channel, 736.5 MHz			
PAPR Value (dB)	Limit (dB)	Results	
7.69	13	Pass	



# PEAK-TO-AVERAGE POWER RATIO (PAPR)



TbtTx 2019.08.30.0 XMU 2019.09.05



# PEAK-TO-AVERAGE POWER RATIO (PAPR)



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.

Because the conducted Output Power was measured using a RMS Average detector, the Peak to Average Power Ratio (PAPR) was measured to show that the maximum peak-max-hold spectrum to the maximum of the average spectrum does not exceed 13 dB.

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4.

The PAPR was measured using the CCDF function of the spectrum analyzer.

# PEAK-TO-AVERAGE POWER RATIO (PAPR)



XMI 2019.08.05

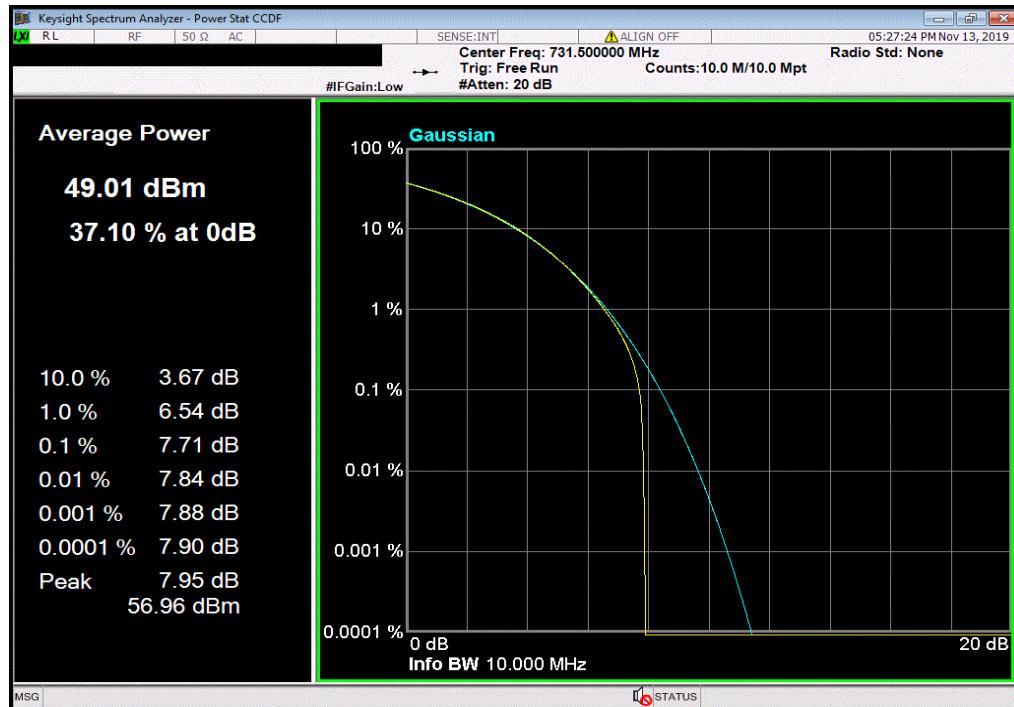
EUT:	AHLBBA RRH	Work Order:	NOKI0004
Serial Number:	K9193514835	Date:	18-Nov-19
Customer:	Nokia Solutions and Networks	Temperature:	22.4 °C
Attendees:	John Rattanavong	Humidity:	29.7% RH
Project:	None	Barometric Pres.:	1019 mbar
Tested by:	Jonathan Kiefer	Power:	54VDC
TEST SPECIFICATIONS		Test Method	ANSI C63.26:2015
FCC 27:2019			
COMMENTS			
Band 12 PAPR measurements for 256QAM modulation type at Low, Mid, High channels for LTE5 and LTE10 channel bandwidths. Tested on highest power antenna port (Port 1). EUT is operated at 100% duty cycle. Note 256QAM LTE5 BW Mid channel data shown elsewhere in the report.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature	
		<i>Jonathan Kiefer</i>	
		PAPR Value (dB)	Limit (dB)
		Results	
Band 12			
256QAM Modulation			
LTE5 Bandwidth			
Low Channel, 731.5 MHz 7.71 13 Pass			
High Channel, 741.5 MHz 7.69 13 Pass			
LTE10 Bandwidth			
Mid Channel, 736.5 MHz 7.69 13 Pass			
Low Channel, 734.0 MHz 7.7 13 Pass			
High Channel, 739.0 MHz 7.69 13 Pass			

# PEAK-TO-AVERAGE POWER RATIO (PAPR)

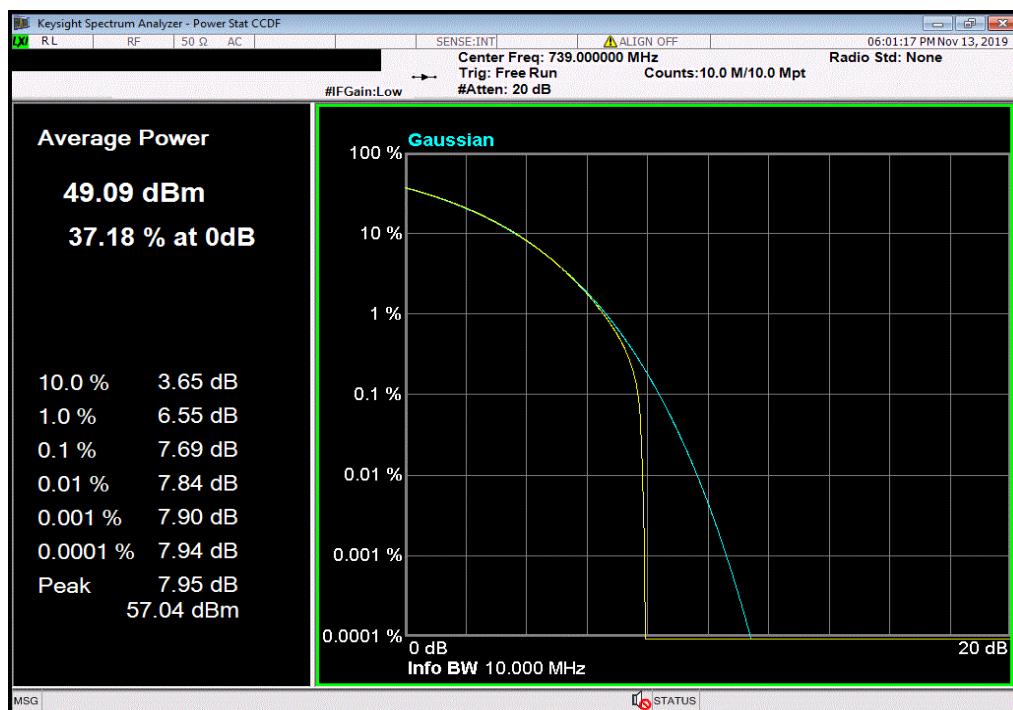


XMI 2019.09.05

Band 12, 256QAM Modulation, LTE5 Bandwidth, Low Channel, 731.5 MHz			
PAPR Value (dB)	Limit (dB)	Results	
7.71	13	Pass	



Band 12, 256QAM Modulation, LTE5 Bandwidth, High Channel, 741.5 MHz			
PAPR Value (dB)	Limit (dB)	Results	
7.69	13	Pass	

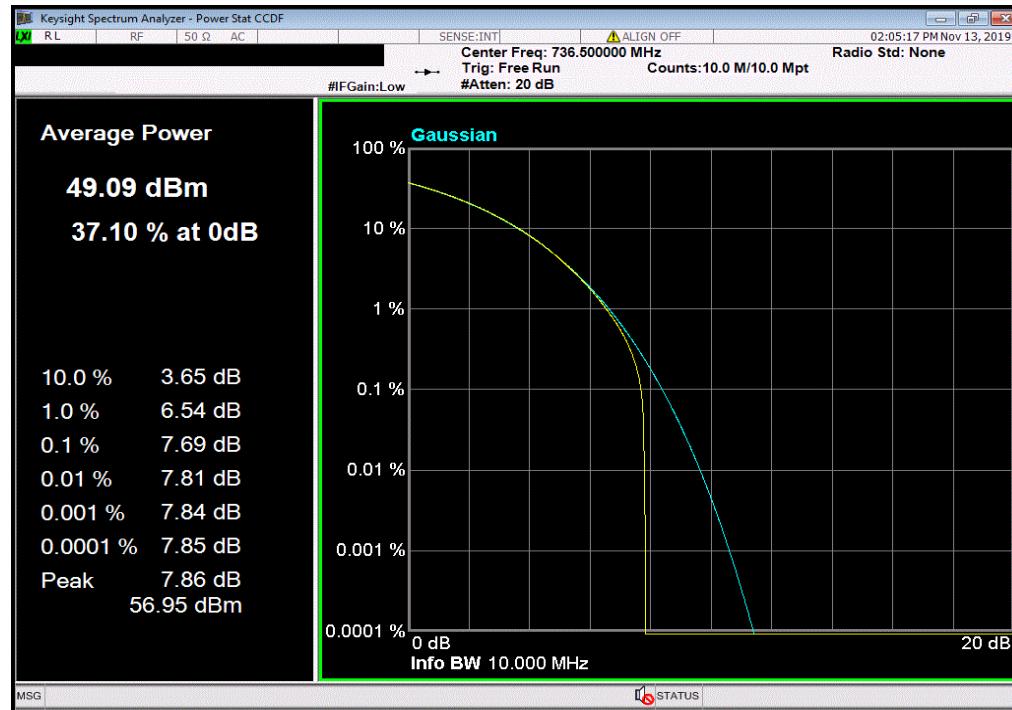


# PEAK-TO-AVERAGE POWER RATIO (PAPR)

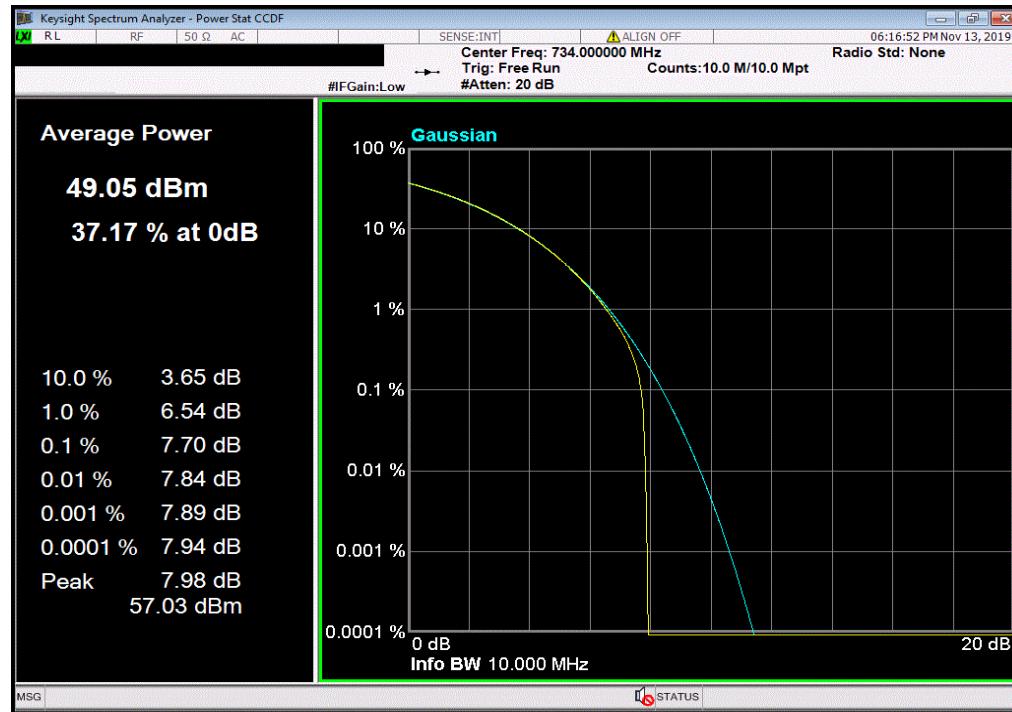


XMI 2019.09.05

Band 12, 256QAM Modulation, LTE10 Bandwidth, Mid Channel, 736.5 MHz			
PAPR Value (dB)	Limit (dB)	Results	
7.69	13	Pass	



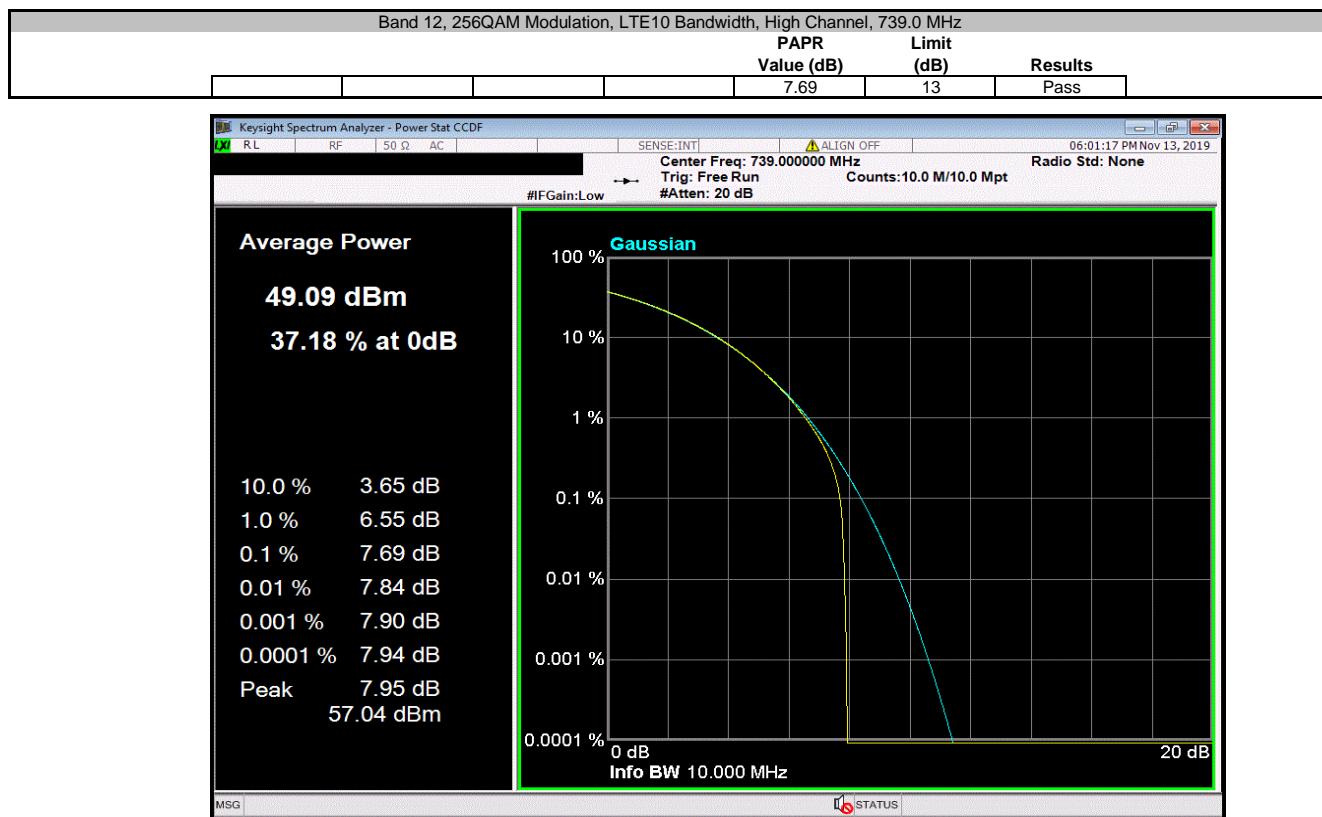
Band 12, 256QAM Modulation, LTE10 Bandwidth, Low Channel, 734.0 MHz			
PAPR Value (dB)	Limit (dB)	Results	
7.7	13	Pass	



# PEAK-TO-AVERAGE POWER RATIO (PAPR)



XMI 2019.09.05



# PEAK-TO-AVERAGE POWER RATIO (PAPR)



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.

Because the conducted Output Power was measured using a RMS Average detector, the Peak to Average Power Ratio (PAPR) was measured to show that the maximum peak-max-hold spectrum to the maximum of the average spectrum does not exceed 13 dB.

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4.

The PAPR was measured using the CCDF function of the spectrum analyzer.

# PEAK-TO-AVERAGE POWER RATIO (PAPR)



TbTx 2019.08.30.0

XMI 2019.08.05

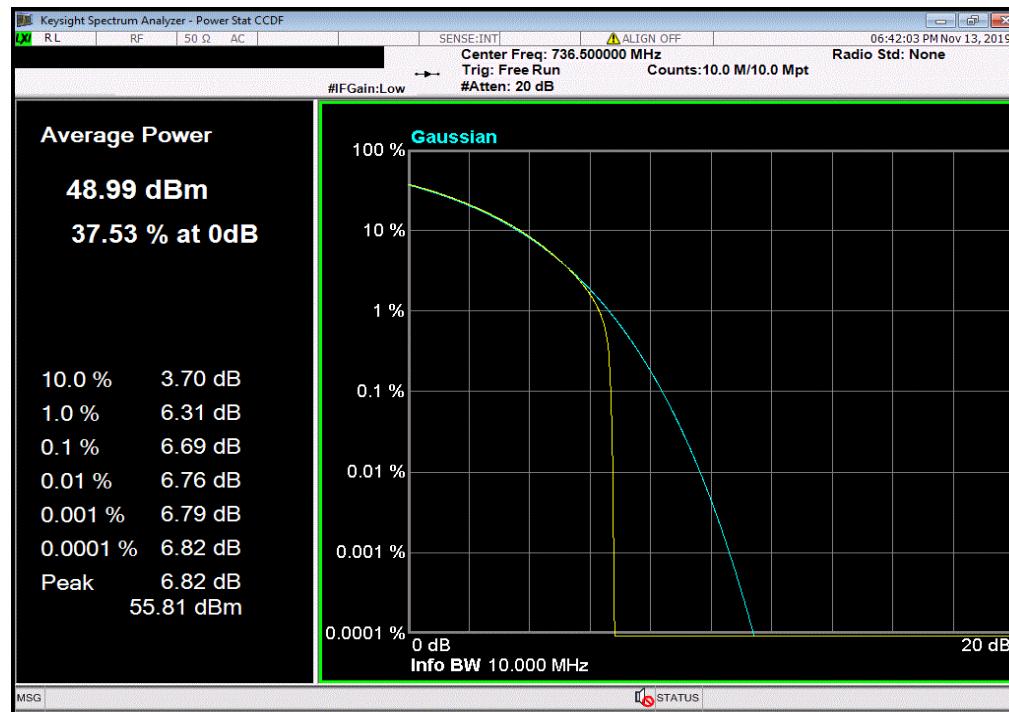
EUT:	AHLBBA RRH	Work Order:	NOKI0004			
Serial Number:	K9193514835	Date:	18-Nov-19			
Customer:	Nokia Solutions and Networks	Temperature:	22.4 °C			
Attendees:	John Rattanavong	Humidity:	29.7% RH			
Project:	None	Barometric Pres.:	1019 mbar			
Tested by:	Jonathan Kiefer	Power:	54VDC			
TEST SPECIFICATIONS		Test Method	ANSI C63.26:2015			
FCC 27:2019						
COMMENTS	Band 12 PAPR measurements for LTE5 channel bandwidth at Mid channel for four modulation types. Tested on highest power antenna port (Port 2). EUT is operated at 100% duty cycle.					
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	2	Signature				
		<i>Jonathan Kiefer</i>				
		PAPR Value (dB)	Limit (dB)			
		Results				
Band 12						
QPSK Modulation						
LTE5 Bandwidth		6.69	13			
Mid Channel, 736.5 MHz			Pass			
16QAM Modulation		6.7	13			
LTE5 Bandwidth			Pass			
Mid Channel, 736.5 MHz						
64QAM Modulation		6.73	13			
LTE5 Bandwidth			Pass			
Mid Channel, 736.5 MHz						

# PEAK-TO-AVERAGE POWER RATIO (PAPR)

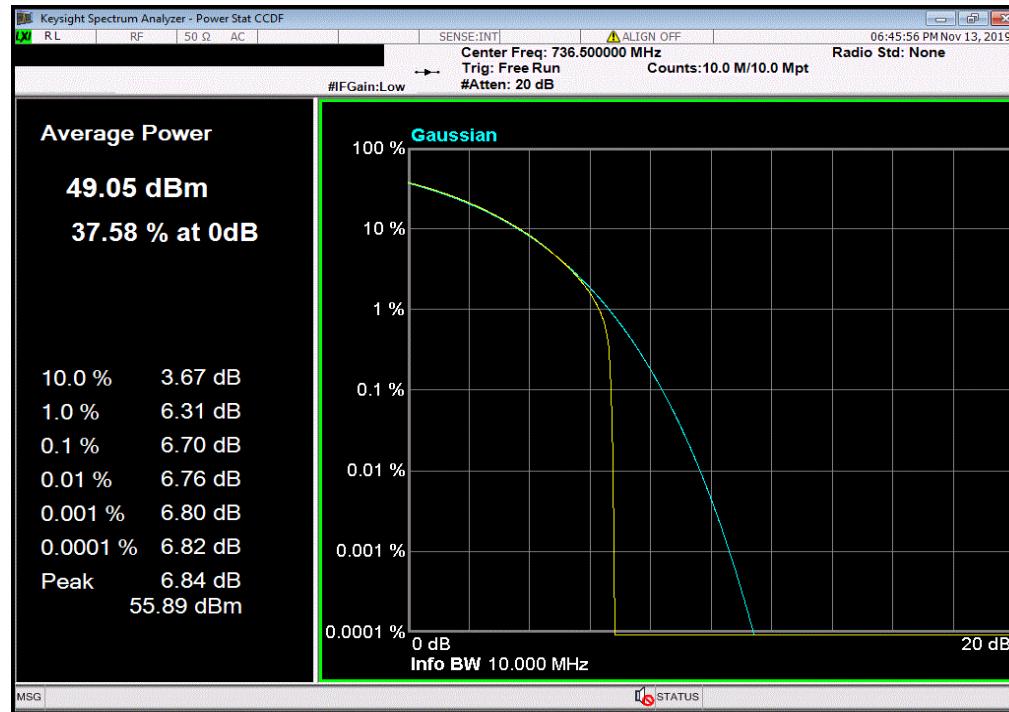


TbtTx 2019.08.30.0 XMU 2019.09.05

Band 12, QPSK Modulation, LTE5 Bandwidth, Mid Channel, 736.5 MHz			
PAPR Value (dB)	Limit (dB)	Results	
6.69	13	Pass	



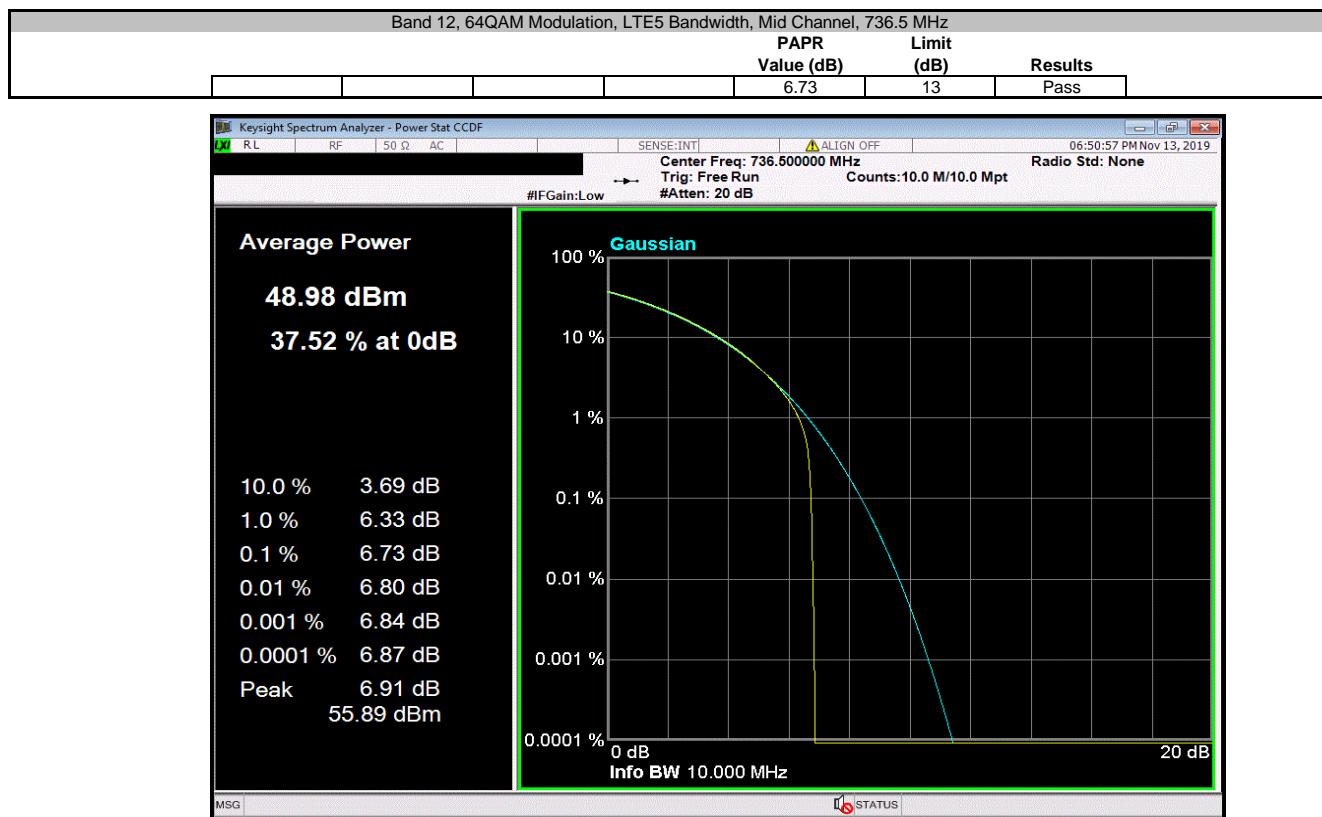
Band 12, 16QAM Modulation, LTE5 Bandwidth, Mid Channel, 736.5 MHz			
PAPR Value (dB)	Limit (dB)	Results	
6.7	13	Pass	



# PEAK-TO-AVERAGE POWER RATIO (PAPR)



TbtTx 2019.08.30.0 XMU 2019.09.05



# PEAK-TO-AVERAGE POWER RATIO (PAPR)



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.

Because the conducted Output Power was measured using a RMS Average detector, the Peak to Average Power Ratio (PAPR) was measured to show that the maximum peak-max-hold spectrum to the maximum of the average spectrum does not exceed 13 dB.

The PAPR measurement method is described in ANSI C63.26 section 5.2.3.4.

The PAPR was measured using the CCDF function of the spectrum analyzer.

# PEAK-TO-AVERAGE POWER RATIO (PAPR)



TbTx 2019.08.30.0

XMI 2019.08.05

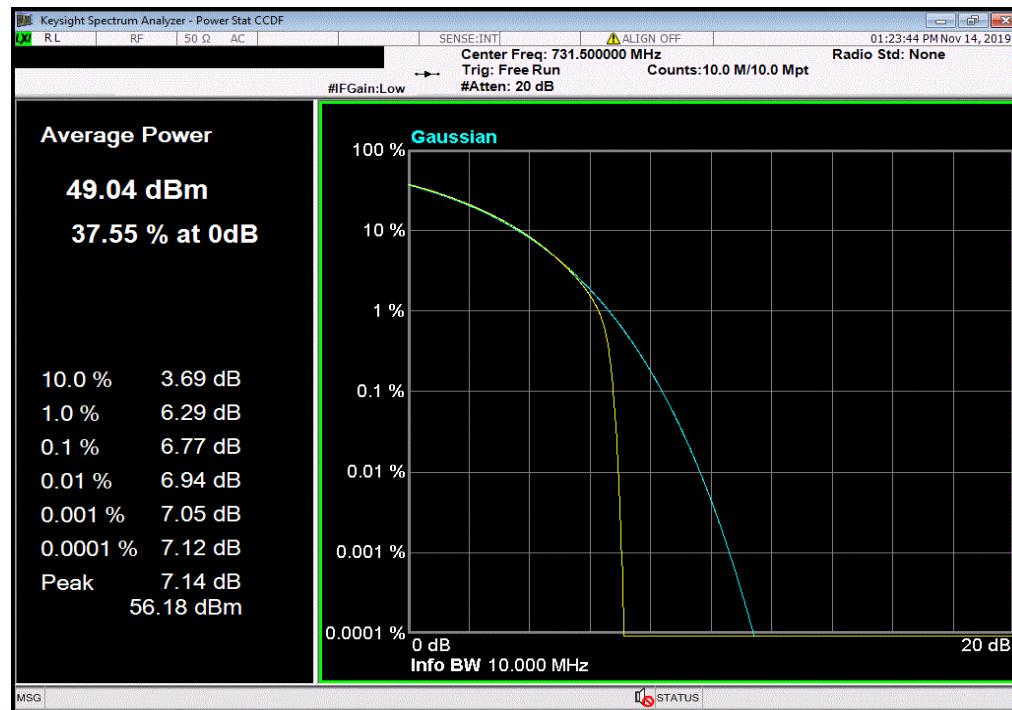
EUT:	AHLBBA RRH	Work Order:	NOKI0004
Serial Number:	K9193514835	Date:	18-Nov-19
Customer:	Nokia Solutions and Networks	Temperature:	22.4 °C
Attendees:	John Rattanavong	Humidity:	29.7% RH
Project:	None	Barometric Pres.:	1019 mbar
Tested by:	Jonathan Kiefer	Power:	54VDC
TEST SPECIFICATIONS		Test Method	ANSI C63.26:2015
FCC 27:2019			
COMMENTS			
Band 12 PAPR measurements for 256QAM modulation type at Low, Mid and High channels for LTE5 and LTE10 channel bandwidths. Tested on highest power antenna port (Port 2). EUT is operated at 100% duty cycle. Note: 256QAM LTE5 BW Mid Channel data shown elsewhere in the report.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature	
		<i>Jonathan Kiefer</i>	
		PAPR Value (dB)	Limit (dB)
		Results	
Band 12			
256QAM Modulation			
LTE5 Bandwidth			
Low Channel, 731.5 MHz		6.77	13
High Channel, 741.5 MHz		6.7	13
LTE10 Bandwidth			
Mid Channel, 736.5 MHz		6.79	13
Low Channel, 734.0 MHz		6.93	13
High Channel, 739.0 MHz		6.75	13

# PEAK-TO-AVERAGE POWER RATIO (PAPR)

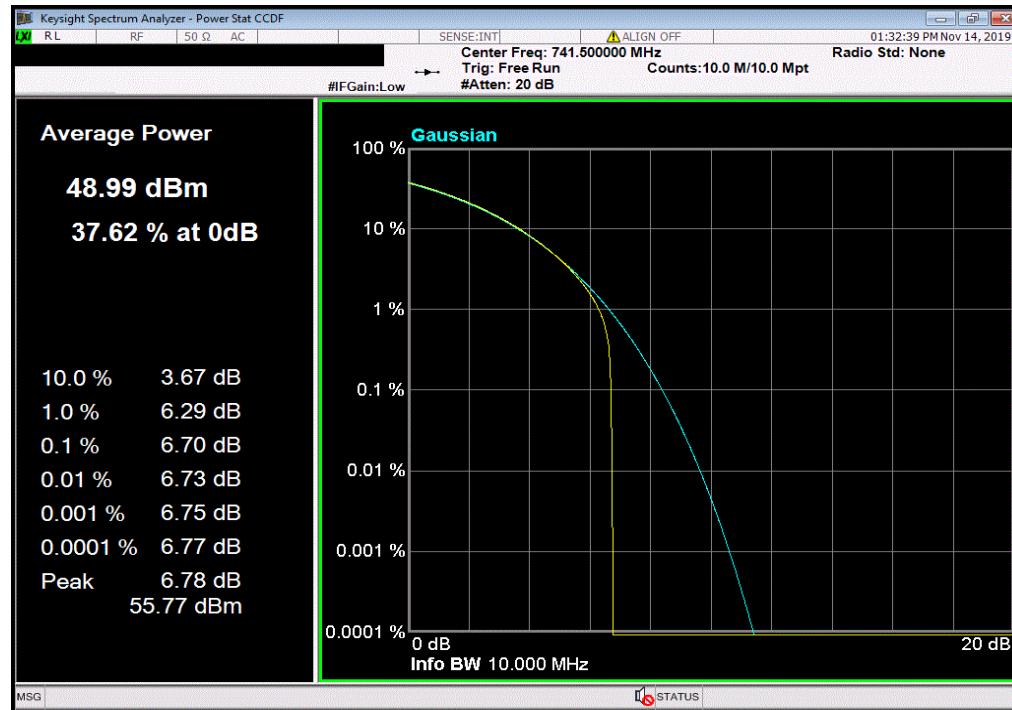


TbtTx 2019.08.30.0 XMI 2019.09.05

Band 12, 256QAM Modulation, LTE5 Bandwidth, Low Channel, 731.5 MHz			
PAPR Value (dB)	Limit (dB)	Results	
6.77	13	Pass	



Band 12, 256QAM Modulation, LTE5 Bandwidth, High Channel, 741.5 MHz			
PAPR Value (dB)	Limit (dB)	Results	
6.7	13	Pass	

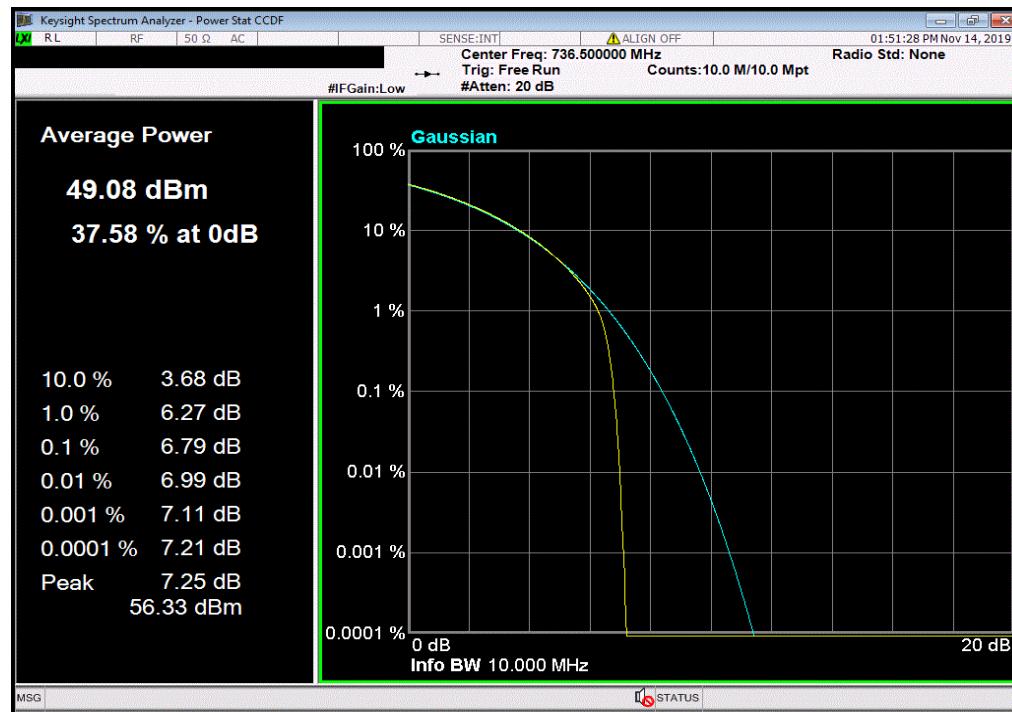


# PEAK-TO-AVERAGE POWER RATIO (PAPR)

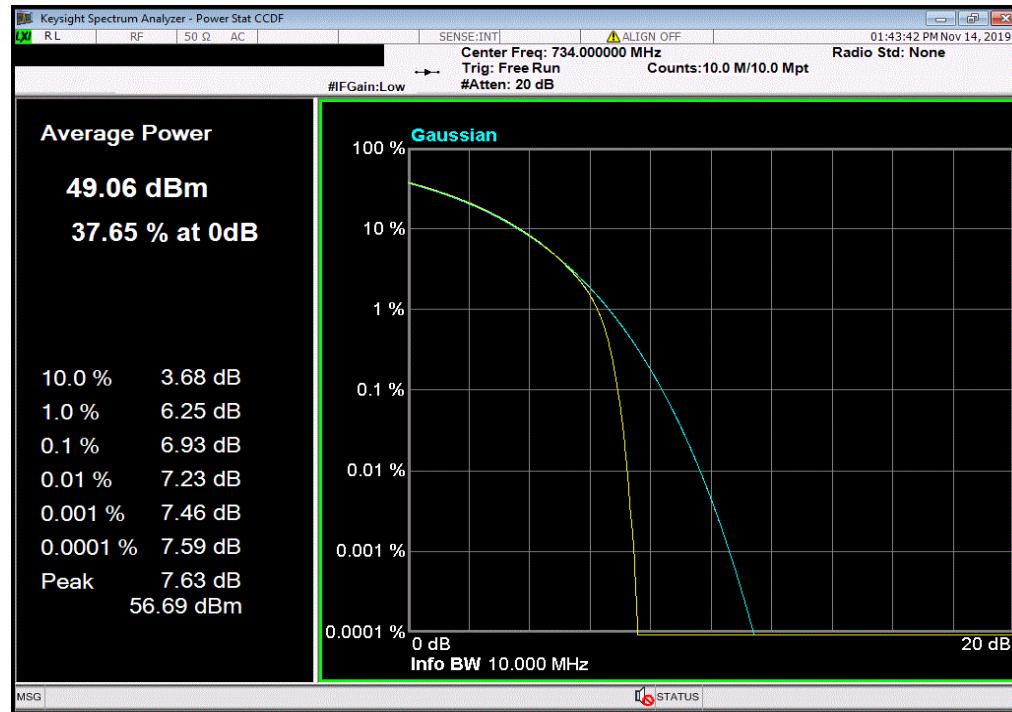


TbTx 2019.08.30.0 XMU 2019.09.05

Band 12, 256QAM Modulation, LTE10 Bandwidth, Mid Channel, 736.5 MHz			
PAPR Value (dB)	Limit (dB)	Results	
6.79	13	Pass	



Band 12, 256QAM Modulation, LTE10 Bandwidth, Low Channel, 734.0 MHz			
PAPR Value (dB)	Limit (dB)	Results	
6.93	13	Pass	



# PEAK-TO-AVERAGE POWER RATIO (PAPR)



TbtTx 2019.08.30.0 XMU 2019.09.05

Band 12, 256QAM Modulation, LTE10 Bandwidth, High Channel, 739.0 MHz			
PAPR	Limit		
Value (dB)	(dB)	Results	
6.75	13	Pass	

