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-48.0	20	-3.086876168	-0.001	107	0.05	compliant
-55.2	20	-3.392128056	-0.002	107	0.05	compliant
<b>16QAM Modulation ANT4</b>						
-40.8	20	3.25856352	0.002	107	0.05	compliant
-48.0	20	3.427952397	0.002	107	0.05	compliant
-55.2	20	2.624348126	0.001	107	0.05	compliant
<b>256QAM Modulation ANT1</b>						
-40.8	20	-3.77229866	-0.002	107	0.05	compliant
-48.0	20	-2.528002078	-0.001	107	0.05	compliant
-55.2	20	4.151273752	0.002	107	0.05	compliant
<b>256QAM Modulation ANT2</b>						
-40.8	20	2.799688154	0.001	107	0.05	compliant
-48.0	20	-2.790845028	-0.001	107	0.05	compliant
-55.2	20	2.981503203	0.001	107	0.05	compliant
<b>256QAM Modulation ANT3</b>						
-40.8	20	-2.125936153	-0.001	107	0.05	compliant
-48.0	20	-2.648141381	-0.001	107	0.05	compliant
-55.2	20	4.126764543	0.002	107	0.05	compliant
<b>256QAM Modulation ANT4</b>						
-40.8	20	-2.881422843	-0.001	107	0.05	compliant
-48.0	20	-2.563687158	-0.001	107	0.05	compliant
-55.2	20	-4.686689645	-0.002	107	0.05	compliant

**Table 32 Frequency stability with voltage var. (20 MHz Channel BW)**

The measured frequency stability was found to be compliant with the manufacturer's specifications and with all requirements of the FCC rules.



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## 5. TEST DATA AND SCREENSHOTS

### 5.1 Part List of the RF Measurement Test Equipment

No.	Test Equipment	Manufacturer & Type	Serial Number	Calibration date	Calibration due	Test No.
1	Signal Analyzer	Rohde & Schwarz: FSW 2 Hz – 43.5 GHz	104600	10/2018	10/2019	1, 2, 3, 4, 6
2	Vector Network Analyzer	Rohde & Schwarz: ZVA40	100146	07/2018	07/2019	1, 2, 3, 4, 6
3	Vector Network Analyzer	Rohde & Schwarz: ZVL13	101177	07/2018	07/2019	1, 2, 3, 4, 6
4	Calibration Unit	Rohde & Schwarz: ZV-Z54	100125	7/2018	7/2019	1, 2, 3, 4, 6
5	Frequency Standard	Microsemi 8040C	162230101006	01/2019	01/2020	6
6	Multimeter	Fluke 83	65870302	01/2019	01/2020	1, 2, 3, 4, 6
7	Humidity and Temperature Indicator	Vaisala: HMI 31	P3730008	01/2019	01/2020	1, 2, 3, 4, 6
8	AC Power Supply	Sorensen SGI 80/188D-1AAA	0525A00547	cnn	-	1, 2, 3, 4, 6
9	Signal Analyzer 2	Rohde & Schwarz: FSV 90 kHz – 30 GHz	100781	07/2018	07/2019	1, 2, 3, 4, 6
10	Attenuator	DTS 100G-20dB-24G-3.5mm(F,F)-B	14111102	cnn	-	1, 2, 3, 4, 6
11	EMI Test Receiver	R&S ESU40	100262/040	07/2018	07/2019	5
12	Horn Antenna	ETS-Lindgren 3116C-PA	150635	11/2018	11/2019	5
13	Horn Antenna	ETS-Lindgren ETS3115	6346	07/2018	08/2019	5
14	Bilog Antenna	Schaffner Chase CBL6112	2003	07/2018	07/2019	5
15	Humidity and temperature meter	Vaisala HM31	P3730008	03/2018	03/2019	5
16	Mast Controller	Maturo NCD/180 2	17210416	cnn	-	5
17	4 meter mast	Maturo TAM4.0-E	086/17210915	cnn	-	5
18	Anechoic Chamber	S&MC	B83317-C6019	09/2016	09/2019	5
19	Amplifier	Miteq 4FSX4	902638	cnn	-	5

Table 33 Part List of the RF Measurement Test Equipment



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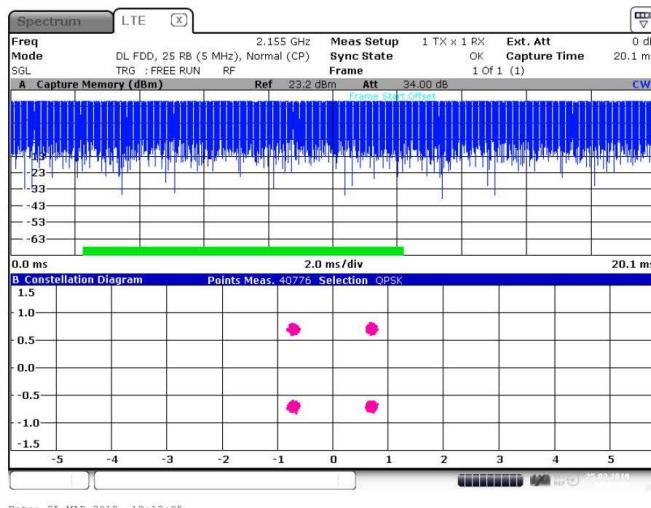
Test Report No:  
Typeappr-1508717799-612

## 5.2 Spectral Plots

### 5.2.1. Test No. 2: Modulation Characteristics

No additional measurements are required for the modulation characteristics. Please refer to test no. 3, occupied bandwidth on page 18.

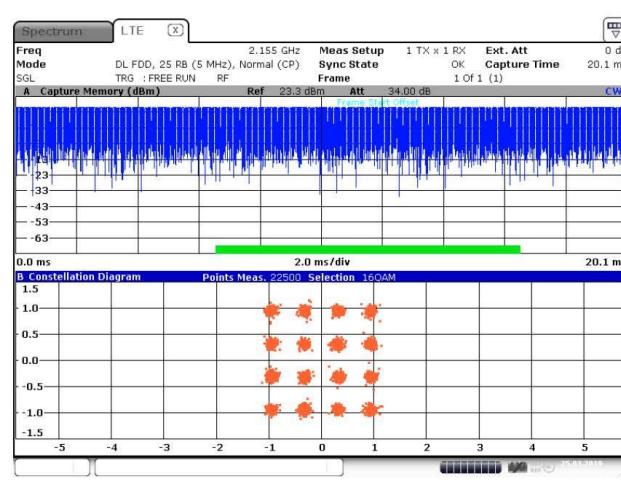
Screenshots below shows information about the modulations I/Q constellation form and modulation information table, displaying error to ideal modulation symbols.



**Figure 4 I/Q constellation diagram with capture buffer – QPSK (2155 MHz) (5MHz Channel BW)**



FCC ID: VBNAHIB-01

Test Report No:  
Typeappr-1508717799-612**Figure 3 I/Q constellation table with I/Q error – QPSK (2155 MHz) (5 MHz Channel BW)****Figure 4 I/Q constellation diagram with capture buffer – 16QAM (2155 MHz) (5 MHz Channel BW)**



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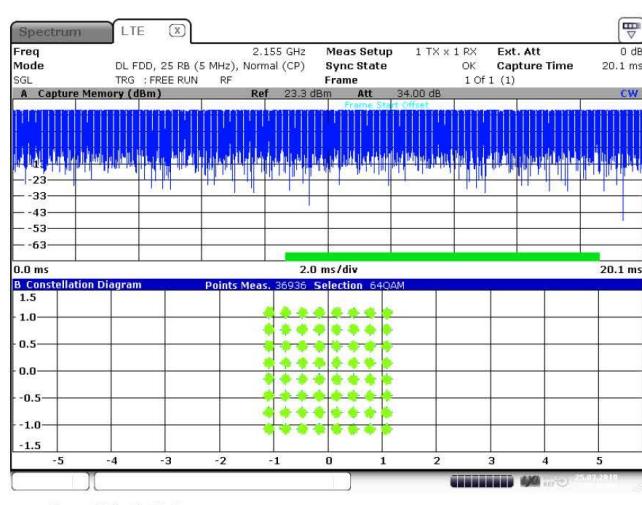
Spectrum LTE

2.155 GHz Meas Setup 1 TX x 1 RX Ext. Att 0 dB  
 Mode DL FDD, 25 RB (5 MHz), Normal (CP) Sync State OK Capture Time 20.1 ms  
 SGL TRG : FREE RUN RF Frame 1 Of 1 (1)

**Result Summary**

Frame Result 1/1	Min	Mean	Limit	Max	Limit	Unit
EVM PDSCH QPSK	2.54	2.54	2.54	18.50	%	
EVM PDSCH 16QAM	4.32	4.32	4.32	13.50	%	
EVM PDSCH 64QAM				9.00	%	
EVM PDSCH 256QAM					%	
Time Alignment Error 2,1					ns	
Time Alignment Error 3,1					ns	
Time Alignment Error 4,1					ns	
Results for Selection Subframe(s) ALL Selection Antenna 1 Frame Result 1/1						
EVM All	2.61	3.68	4.35		%	
EVM Phys. Channel	2.58	3.69	4.25		%	
EVM Phys. Signal	2.58	3.45	5.87		%	
Frequency Error	-2.21	0.07	3.32		Hz	
Sampling Error	-1.03	0.05	1.11		ppm	
IQ Offset	-91.85	-65.44	-60.03		dB	
IQ Gain Imbalance	-0.02	0.00	0.02		dB	
IQ Quadrature Error	-0.15	0.00	0.09		°	
RSTP	-11.69	-11.63	-11.61		dBM	
OSTP	12.97	13.12	13.23		dBM	
Power	13.05	13.14	13.19		dBM	
Crest Factor		7.30			dB	

Date: 25.MAR.2019 18:29:09

**Figure 5 I/Q constellation table with I/Q error – 16QAM (2155 MHz) (5 MHz Channel BW)****Figure 6 I/Q constellation diagram with capture buffer – 64QAM (2155 MHz) (5 MHz Channel BW)**



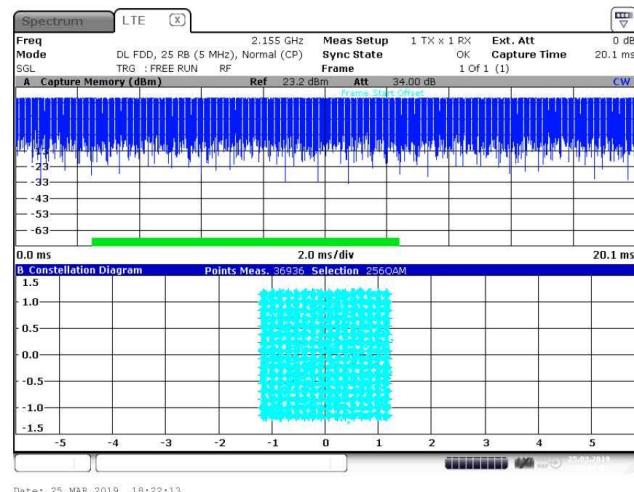
FCC ID: VBNAHIB-01

Test Report No:  
Typeappr-1508717799-612



Date: 25.MAR.2019 18:27:39

**Figure 7 I/Q constellation table with I/Q error – 64QAM (2155 MHz) (5 MHz Channel BW)**



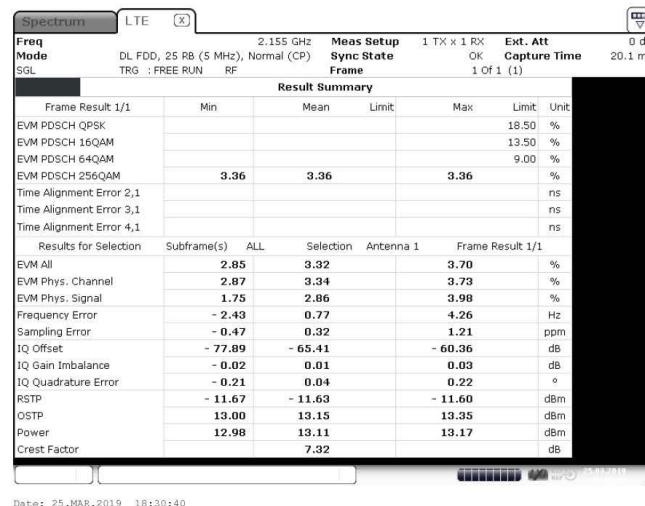
Date: 25.MAR.2019 18:22:13

**Figure 8 I/Q constellation diagram with capture buffer – 256QAM (2155 MHz) (5 MHz Channel BW)**



FCC ID: VBNAHIB-01

Test Report No:  
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**Figure 9 I/Q constellation table with I/Q error – 16QAM (2155 MHz) (5 MHz Channel BW)**



FCC ID: VBNAHIB-01

Test Report No:  
Typeappr-1508717799-612

### 5.2.2. Test No. 3: Occupied Bandwidth

The value ‘Occ BW’ in screenshots is the measured occupied bandwidth.

#### Config A ANT4:

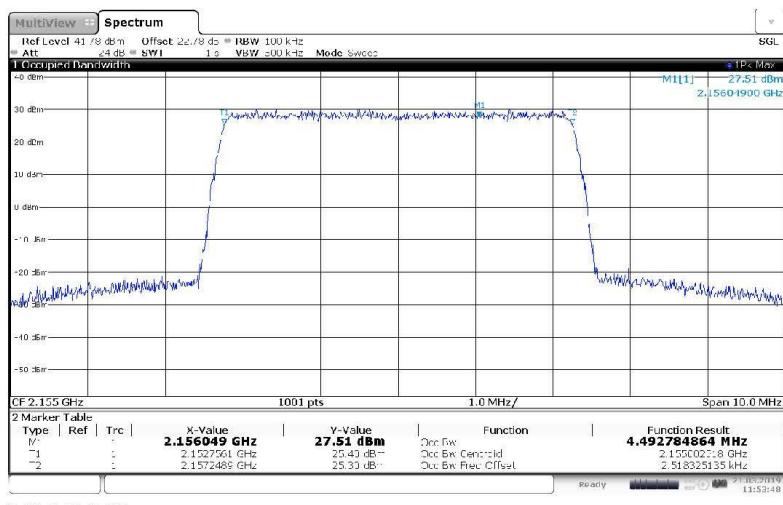


Figure 10 Occupied Bandwidth – QPSK (2155 MHz) (5 MHz Channel BW)



FCC ID: VBNAHIB-01

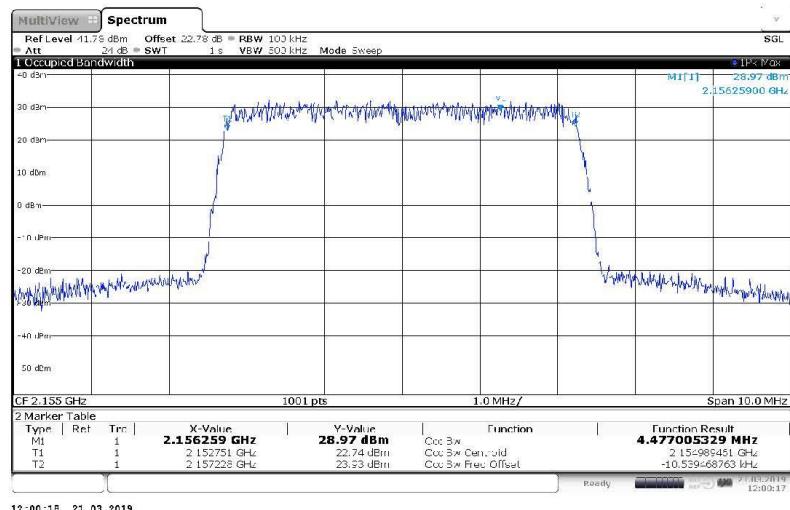
Test Report No:  
Typeappr-1508717799-612

Figure 11 Occupied Bandwidth – 16QAM (2155 MHz) (5 MHz Channel BW)

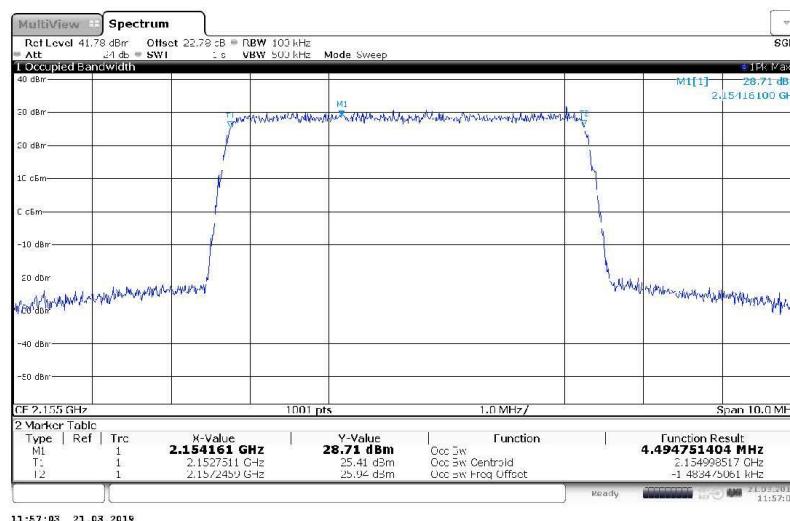


Figure 12 Occupied Bandwidth – 64QAM (2155 MHz) (5 MHz Channel BW)



FCC ID: VBNAHIB-01

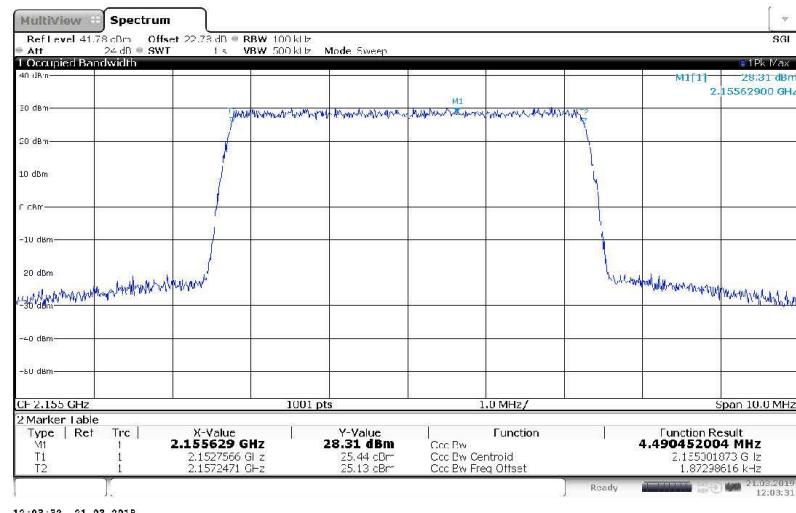
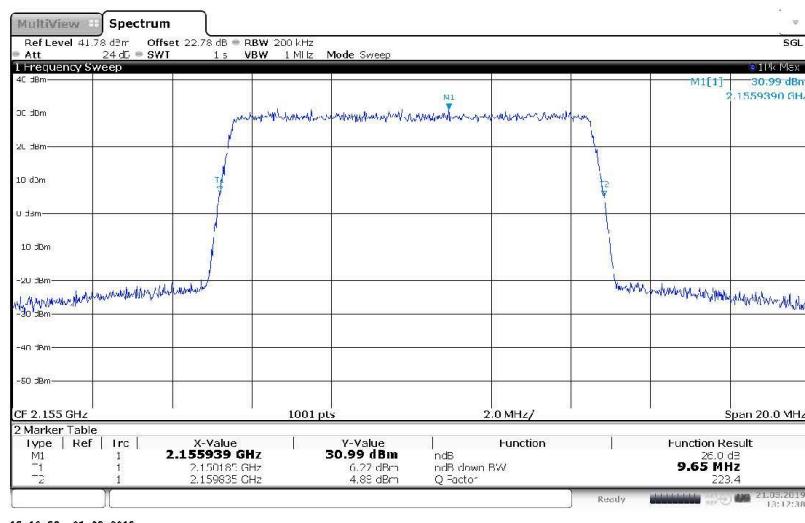
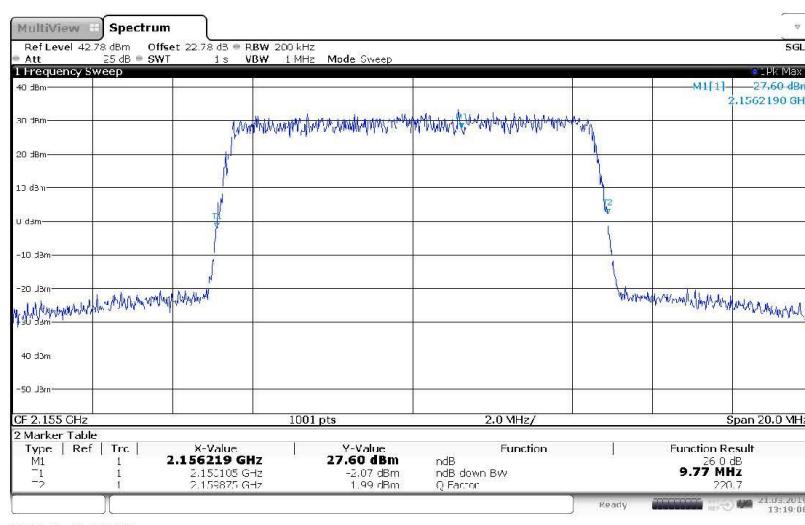
Test Report No:  
Typeappr-1508717799-612

Figure 13 Occupied Bandwidth – 256QAM (2155 MHz) (5 MHz Channel BW)



FCC ID: VBNAHIB-01

Test Report No:  
Typeappr-1508717799-612**Config B ANT4:****Figure 14 Occupied Bandwidth – QPSK (2155 MHz) (10 MHz Channel BW)****Figure 15 Occupied Bandwidth – 16QAM (2155 MHz) (10MHz Channel BW)**



FCC ID: VBNAHIB-01

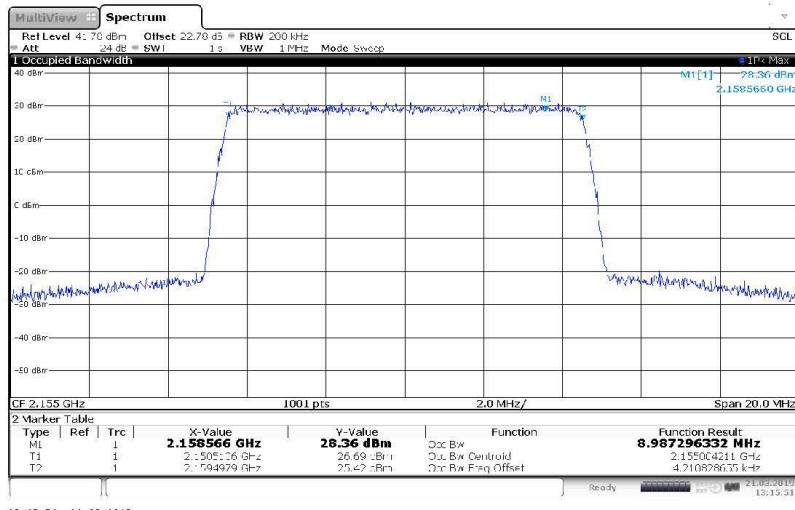
Test Report No:  
Typeappr-1508717799-612

Figure 16 Occupied Bandwidth – 64QAM (2155 MHz) (10 MHz Channel BW)

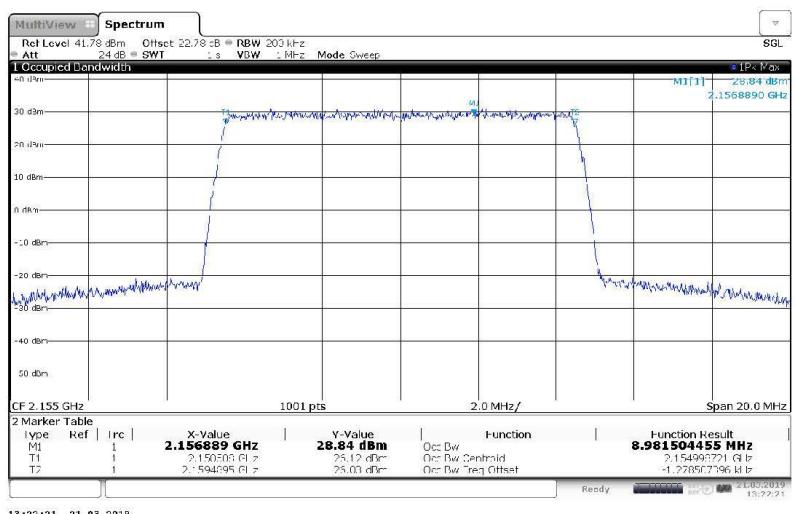


Figure 17 Occupied Bandwidth – 256QAM (2155 MHz) (10 MHz Channel BW)

**Config C ANT4:**



FCC ID: VBNAHIB-01

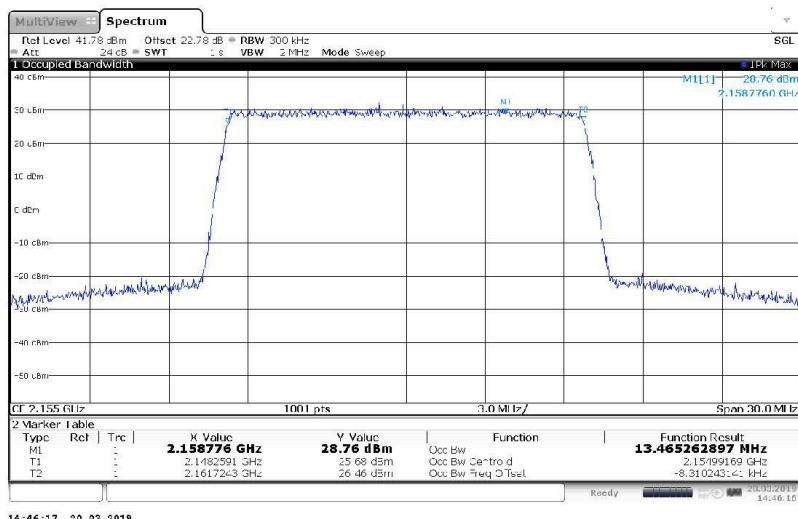
Test Report No:  
Typeappr-1508717799-612

Figure 18 Occupied Bandwidth – QPSK (2155 MHz) (15 MHz Channel BW)

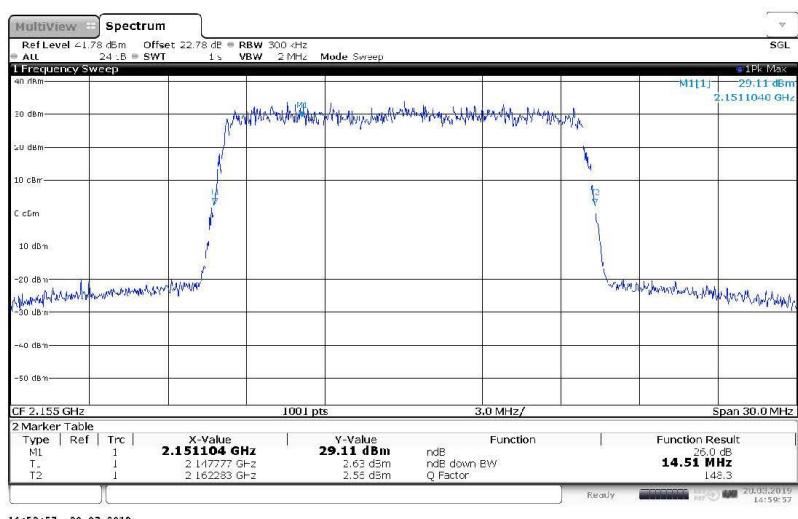


Figure 19 Occupied Bandwidth – 16QAM (2155 MHz) (15 MHz Channel BW)



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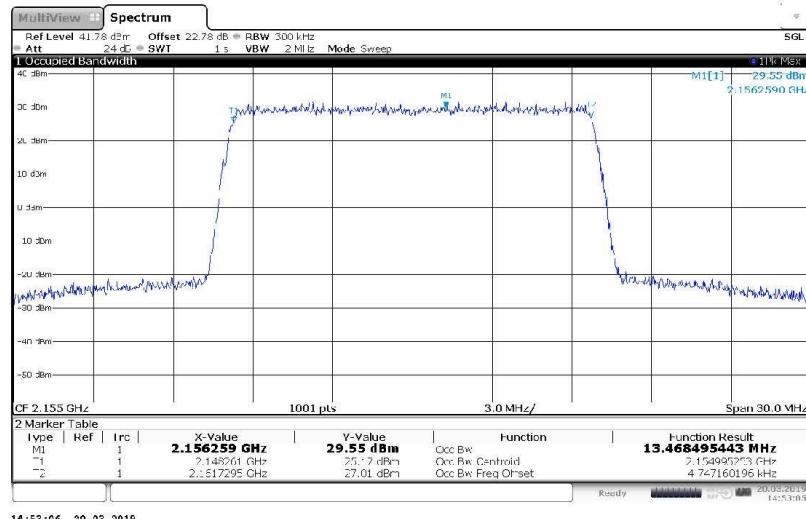


Figure 20 Occupied Bandwidth – 64QAM (2155 MHz) (15 MHz Channel BW)

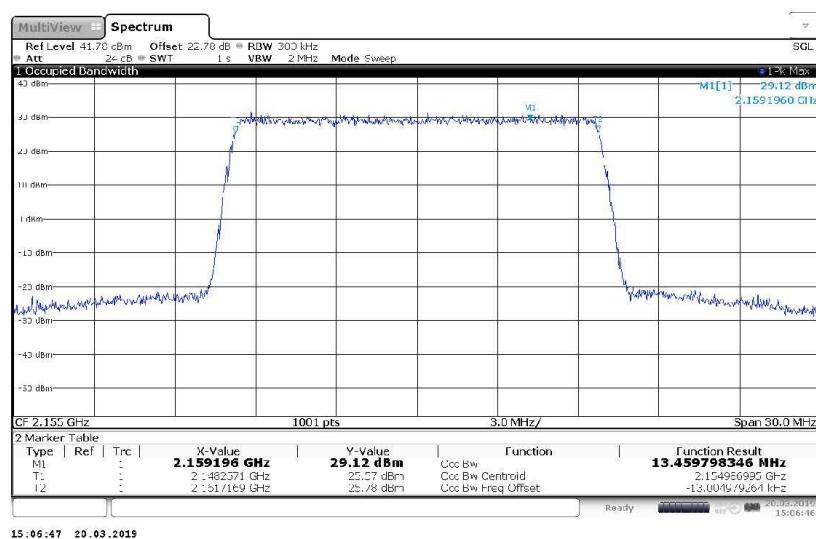
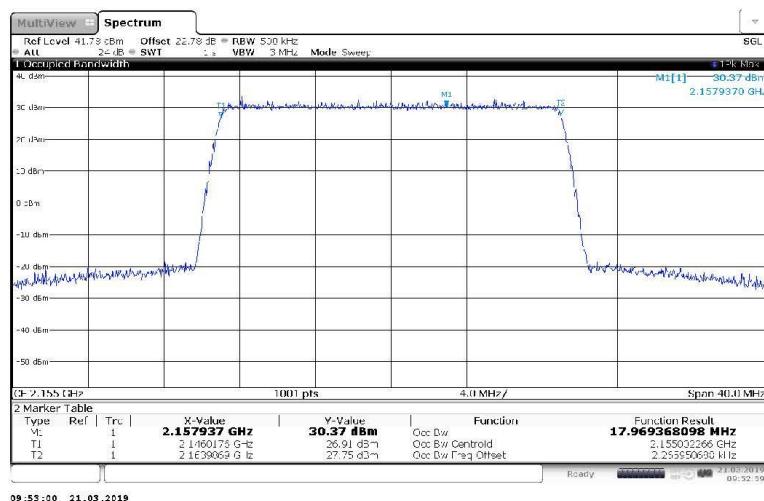
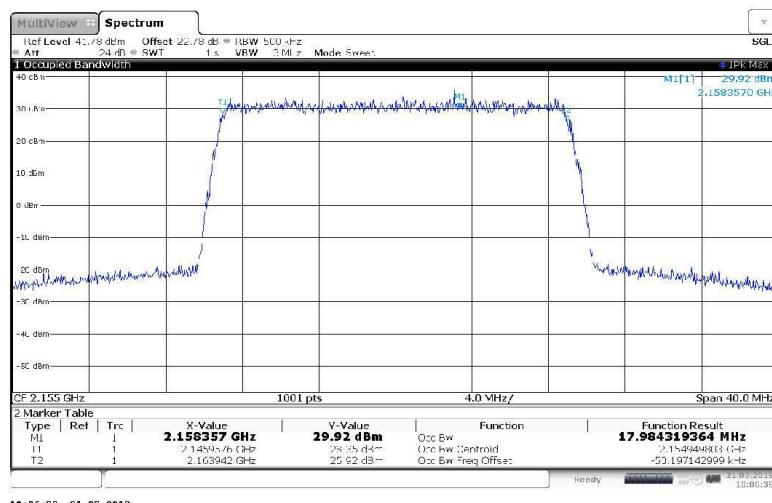


Figure 21 Occupied Bandwidth – 256QAM (2155 MHz) (15 MHz Channel BW)



FCC ID: VBNAHIB-01

Test Report No:  
Typeappr-1508717799-612**Config D ANT4:****Figure 22 Occupied Bandwidth – QPSK (2155 MHz Hz) (20 MHz Channel BW)****Figure 23 Occupied Bandwidth – 16QAM (2155 MHz) (20 MHz Channel BW)**



FCC ID: VBNAHIB-01

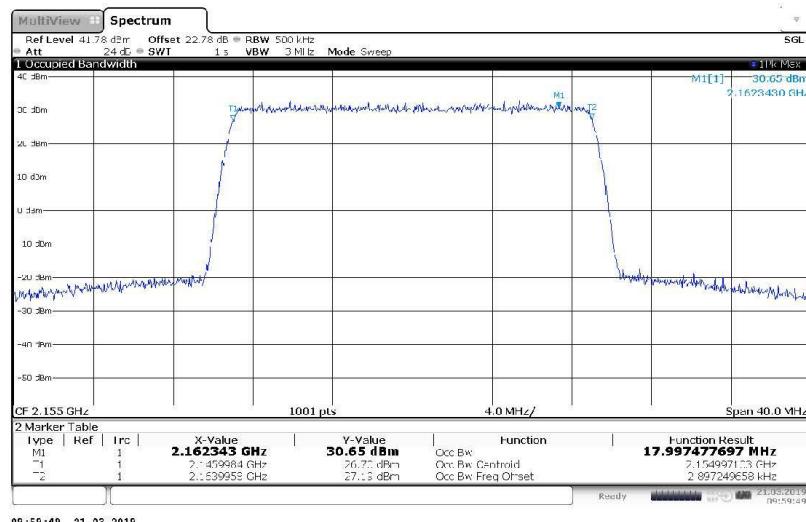
Test Report No:  
Typeappr-1508717799-612

Figure 24 Occupied Bandwidth – 64QAM (2155 MHz) (20 MHz Channel BW)

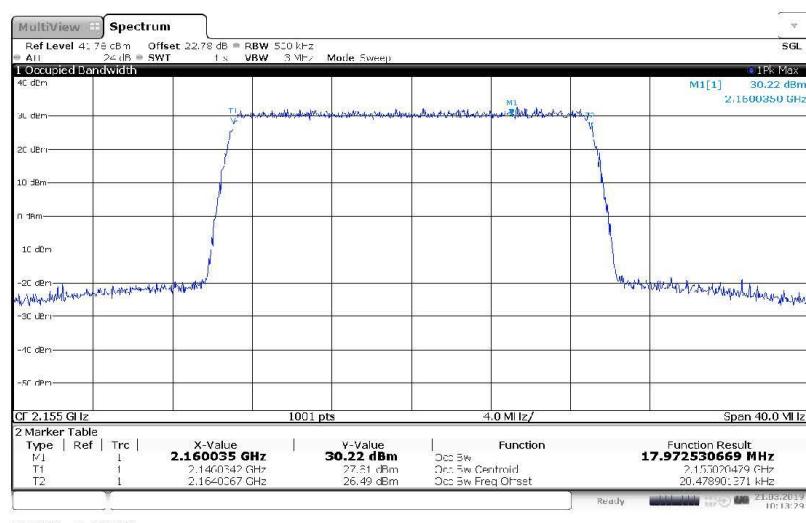


Figure 25 Occupied Bandwidth – 256QAM (2155 MHz) (20 MHz Channel BW)



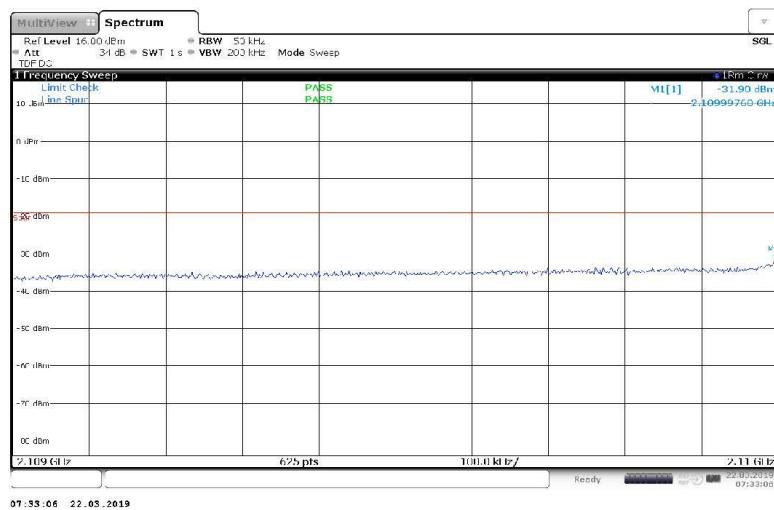
FCC ID: VBNAHIB-01

Test Report No:  
Typeappr-1508717799-612

### 5.2.3. Test No. 4: Spurious Emissions at the Antenna Terminals

Screenshots of highest power and emission antenna in this unit it was antenna port 4. The external attenuation (connection loss of the set up) is already added in the results. Limit line is set fixed to level -19.02dB.

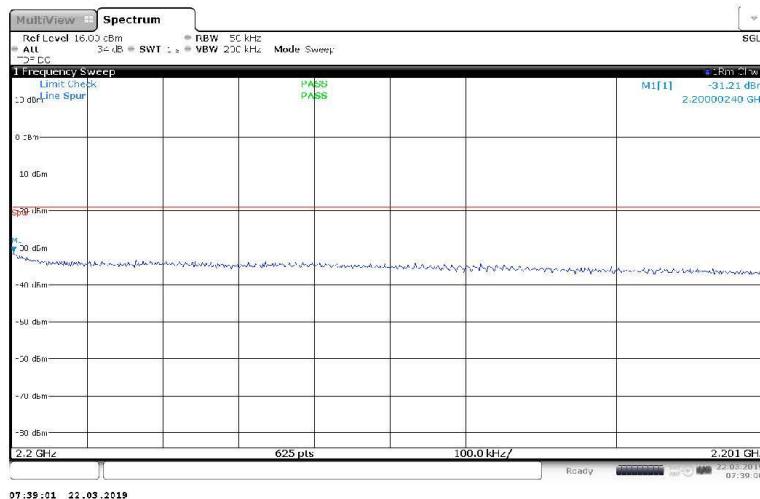
#### Config A ANT4:



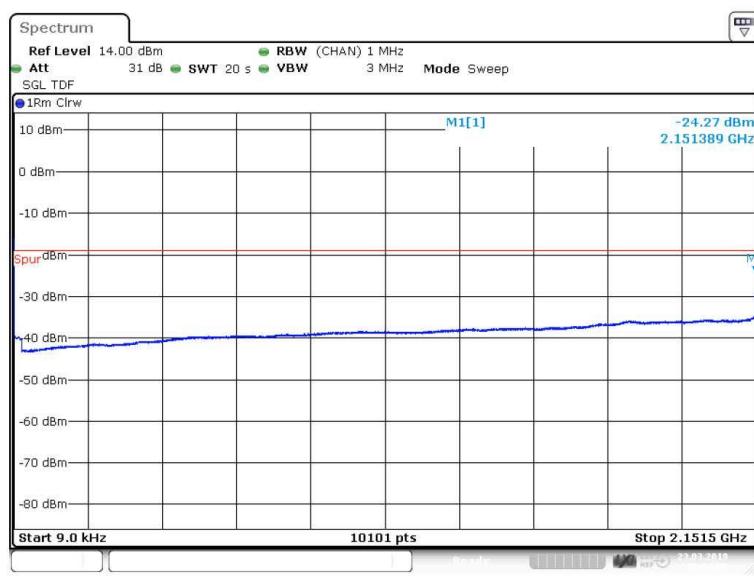
**Figure 26 Spurious Emissions (Lower Band Edge) – QPSK (2112.5 MHz, 5 MHz Channel BW)**



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**Figure 27 Spurious Emissions (Upper Band Edge) – QPSK (2197.5 MHz, 5 MHz Channel BW)**



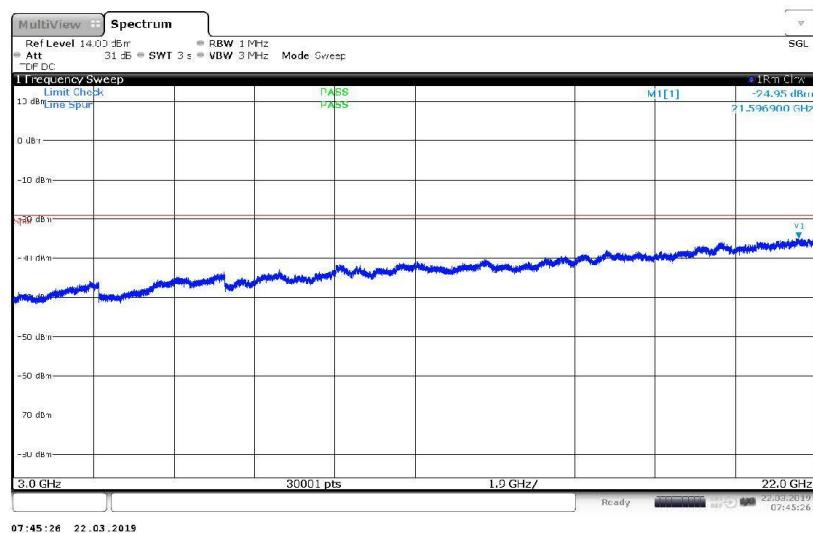
**Figure 28 Spurious Emissions (9kHz – 2.1515 GHz) - QPSK (2155 MHz, 5 MHz Channel BW)**



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**Figure 29 Spurious Emissions (2.1585 GHz – 3 GHz) – QPSK (2155 MHz, 5 MHz Channel BW)**

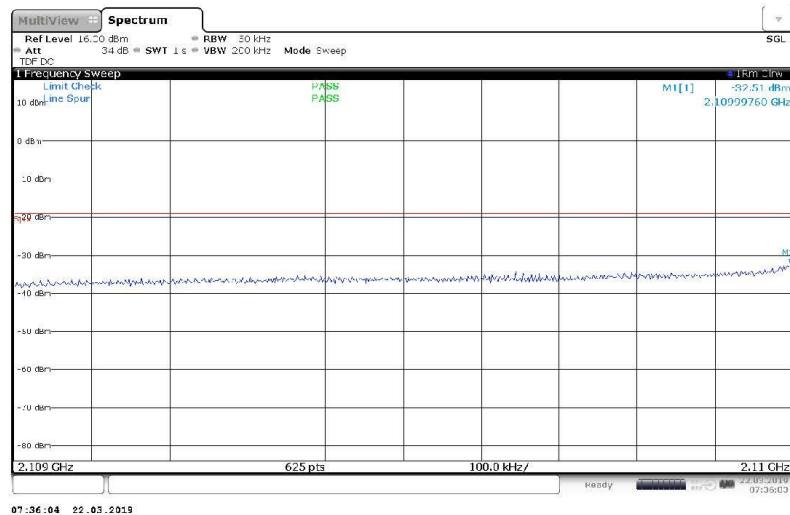


**Figure 30 Spurious Emissions (3 GHz – 22GHz) – QPSK (2155 MHz, 5 MHz Channel BW)**

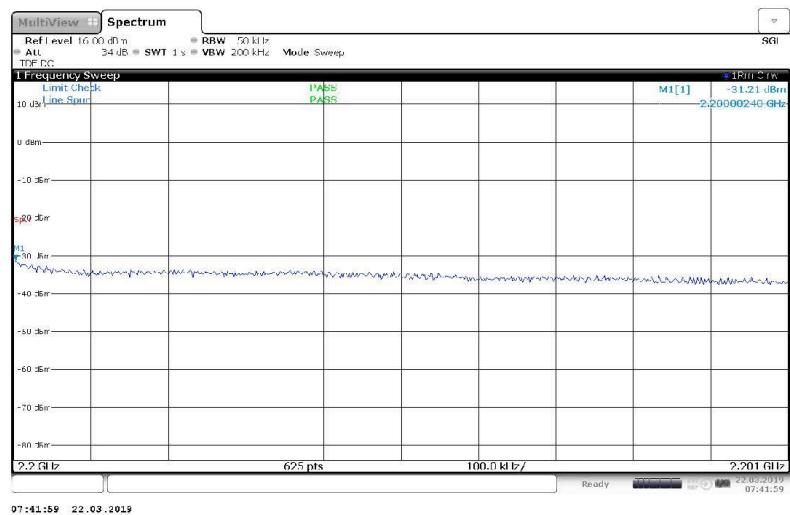


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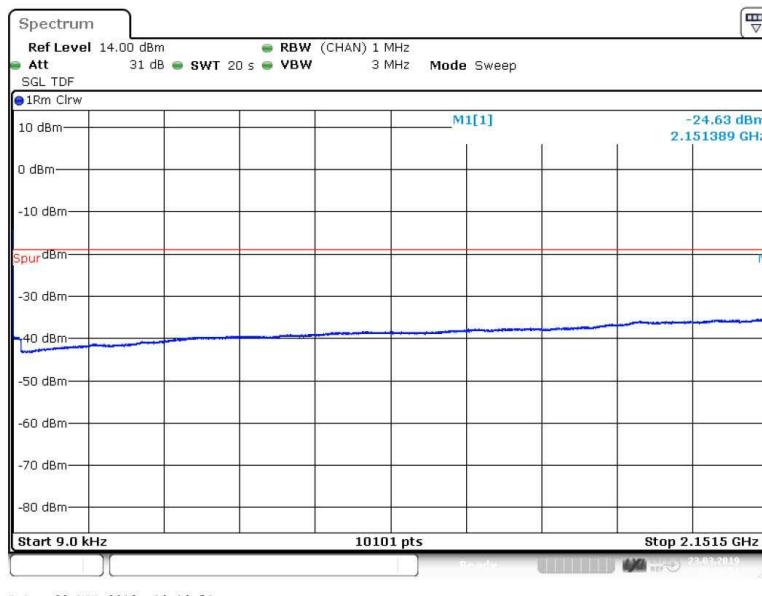
**Figure 31 Spurious Emissions (Lower Band Edge) – 16QAM (2112.5 MHz, 5 MHz Channel BW)**



**Figure 32 Spurious Emissions (Upper Band Edge) – 16QAM (2197.5 MHz, 5 MHz Channel BW)**



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Test Report No:  
Typeappr-1508717799-612**Figure 33 Spurious Emissions (9kHz – 2.1585 GHz) – 16QAM (2155 MHz, 5 MHz Channel BW)****Figure 34 Spurious Emissions (2.1585 GHz – 3 GHz) – 16QAM (2155 MHz, 5 MHz Channel BW)**