Class II Change Application for Grant of Equipment Authorization

Nokia Solutions and Networks
Airscale Base Transceiver Station
AHFIB Remote Radio Head

FCC ID: VBNAHFIB-01
IC: 661W-AHFIB

CERTIFICATE #: 0214.19

Test Sites: Nokia Solutions and Networks
6000 Connection Drive
Irving, TX 75039 and
National Technical Systems – Plano
1701 E Plano Pkwy #150
Plano, TX 75074

NTS Plano FCC Laboratory Designation No.: US1077
NTS Plano ISED Laboratory Assigned Code: 4319A

Test Dates: October 15-16, 2018
Total Number of Pages: 50

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Revision History

Rev#	Date	Comments	Modified By
0	10/26/2018	Initial Draft	Daniel Ramirez

CONTENTS

1. SCOPE/OBJECTIVE

A class II permissive change on the original filing is being pursued to add a single Narrow band Internet of Things Guard Band (NB IoT GB here after) carrier to the AHFIB AirScale Base Station Remote Radio Head Federal Communication Commission and Industry Canada certifications. Please refer to the test report on the original certification (NTS Report PR072254 Rev 1 dated March 16, 2018) for details on all required testing.

All conducted RF testing performed for the original certification testing has been repeated using NB IoT GB for this class II permissive change per correspondence/guidance from Nemko TCB. NB IoT offsets from LTE carrier center frequencies were: LTE10: +/-4597.5 kHz; LTE15: +/-6892.5 kHz; and, LTE20: +/-9097.5 kHz. Tests performed under the class II change effort include RF power, peak to average power ratio, emission bandwidth (99% and 26 dB down), band edge spurious emissions (± 1MHz), and conducted spurious emissions.

Antenna port conducted RF measurements were taken with NTS personnel **(Jose Mendez)** at Nokia located at 6000 Connection Drive, Irving, Texas, on **October 15-16, 2018**. The base station and remote radio head software for this testing is an updated release that includes the single carrier NB IoT GB support. The LTE and guard band modulation types were both QPSK for all testing herein. The test sample was selected and prepared by John LoPresti of Nokia Solutions and Networks.

Conducted Emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards:

ANSI C63.26-2015

FCC KDB 971168 DO1 v03r01

FCC KDB 662911 DO1 v02r01

STATEMENT OF COMPLIANCE

The tested sample of Nokia Solutions and Networks product AHFIB AirScale Base Station Remote Radio Head complied with the requirements of the standards and frequency bands declared in the scope of this test report.

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

MEASUREMENT UNCERTAINTIES

Measurement uncertainties of the test facility based on a 95% confidence level are as follows:

Table 1. Measurement Uncertainties

Test	Uncertainty
Radio frequency	± 0.2ppm
RF power conducted	±1.2 dB
RF power radiated	±3.3 dB
RF power density conducted	±1.2 dB
Spurious emissions conducted	±1.2 dB
Adjacent channel power	±0.4 dB
Spurious emissions radiated	±4 dB
Temperature	±1°C
Humidity	±1.6 %
Voltage (DC)	±0.2 %
Voltage (AC)	±0.3 %

2. RESULT SUMMARY FOR THE CLASS II TESTING

The following tables provide a summary (Class II testing only) of the test results:

AHFIB with LTE plus single NB IoT Guard Band carrier					
FCC	**IC**	**Description**	**Measured**	**Limit**	**Results**
24.229 27.5(h)&(j)	RSS-133 Sec 6.1 RSS-139 Sec 6.1	Frequency Ranges	LTE10: 1935-1990 MHz LTE10: 2115.0 - 2150.0 MHz	1930 – 1995 MHz 2110.0 – 2155.0 MHz	Pass
2.1047 2.1033(c)(4)	RSS-133 Sec 6.2 RSS-139 Sec 6.2	Modulation Type	NB IoT Guard band (QPSK) with LTE10 (QPSK)	Digital	Pass
24.232 27.50(d)(2)	RSS-133 Sec 6.4 RSS-139 Sec 6.5	Output Power	Highest Conducted Power Output RMS: 45.53dBm EIRP depends on antenna gain which is unknown.	FCC: 1640W EIRP IC: 100W Conducted	Pass
24.232 27.50(d)(5)	RSS-133 Sec 6.4 RSS-139 Sec 6.5	Peak to Average Ratio	Highest Measured PAPR: 8.20dB	13dB	Pass
	RSS-133 Sec 2.3 RSS-Gen Sec 6.6	99% Emission Bandwidth	LTE10: 9.24 MHz IC Emission Designator is **9M24F9W**	Remain in Block	Pass
24.238 27.53(h)(3)		26dB down Emission Bandwidth	LTE10: 9.81 MHz FCC Emission Designator is **9M81F9W**	Remain in Block	Pass
24.238 27.53(h)	RSS-133 Sec 6.5.1 RSS-139 Sec 6.6	Transmitter Spurious Emissions at the Antenna Terminal (See Note 1)	< -19dBm	-19dBm per Transmit Chain	Pass
Note 1: Based on 1MHz RBW. In the 1MHz immediately outside and adjacent to the frequency block a RBW of at least 1% of the emission bandwidth was used					
Note 2: In addition to the above, refer to the original certification report (NTS Report PR072254 Rev 1 dated March 16, 2018) for the complete list of test results					

3. EUT HARDWARE

Company	Model	Description	Part/Serial Number	FCC ID/IC Number
Nokia Solutions and Networks	AHFIB	AirScale BTS RRH	Part#: 474216A.101 Serial#: K9174553644	FCC ID: VBNAHFIB-01 IC ID: 661W-AHFIB

4. TEST MEASUREMENT EQUIPMENT

Company	Type		Model	Serial Number	Last Cal	Cal Due
Keysight	Spectrum Analyzer		MXA N2090A	US46220313	02/16/17	02/16/19
Keysight	Spectrum Analyzer		PSA E4440A	MY44303970	10/18/17	10/18/19
R&S	Network Analyzer		ZVL	102098	02/11/18	02/11/19
R&S	Network Analyzer		ZVA50	100241	05/04/2018	05/04/2019

5. AUXILLARY EQUIPMENT

Company	Description	Part Number	Serial Number
Aeroflex/Weinschel	Attenuator, 20 dB, 100 W	48-20-33	BT3184
Aeroflex/Weinschel	Attenuator, 20 dB, 50 W	24-20-34	BH6436
Weinschel	Attenuator, 20 dB, 150 W	57-20-33-LM	MC060
Microwave Circuits	Low Pass Filter, DC-1350 MHz	L13502G1	2050-02 DC0229

6. SUPPORT EQUIPMENT

Company	Model	Description	Part/Serial Number	FCC ID/IC Number
Nokia	ASIA	Airscale System Module	Part#: 473095A.101, Serial#: L1163006115	N/A
Nokia	6GHz SFP Module	FOSH 6G SFP+ 300m 850nm	PN: 472579A.101 SN: FR162521945	
Nokia	6GHz SFP Module	FOSH 6G SFP+ 300m 850nm	PN: 472579A.101 SN: FR1625704824	
HP	Z240	Tower Workstation (PC)	N/A	N/A

7. EUT SOFTWARE

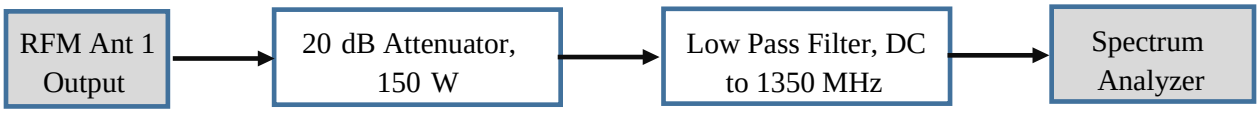
The base station and RF module software for this testing is an updated release that includes the NB IoT GB type as defined below.

(1) RFM Unit Software: FRM 58.08.R05H
(2) System Module Software: FL18SP_ENB_0000_000623_0000
(3) BTS Manager Software: FL18SP-0000_000499_000000

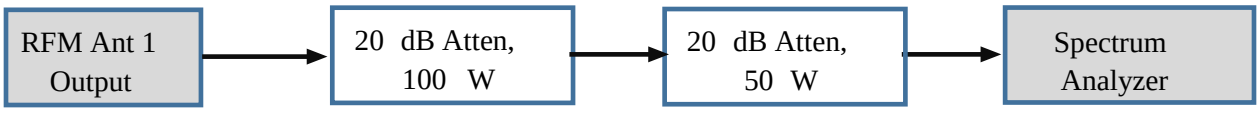
FL18SP only supports NBIOT guard band signals for LTE10, LTE15 and LTE20 bandwidths, and for the AHFIB, only LTE10 is supported. Therefore, LTE10 was the only configuration tested for this feature. As required in 3GPP TS 36.141 §6.1.4, the IOT carrier configured was given Cell ID 103.

8. RF TEST SETUP DIAGRAMS

The following are the setups used in the RF conducted emissions testing.

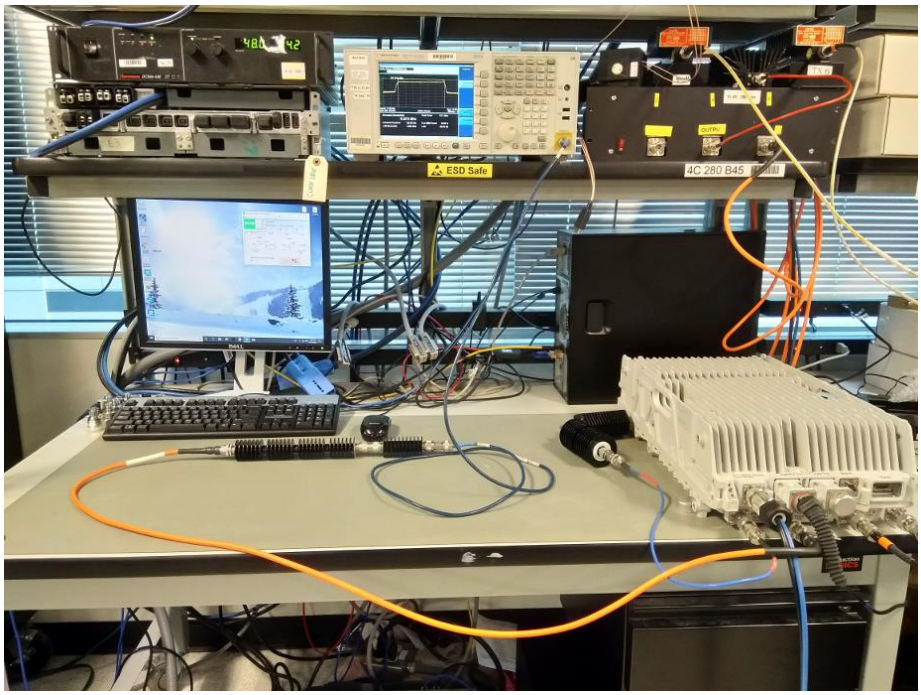


Setup for 9 kHz to 10MHz Measurements

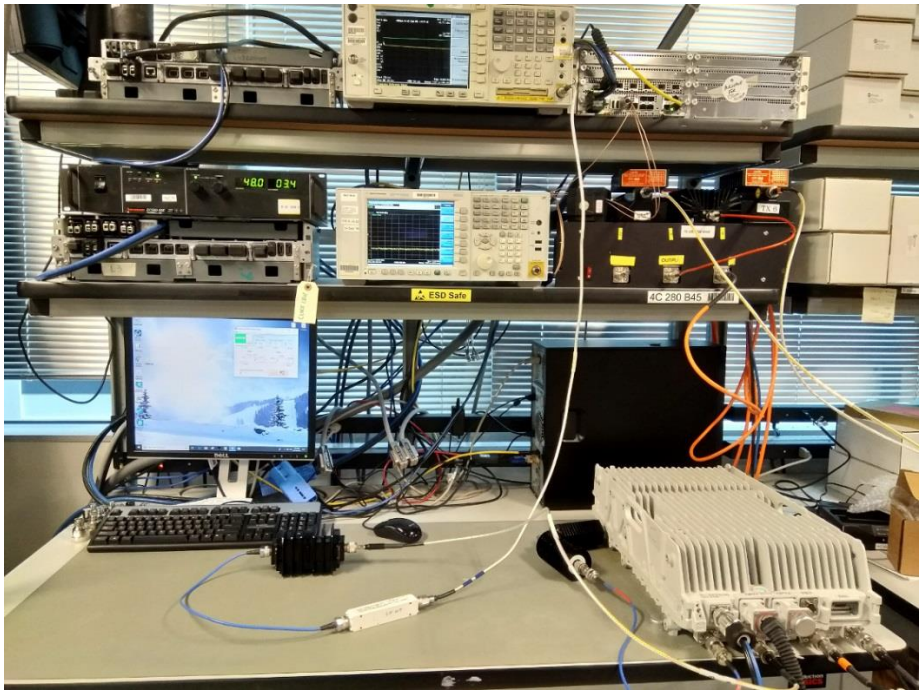


Setup for 10MHz to 22GHz Measurements

9. TEST SETUP PHOTOGRAPHS



10MHz to 22GHz Setup Photo



9 kHz to 10MHz Setup Photo

10. AHFIB LTE DOWNLINK BAND EDGE EARFCNS

Band 25 (BTS Rx: 1850 to 1915 MHz/BTS Tx: 1930 to 1995 MHz) and Band 66 (BTS Rx: 1710 to 1780 MHz/BTS Tx: 2110 to 2200 MHz) band edge downlink (BTS Transmit)

EARFCNs for LTE channel bandwidths (5, 10, 15 and 20 MHz) are provided in following table. The EARFCN is defined as E-UTRA Absolute Radio Frequency Channel Number. The channel spacing is 100 kHz between channel numbers.

Table 2. AHFIB LTE Center Frequencies and Channels

band 66				band 25			
	LTE5				LTE5		
	B	M	T		B	M	T
EARFCN	66461	66886	67311	EARFCN	8065	8365	8665
Freq.	2112.5	2155	2197.5	Freq.	1932.5	1962.5	1992.5
	LTE10				LTE10		
	B	M	T		B	M	T
EARFCN	66486	66886	67286	EARFCN	8090	8365	8640
Freq.	2115	2155	2195	Freq.	1935	1962.5	1990
	LTE15				LTE15		
	B	M	T		B	M	T
EARFCN	66511	66886	67261	EARFCN	8115	8365	8615
Freq.	2117.5	2155	2192.5	Freq.	1937.5	1962.5	1987.5
	LTE20				LTE20		
	B	M	T		B	M	T
EARFCN	66536	66886	67236	EARFCN	8140	8365	8590
Freq.	2120	2155	2190	Freq.	1940	1962.5	1985

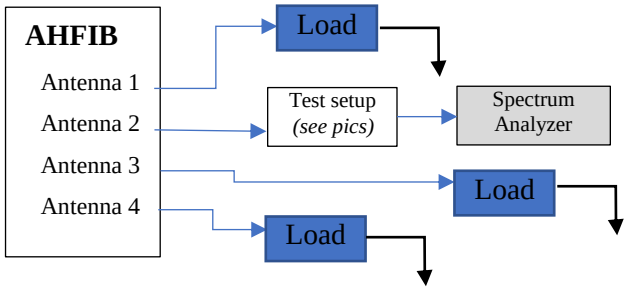
All frequencies are in MHz, EARFCN numbers are unitless.
B=bottom channel LTE center frequency
M=middle channel LTE center frequency
T= top channel LTE center frequency

Table 3. AHFIB Downlink Band Edge Frequencies

Band	Bottom Edge Freq. (MHz)	Top Edge Freq. (MHz)
band 66	2110	2200
band 25	1930	1995
Band Edge frequencies are the same for all LTE bandwidths.		

11. TEST DATA FOR AHFIB

All conducted RF measurements for this test effort in this section were made at AHFIB antenna port 2, consistent with the original certification. The general test setup used is provided below.



General Test Setup Used for Conducted RF Measurements on AHFIB

11.1. RF Output Power

Peak and RMS Average RF output power was measured at the AHFIB RRH antenna port 2. Measurements were made on the bottom, middle and top channels on each band (25 and 66) placing the NB IoT Guard Band carrier at the lower end of the carrier and then the upper end of the carrier for the LTE bandwidths of 10MHz, 15MHz, and 20MHz. Peak to average power ratio (PAPR) has been calculated as described in section 5.7.2 of KDB971168 D01 v03r01. The results of the power measurements and PAPR calculations are provided in the tables below.

Table 4. RF Output Power – Band 25, LTE10, Lower NB IoT GB

Freq. Band	Freq. Channel	LTE Bandwidth	NB IoT GB placement	LTE - Aggregate w/NB IoT GB		
25	Bottom Channel	LTE10	Lower	53.55	45.53	8.02
25	Middle Channel	LTE10	Lower	53.36	45.28	8.06
25	Top Channel	LTE10	Lower	53.39	45.42	7.97

Table 5. RF Output Power – Band 25, LTE10, Upper NB IoT GB

Freq. Band	Freq. Channel	LTE Bandwidth	NB IoT GB placement	LTE - Aggregate w/NB IoT GB		
25	Bottom Channel	LTE10	Upper	53.59	45.50	8.09
25	Middle Channel	LTE10	Upper	53.29	45.25	8.04
25	Top Channel	LTE10	Upper	53.38	45.45	7.93

Table 6. RF Output Power – Band 66, LTE10, Lower NB IoT GB

Freq. Band	Freq. Channel	LTE Bandwidth	NB IoT GB placement	LTE - Aggregate w/NB IoT GB		
66	Bottom Channel	LTE10	Lower	53.35	45.31	8.04
66	Middle Channel	LTE10	Lower	53.4	45.40	8.00
66	Top Channel	LTE10	Lower	53.37	45.32	8.05

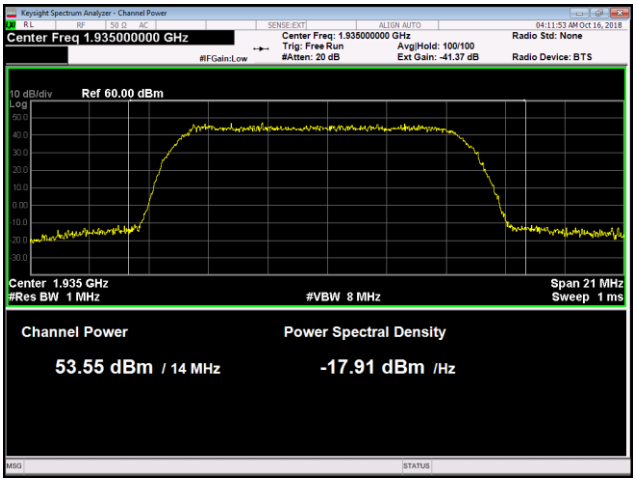
Table 7. RF Output Power – Band 66, LTE10, Upper NB IoT GB

Freq. Band	Freq. Channel	LTE Bandwidth	NB IoT GB placement	LTE - Aggregate w/NB IoT GB		
66	Bottom Channel	LTE10	Upper	53.49	45.37	8.12
66	Middle Channel	LTE10	Upper	53.53	45.37	8.16
66	Top Channel	LTE10	Upper	53.48	45.28	8.20

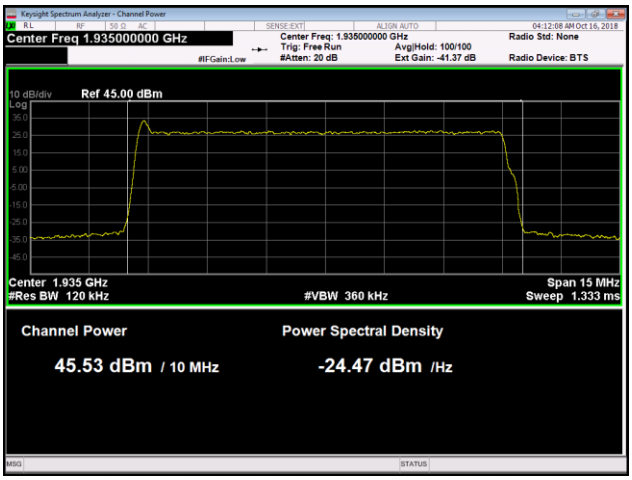
All measurement results are provided in the following pages. The total measurement RF path loss of the test setup (attenuator and test cables) was 41.37 dB for Band 25 and 41.46 for Band 66 and is accounted for by the spectrum analyzer external gain offset.

Channel Power Plots, Band 25, LTE10, Lower NB IoT GB Carrier:

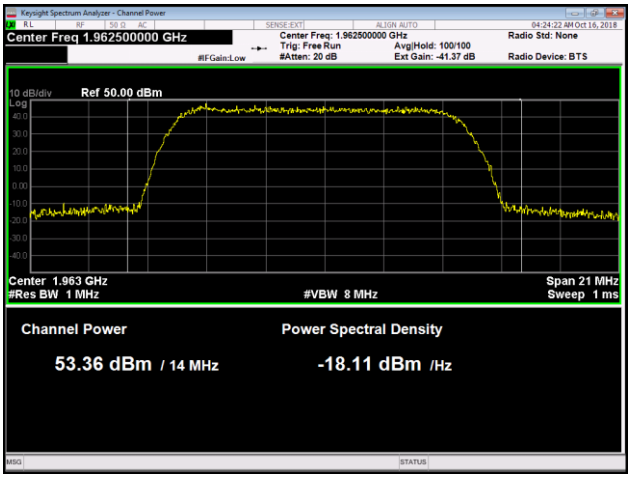
LTE10 Bottom Channel Peak



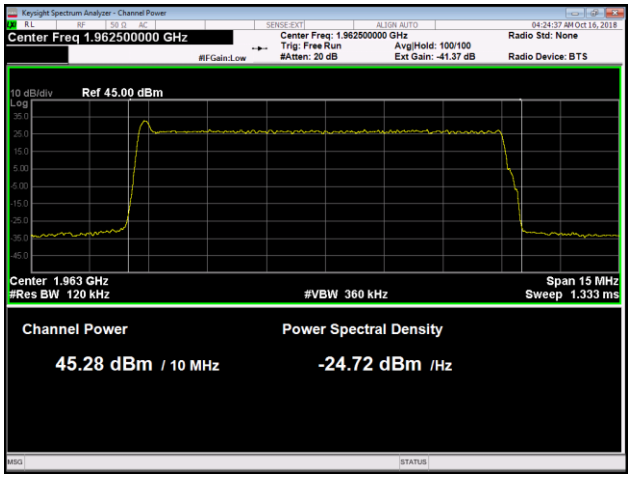
LTE10 Bottom Channel Average



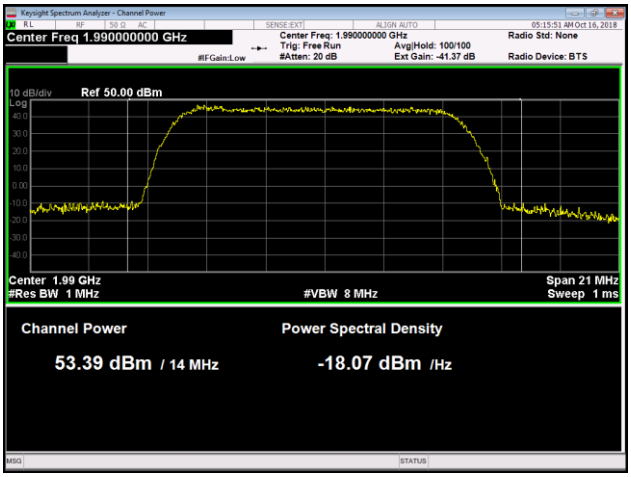
LTE10 Middle Channel Peak



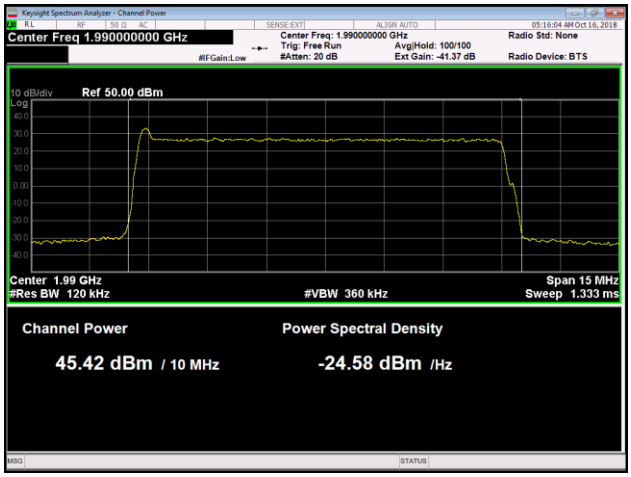
LTE10 Middle Channel Average



LTE10 Top Channel Peak

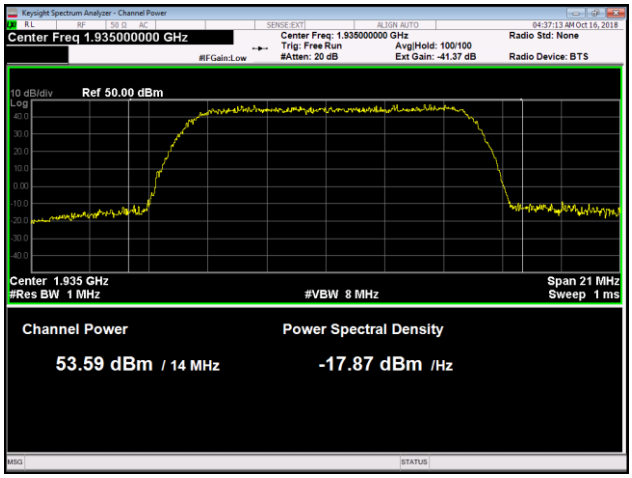


LTE10 Top Channel Average

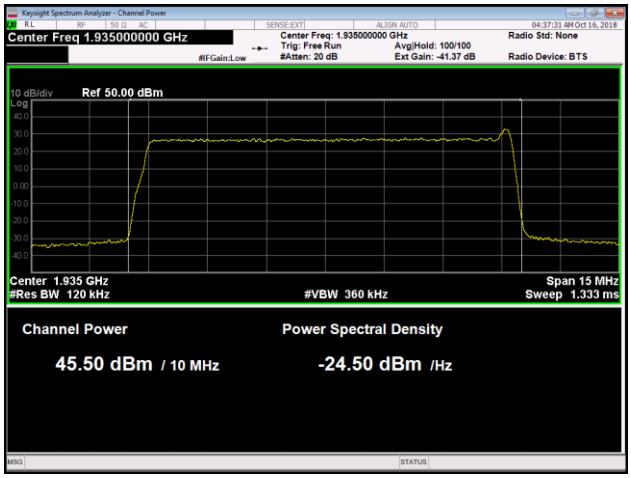


Channel Power Plots, Band 25, LTE10, Upper NB IoT GB Carrier:

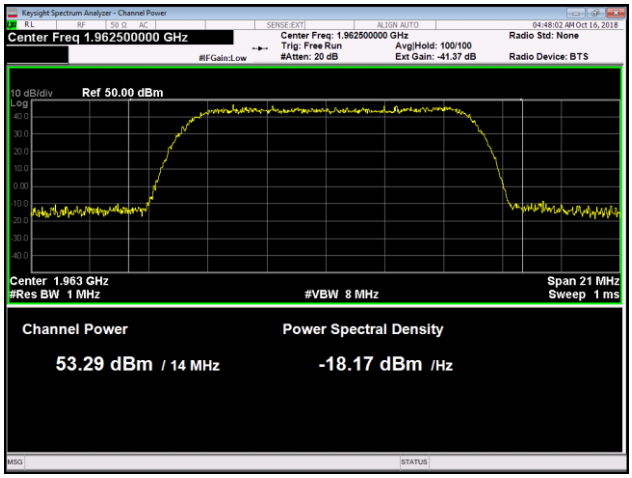
LTE10 Bottom Channel Peak



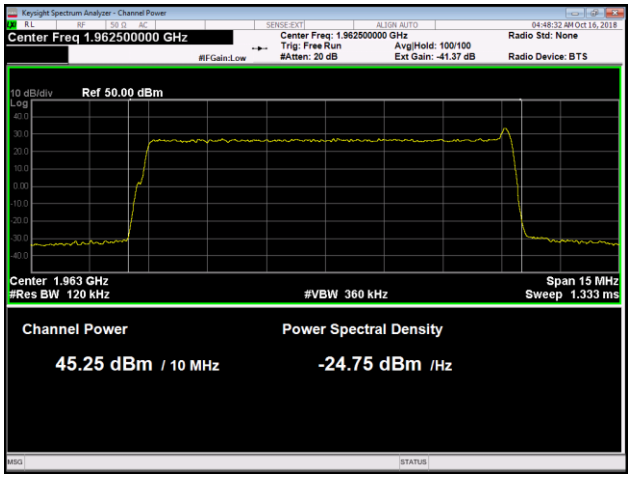
LTE10 Bottom Channel Average



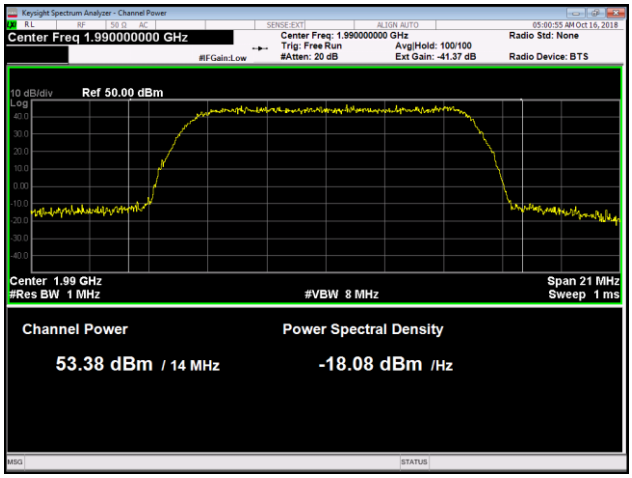
LTE10 Middle Channel Peak



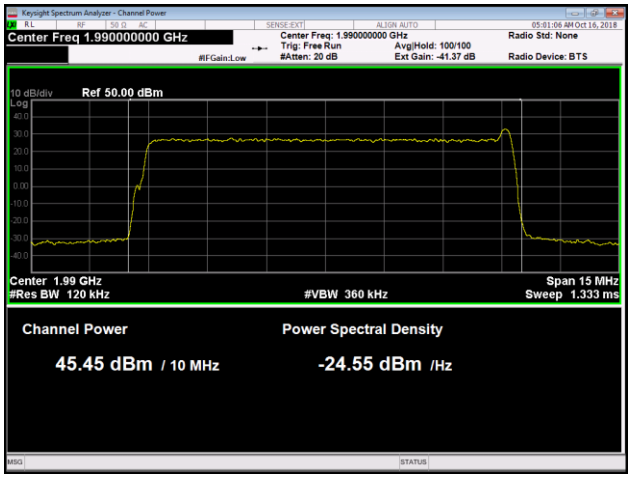
LTE10 Middle Channel Average



LTE10 Top Channel Peak

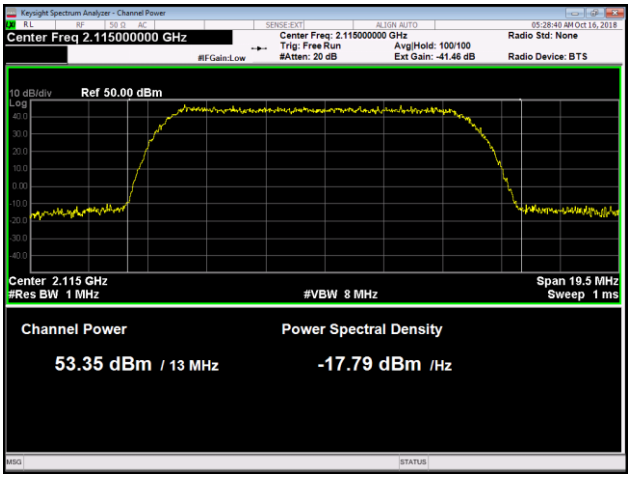


LTE10 Top Channel Average

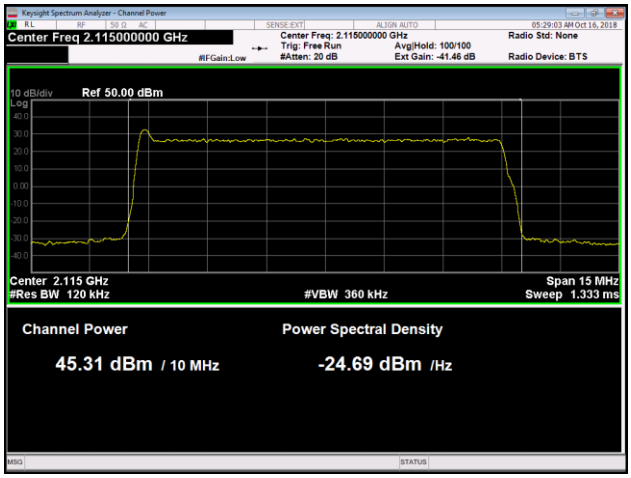


Channel Power Plots, Band 66, LTE10, Lower NB IoT GB Carrier:

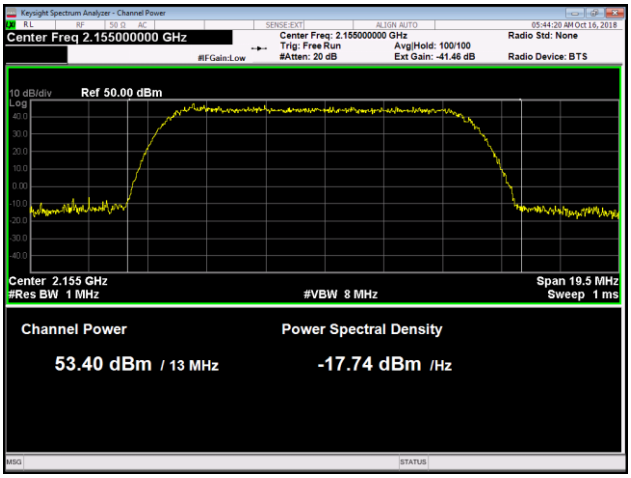
LTE10 Bottom Channel Peak



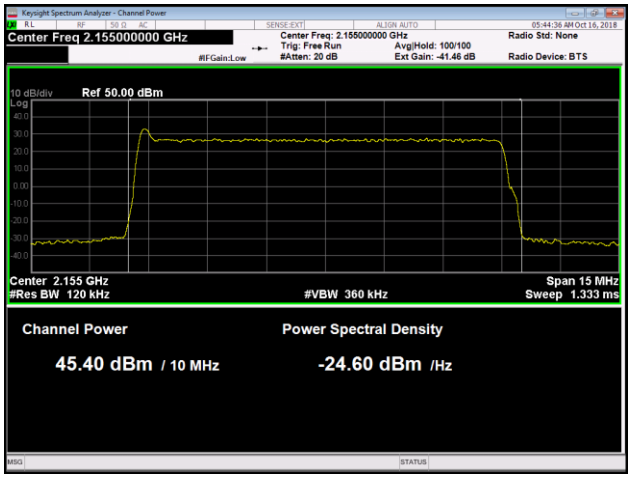
LTE10 Bottom Channel Average



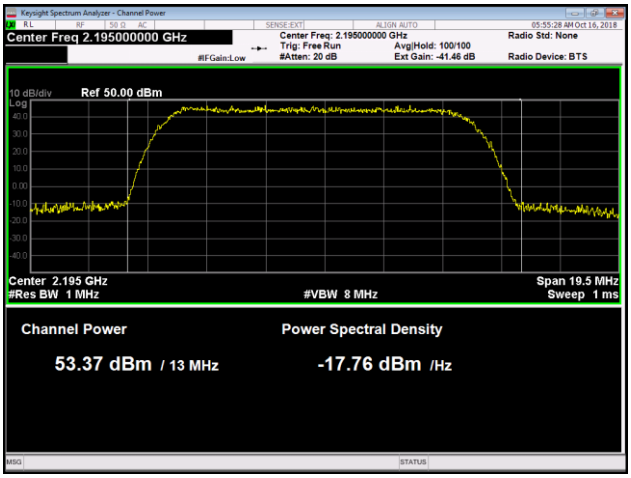
LTE10 Middle Channel Peak



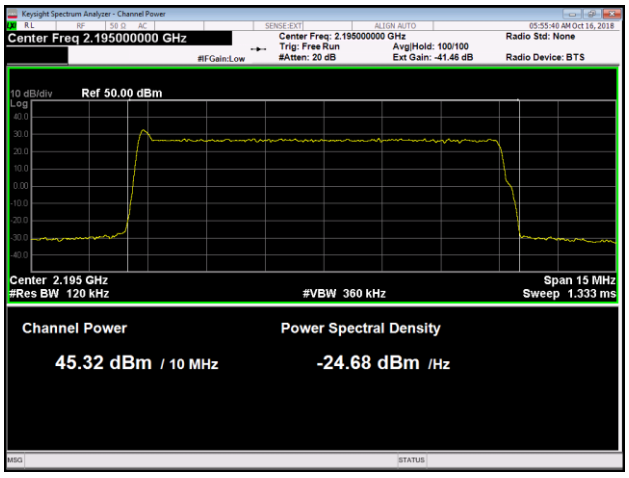
LTE10 Middle Channel Average



LTE10 Top Channel Peak

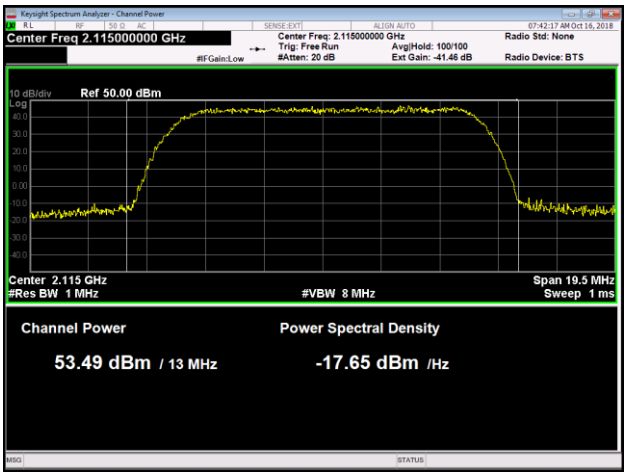


LTE10 Top Channel Average

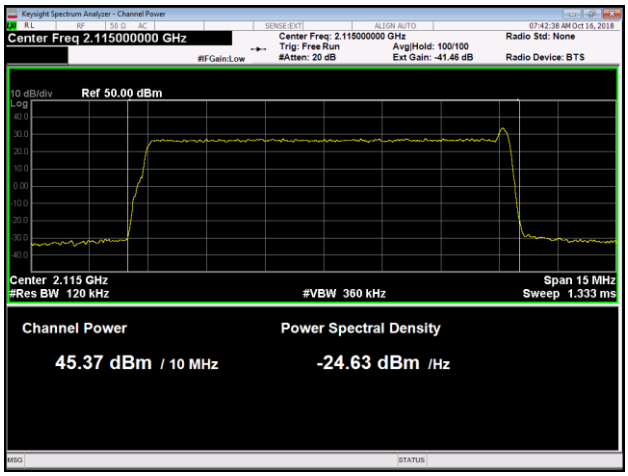


Channel Power Plots, Band 66, LTE10, Upper NB IoT GB Carrier:

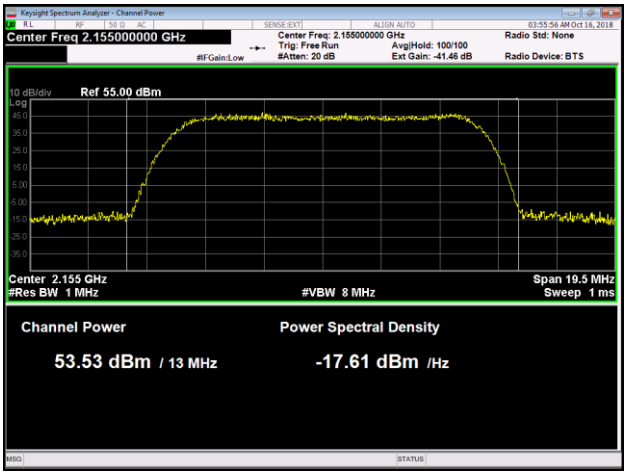
LTE10 Bottom Channel Peak



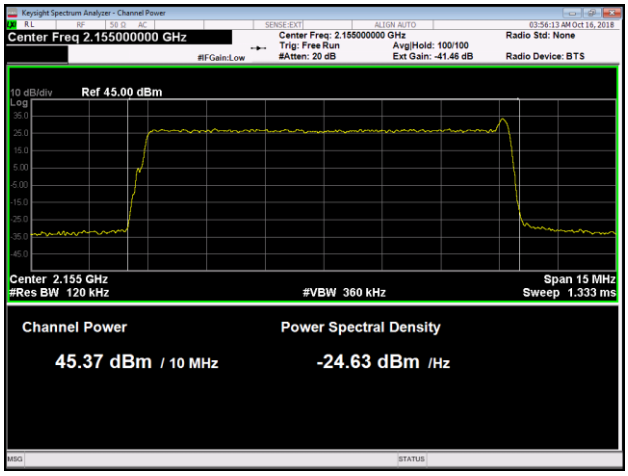
LTE10 Bottom Channel Average



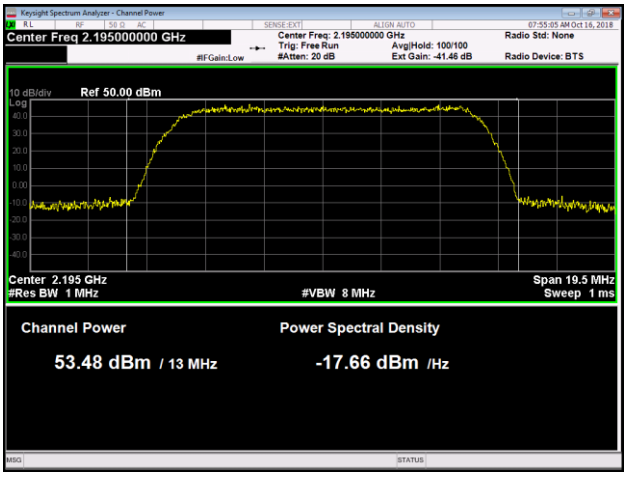
LTE10 Middle Channel Peak



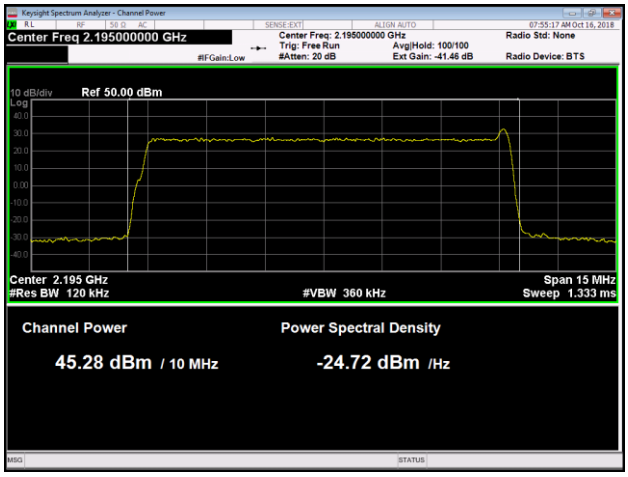
LTE10 Middle Channel Average



LTE10 Top Channel Peak



LTE10 Top Channel Average



11.2. Emission Bandwidth (26 dB down and 99%)

Emission bandwidth measurements were made at AHFIB antenna port 2 for NB IoT GB. Measurements were made on the bottom, middle and top channels for LTE bandwidths of 10MHz, 15MHz, and 20MHz. The results are provided in the following table.

Table 8. Emission Bandwidth Band 25 (Lower Guard Band)

LTE Bandwidth	Band 25 NB IoT Guard band (Lower)					
	Bottom Channel		Middle Channel		Top Channel	
	26dB(MHz)	99% (MHz)	26dB(MHz)	99% (MHz)	26dB(MHz)	99% (MHz)
10M	9.80	9.24	9.78	9.23	9.80	9.23
15M	-	-	-	-	-	-
20M	-	-	-	-	-	-

Table 9. Emission Bandwidth Band 66 (Lower Guard Band)

LTE Bandwidth	Band 66 NB IoT Guard band (Lower)					
	Bottom Channel		Middle Channel		Top Channel	
	26dB(MHz)	99% (MHz)	26dB(MHz)	99% (MHz)	26dB(MHz)	99% (MHz)
10M	9.81	9.24	9.79	9.23	9.80	9.23
15M	-	-	-	-	-	-
20M	-	-	-	-	-	-

Table 10. Emission Bandwidth Band 25 (Upper Guard Band)

LTE Bandwidth	Band 25 NB IoT Guard band (upper)					
	Bottom Channel		Middle Channel		Top Channel	
	26dB(MHz)	99% (MHz)	26dB(MHz)	99% (MHz)	26dB(MHz)	99% (MHz)
10M	9.80	9.23	9.79	9.24	9.80	9.24
15M	-	-	-	-	-	-
20M	-	-	-	-	-	-

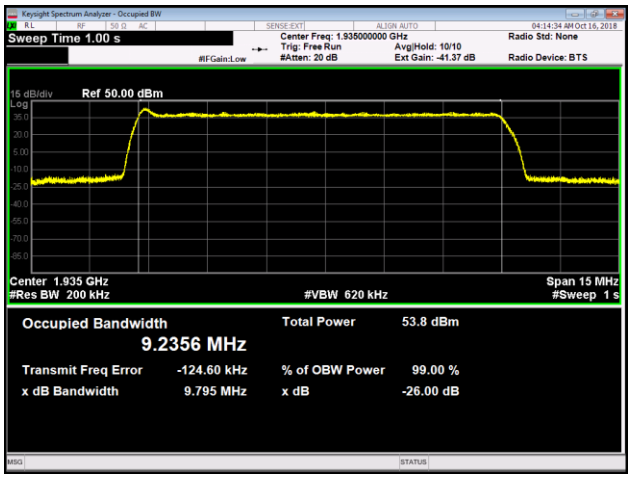
Table 11. Emission Bandwidth Band 66 (Upper Guard Band)

LTE Bandwidth	Band 66 NB IoT Guard band (upper)					
	Bottom Channel		Middle Channel		Top Channel	
	26dB(MHz)	99% (MHz)	26dB(MHz)	99% (MHz)	26dB(MHz)	99% (MHz)
10M	9.80	9.24	9.56	9.19	9.80	9.24
15M	-	-	-	-	-	-
20M	-	-	-	-	-	-

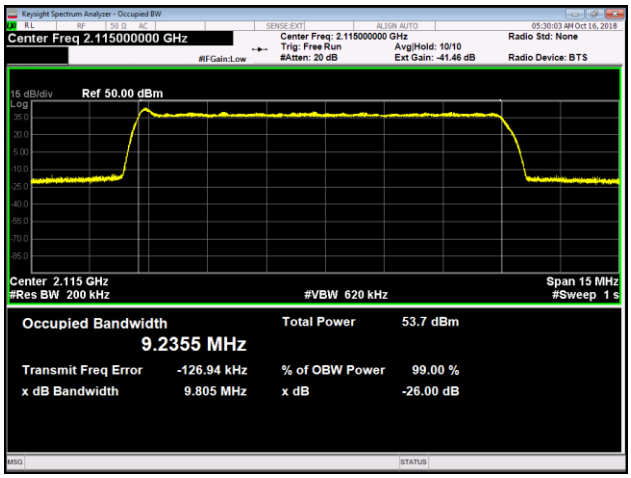
Emission bandwidth measurement data are provided in the following pages.

Emission Bandwidth Plots, NB IoT GB Carrier in Lower Guard Band:

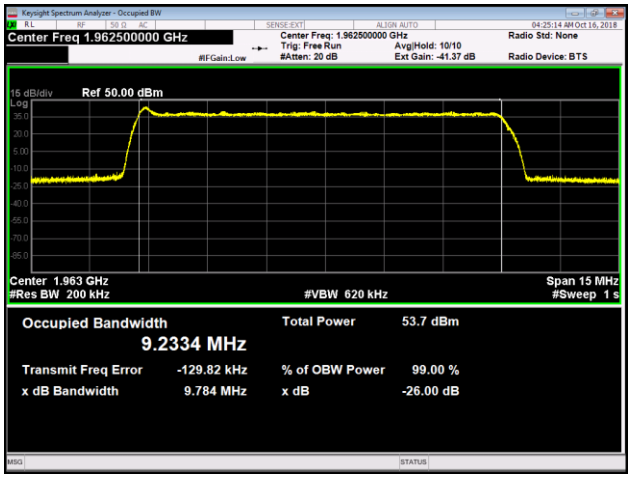
LTE10 Band 25 Bottom Channel



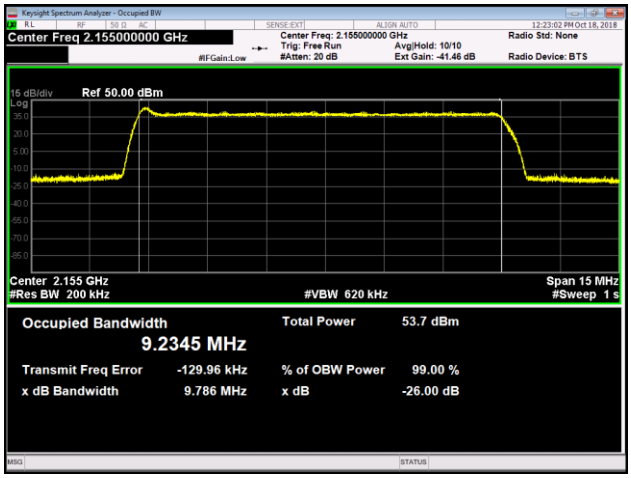
LTE10 Band 66 Bottom Channel



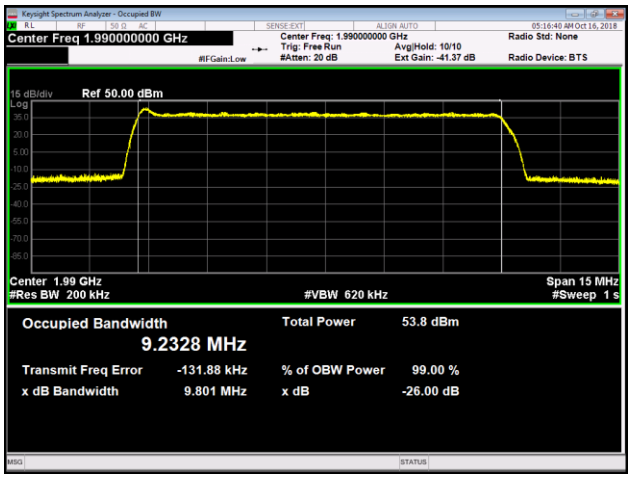
LTE10 Band 25 Middle Channel



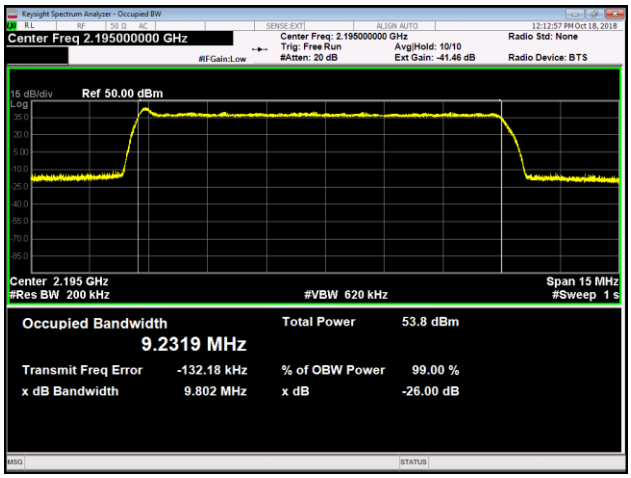
LTE10 Band 66 Middle Channel



LTE10 Band 25 Top Channel

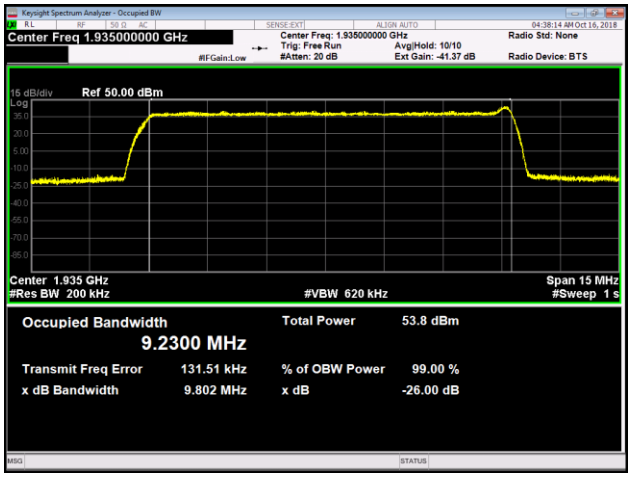


LTE10 Band 66 Top Channel

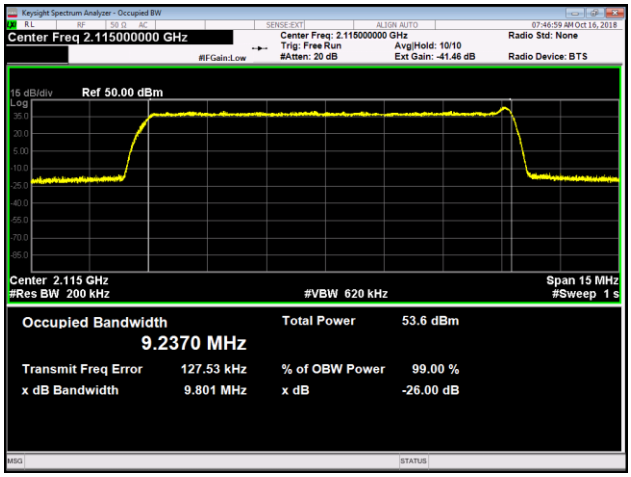


Emission Bandwidth Plots, NB IoT GB Carrier in Upper Guard Band:

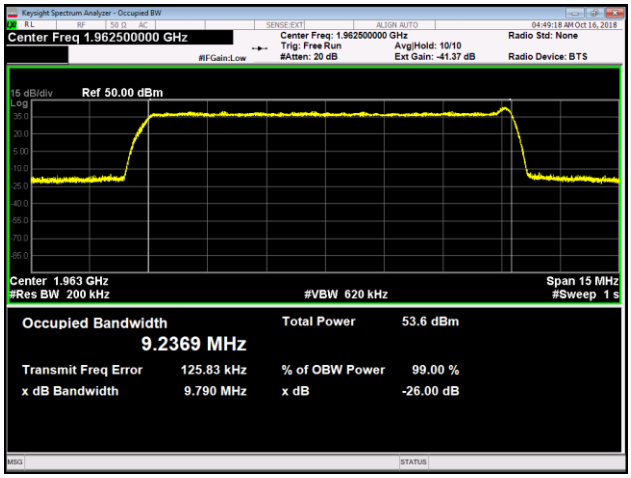
LTE10 Band 25 Bottom Channel



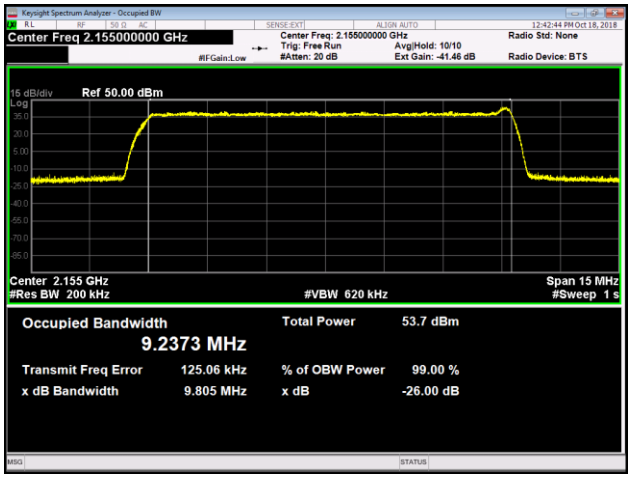
LTE10 Band 66 Bottom Channel



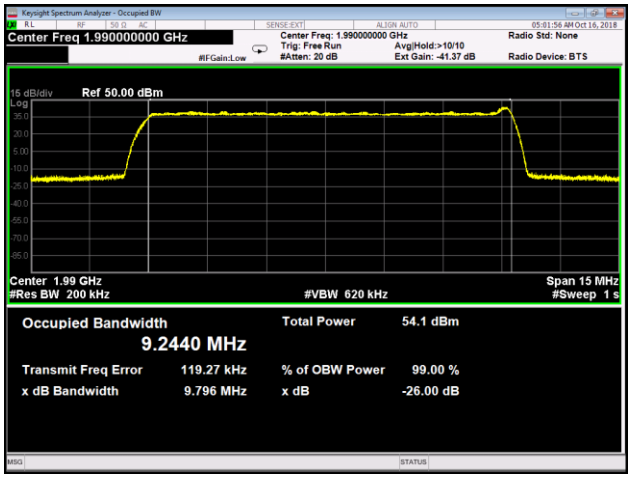
LTE10 Band 25 Middle Channel



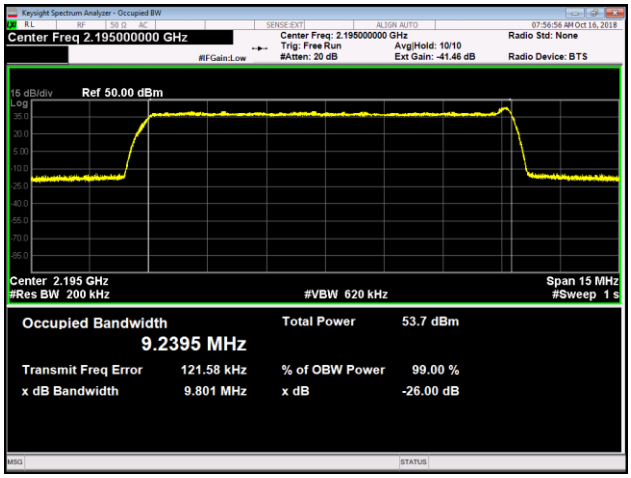
LTE10 Band 66 Middle Channel



LTE10 Band 25 Top Channel



LTE10 Band 66 Top Channel



11.3. Antenna Port Conducted Band Edge

Conducted band edge measurements were made at AHFIB RRH antenna port 2. The AHFIB was operated at the band edge frequencies with a single NB IoT Guard band carrier for 10MHz LTE bandwidth.

The same limit of -13dBm used in the original certification testing is used for this testing. The limit is adjusted to -19dBm [-13dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter.

Measurements were performed with the spectrum analyzer in the RMS average mode over 100 traces. In the 1MHz bands outside and adjacent to the frequency block, a resolution bandwidth of 1% of the emission bandwidth was used. In the 1 to 2MHz frequency range outside the band edge (i.e.: 2108 to 2109MHz and 2156 to 2157MHz bands) the RBW was again reduced to 1% of the emission bandwidth and the power integrated over 1MHz. In the 2 to 5MHz frequency range outside the band edge (i.e.: 2105 to 2108MHz and 2154 to 2156MHz bands) a 1MHz RBW and 3MHz VBW was used.

The results are summarized in the following table. The highest (worst case) emissions from the measurement data are provided.

Table 12. Band Edge (Band 25 Lower Guard Band)

LTE Bandwidth	Lower Guard Band Carrier		Limit (dBm)
	Bottom Channel	Top Channel	
10M	-20.64	-23.53	-19

Table 13. Band Edge (Band 25 Upper Guard Band)

LTE Bandwidth	Upper Guard Band Carrier		Limit (dBm)
	Bottom Channel	Top Channel	
10M	-24.42	-22.47	-19

Table 14. Band Edge (Band 66 Lower Guard Band)

LTE Bandwidth	Lower Guard Band Carrier		Limit (dBm)
	Bottom Channel	Top Channel	
10M	-21.63	-22.70	-19

Table 15. Band Edge (Band 66 Upper Guard Band)

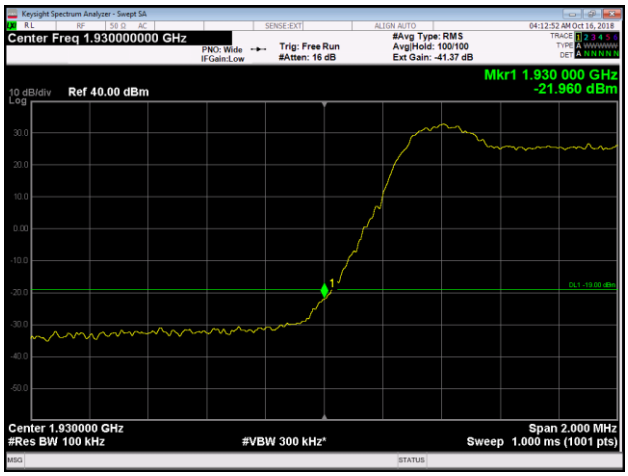
LTE Bandwidth	Upper Guard Band Carrier		Limit (dBm)
	Bottom Channel	Top Channel	
10M	-24.00	-21.03	-19

The total measurement RF path loss of the test setup (attenuator and test cables) was 41.37 dB for Band 25 and 41.46 for Band 66 and is accounted for by the spectrum analyzer external gain offset.

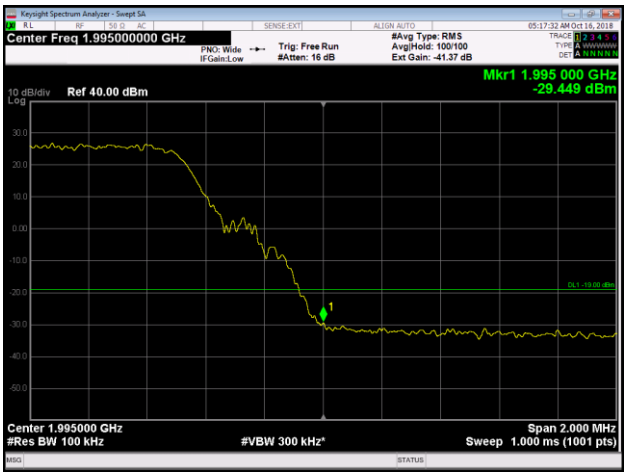
Conducted band edge measurements are provided in the following pages.

Band 25 LTE10 + Lower NB IoT GB Carrier Band Edge Plots:

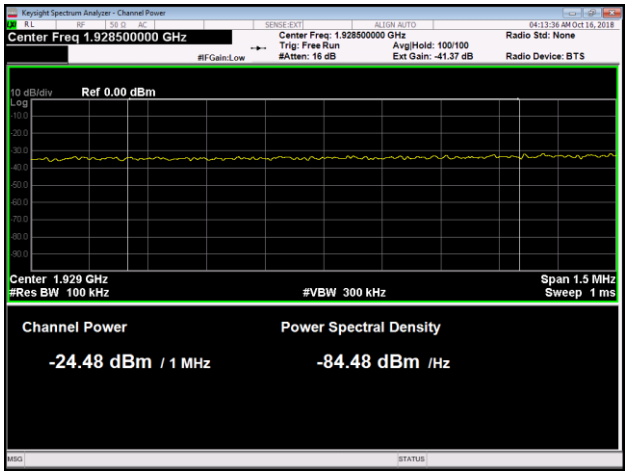
LTE10 Bottom Channel LBE 1929 to 1931MHz



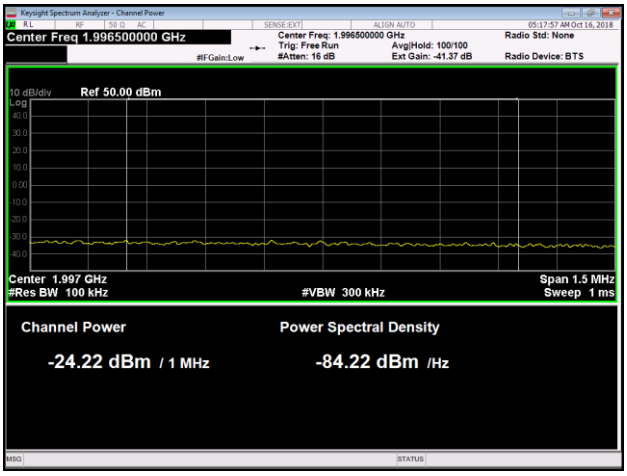
LTE10 Top Channel UBE 1994 to 1996MHz



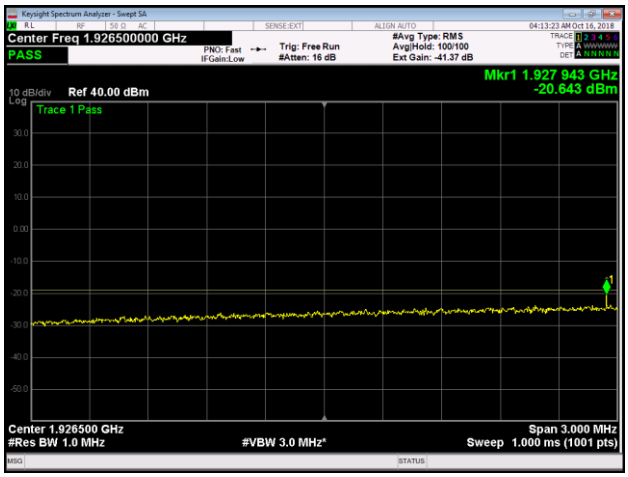
LTE10 Bottom Channel LBE 1928 to 1929MHz



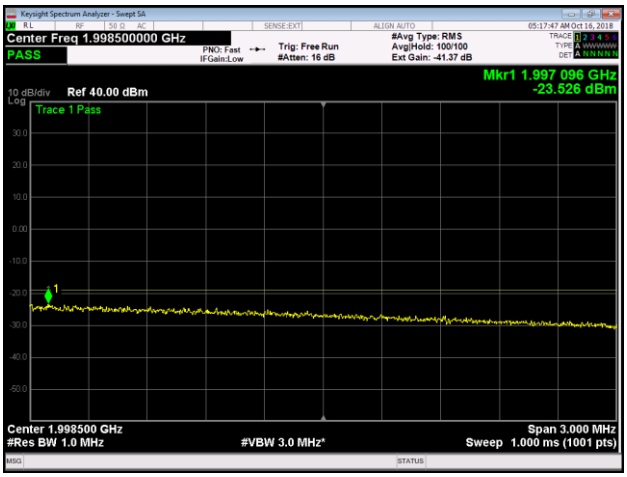
LTE10 Top Channel UBE 1996 to 1997MHz



LTE10 Bottom Channel LBE 1925 to 1928MHz

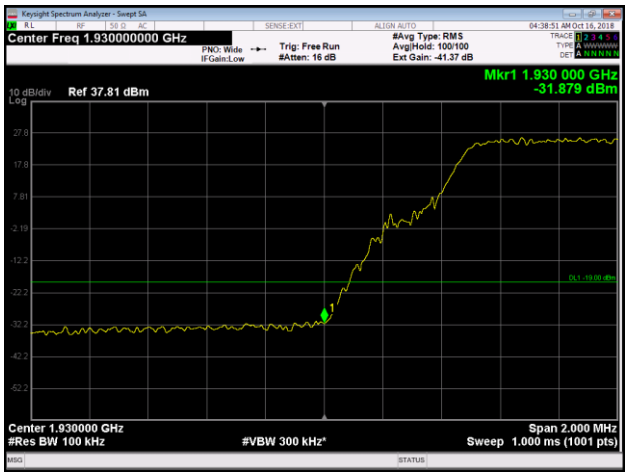


LTE10 Top Channel UBE 1997 to 2000MHz

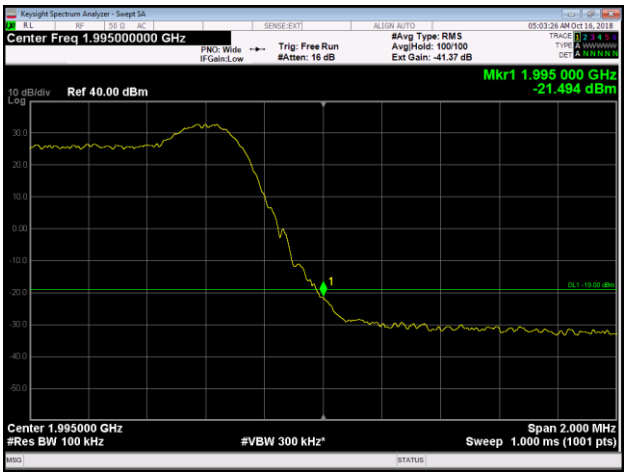


Band 25 LTE10 + Upper NB IoT GB Carrier Band Edge Plots:

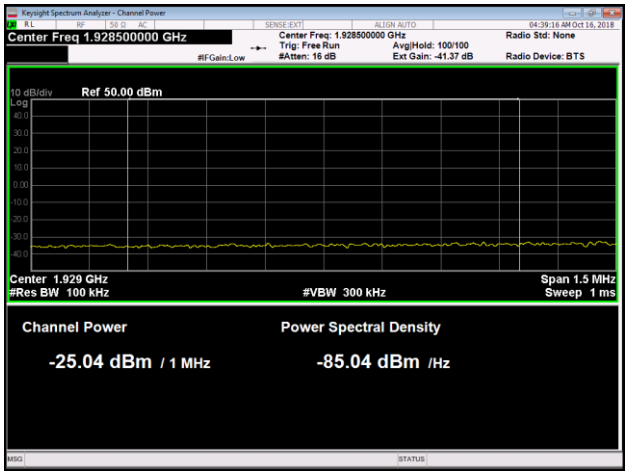
LTE10 Bottom Channel LBE 1929 to 1931MHz



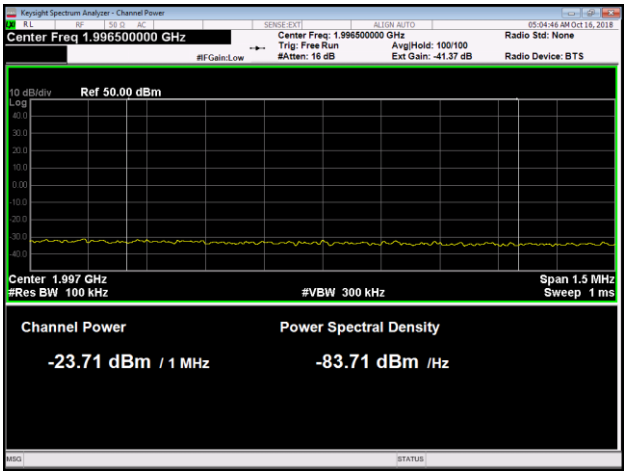
LTE10 Top Channel UBE 1994 to 1996MHz



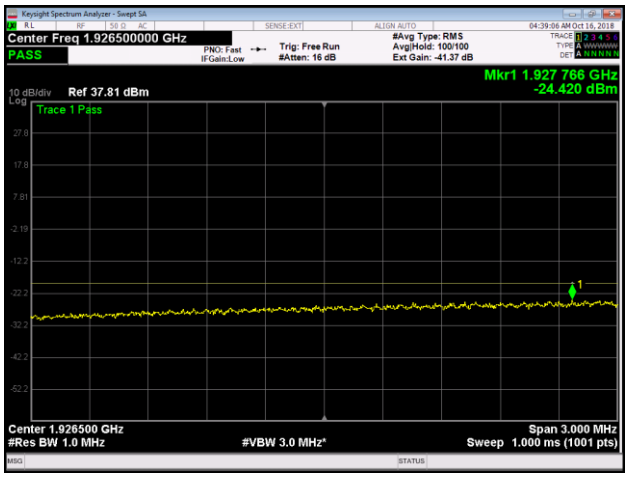
LTE10 Bottom Channel LBE 1928 to 1929MHz



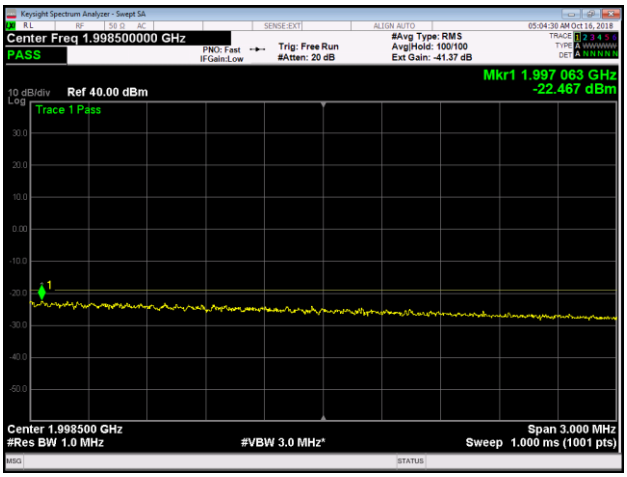
LTE10 Top Channel UBE 1996 to 1997MHz



LTE10 Bottom Channel LBE 1925 to 1928MHz

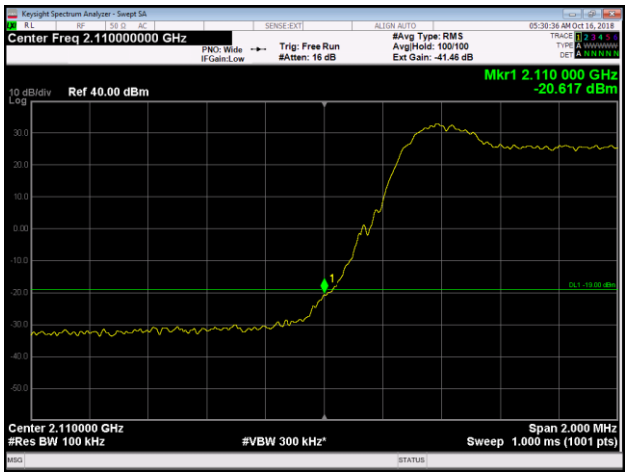


LTE10 Top Channel UBE 1997 to 2000MHz

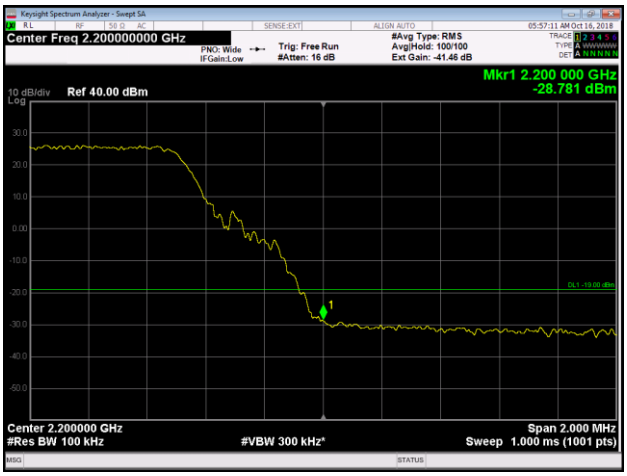


Band 66 LTE10 + Lower NB IoT GB Carrier Band Edge Plots:

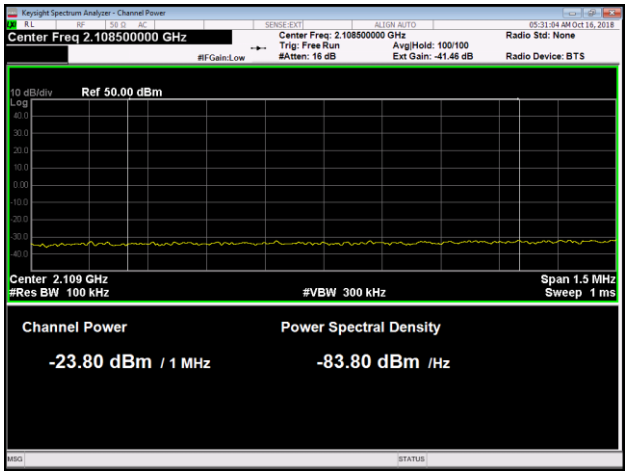
LTE10 Bottom Channel LBE 2109 to 2111MHz



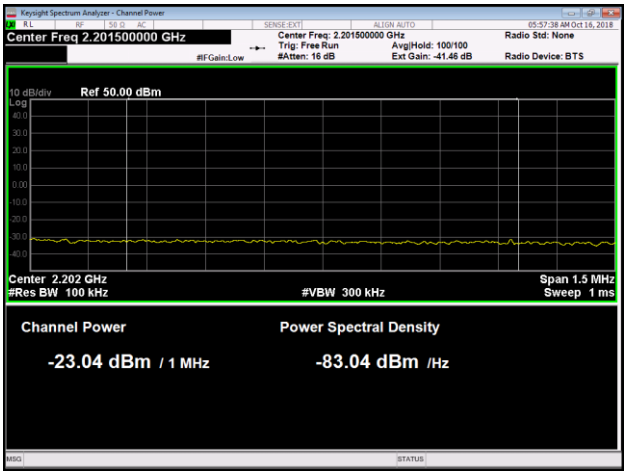
LTE10 Top Channel UBE 2199 to 2201MHz



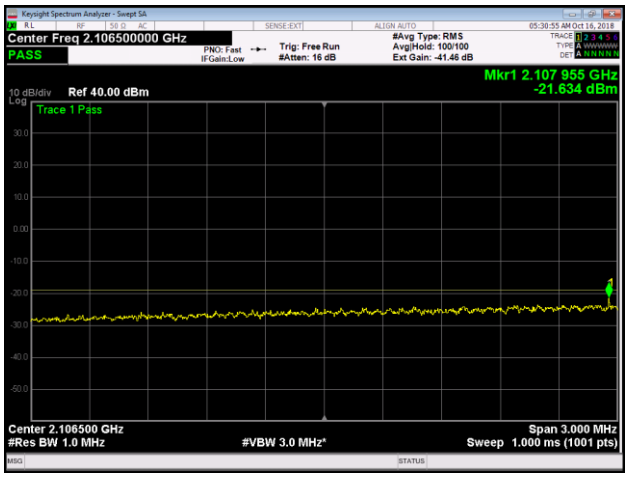
LTE10 Bottom Channel LBE 2108 to 2109MHz



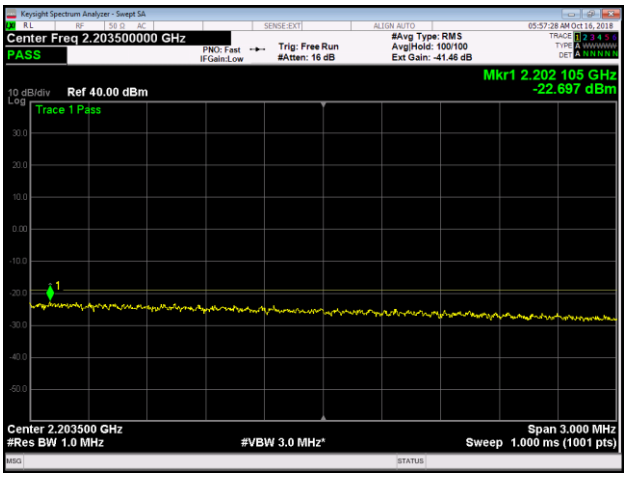
LTE10 Top Channel UBE 2201 to 2202MHz



LTE10 Bottom Channel LBE 2105 to 2108MHz

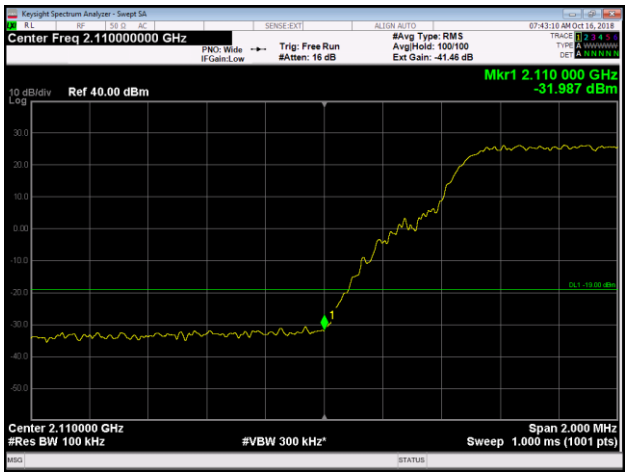


LTE10 Top Channel UBE 2202 to 2205MHz

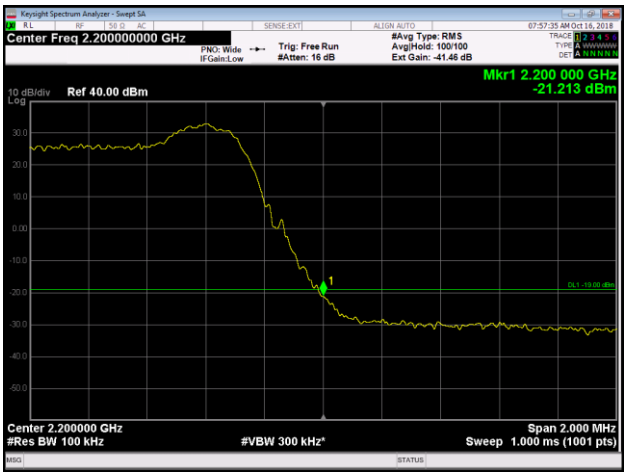


Band 66 LTE10 + Upper NB IoT GB Carrier Band Edge Plots:

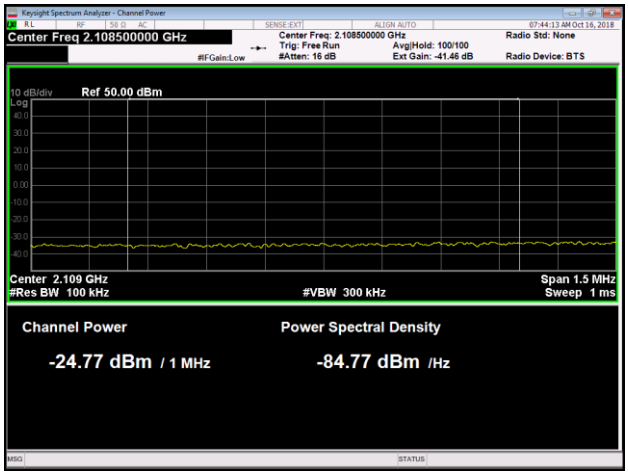
LTE10 Bottom Channel LBE 2109 to 2111MHz



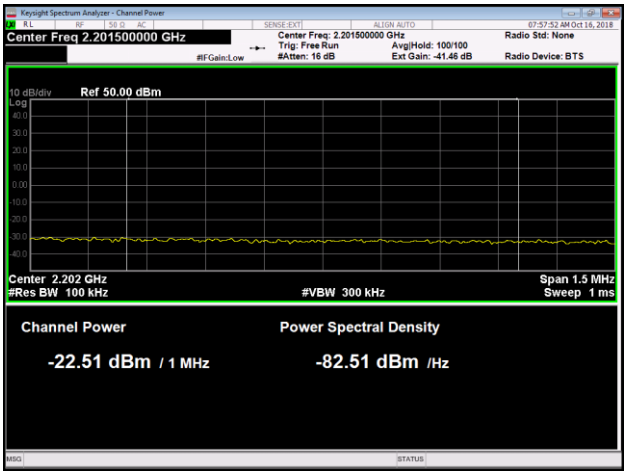
LTE10 Top Channel UBE 2199 to 2201MHz



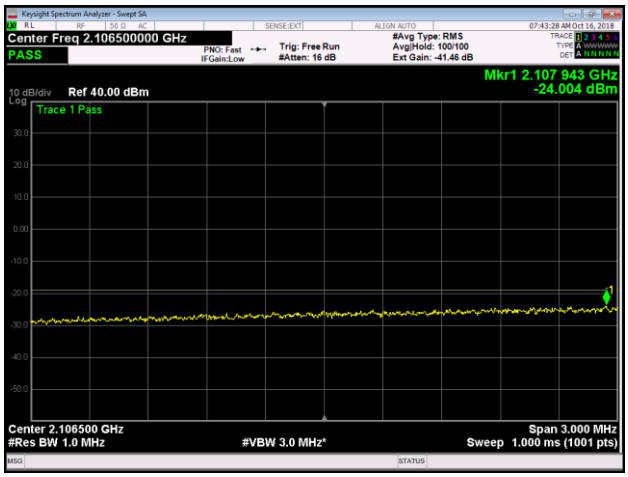
LTE10 Bottom Channel LBE 2108 to 2109MHz



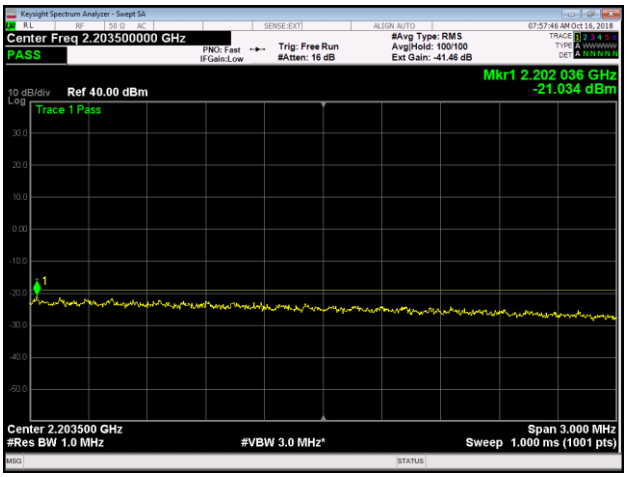
LTE10 Top Channel UBE 2201 to 2202MHz



LTE10 Bottom Channel LBE 2105 to 2108MHz



LTE10 Top Channel UBE 2202 to 2205MHz



11.4. Transmitter Antenna Port Conducted Emissions

Transmitter conducted emission measurements were made at AHFIB RRH antenna port #2. Measurements were performed over the 9kHz to 22GHz frequency range. The AHFIB was operated on the bottom, middle and top channels on both bands 25 and 66 with a single NB IoT Guard band carrier with LTE bandwidth of 10MHz.

The same limit of -13dBm used in the original certification testing is used for this testing. The limit is adjusted to -19dBm [-13dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter. The required measurement parameters include a 1MHz bandwidth with power measured in average value (since transmitter power was measured in average value). Measurements were performed with a spectrum analyzer using a peak detector with either max hold over 50 sweeps or RMS average mode over 100 traces (see table below). The required limit of -13 dBm was used as a base to calculate the following adjustments. The limit was adjusted from -13 dBm to -19dBm [-13dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter. The limit for the 9kHz to 150kHz frequency range was adjusted from -19 dBm 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 –29dBm to correct for a spectrum analyzer RBW of 100kHz versus required RBW of 1MHz [i.e.: -29dBm = -19dBm - 10log(1MHz/100kHz)]. The required limit of -19dBm with a RBW of 1MHz was used for all other frequency ranges.

The spectrum analyzer settings that were used for this test are summarized in the following table.

TABLE OF ANALYZER SETTINGS FOR CONDUCTED SPURIOUS EMISSIONS

Frequency Range	RBW	VBW	Number of Data Points	Detector/ Avg type	Sweep Time	Max Hold over	Path Loss Note (1)
9kHz to 150kHz	1kHz	3kHz	301	RMS Avg	Auto	Note (2)	18.76dB
150kHz to 10MHz	100kHz	300kHz	201	RMS Avg	Auto	Note (2)	18.76dB
10MHz to 100MHz	1MHz	3MHz	201	RMS Avg	Auto	Note (2)	37.81dB
100MHz to 1910MHz	1MHz	3MHz	1811	Max Peak	Auto	50 Sweeps	37.9dB
1910MHz to 2220MHz	1MHz	3MHz	2001	RMS Avg	Auto	Note (2)	41.46dB
2220GHz to 6.2GHz	1MHz	3MHz	3781	Max Peak	Auto	50 Sweeps	41.56dB
6.2GHz to 10GHz	1MHz	3MHz	4001	Max Peak	Auto	50 Sweeps	42.45dB
10GHz to 14GHz	1MHz	3MHz	4001	Max Peak	Auto	50 Sweeps	42.31dB
14GHz to 18GHz	1MHz	3MHz	8001	RMS Avg	Auto	Note (2)	44.04dB
18GHz to 22GHz	1MHz	3MHz	8001	RMS Avg	Auto	Note (2)	44.16dB

Note 1: The total measurement RF path loss of the test setup (attenuators, test cables and filters) is accounted for by the spectrum analyzer external gain offset.

Note 2: Max Hold not used and instead measurements were performed with the spectrum analyzer in the RMS average mode over 100 traces.

A low pass/carrier blocking filter was used to reduce measurement instrumentation noise floor for the frequency ranges less than 10MHz.The total measurement RF path loss of the test setup (attenuators, filter, cables) as shown in the table is accounted for by the spectrum analyzer reference level offset. The display line or limit line on the plots reflects the required limit.

Conducted spurious emission plots/measurements are provided in the following pages.