

DUTY CYCLE

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.	Interval (mos)
Spectrum Analyzer	Agilent	N9010A	AFL	9/20/2014	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMM	2/27/2015	12
Attenuator, 20dB, 40 GHz	Fairview Microwave	SA4018-20	TQY	2/27/2015	12
Signal Generator, 40 GHz	Agilent	N5173B	TIW	7/15/2014	36

TEST DESCRIPTION

The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used. The reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer input.

The duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

If the transmit duty cycle < 98 percent, burst gating was used during some of the other tests in this report to only measure during the burst duration.

DUTY CYCLE

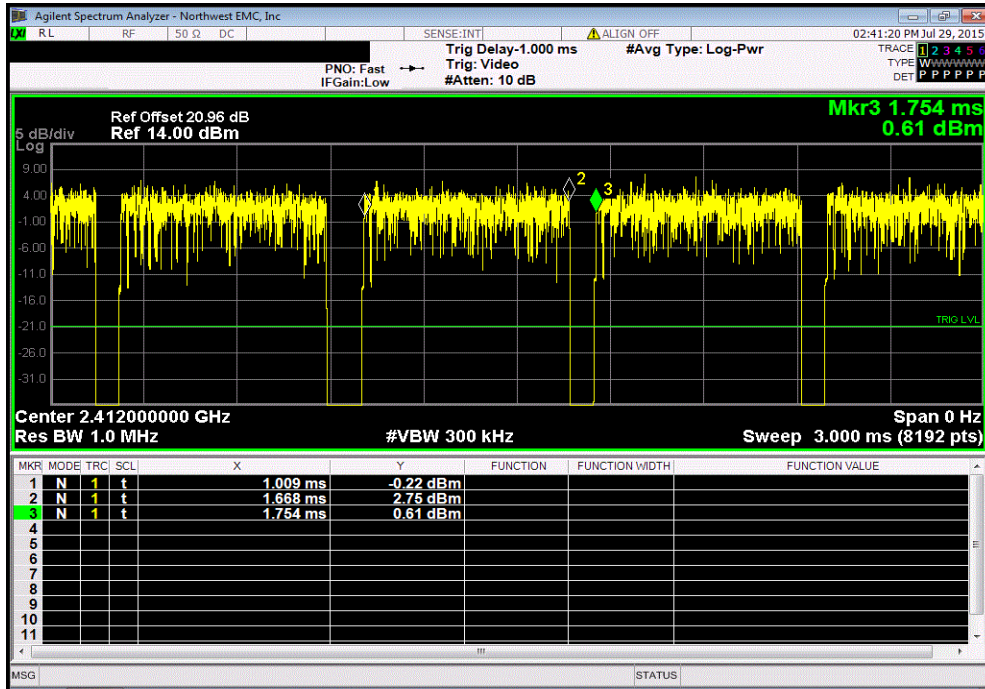


XM1 2015.01.14

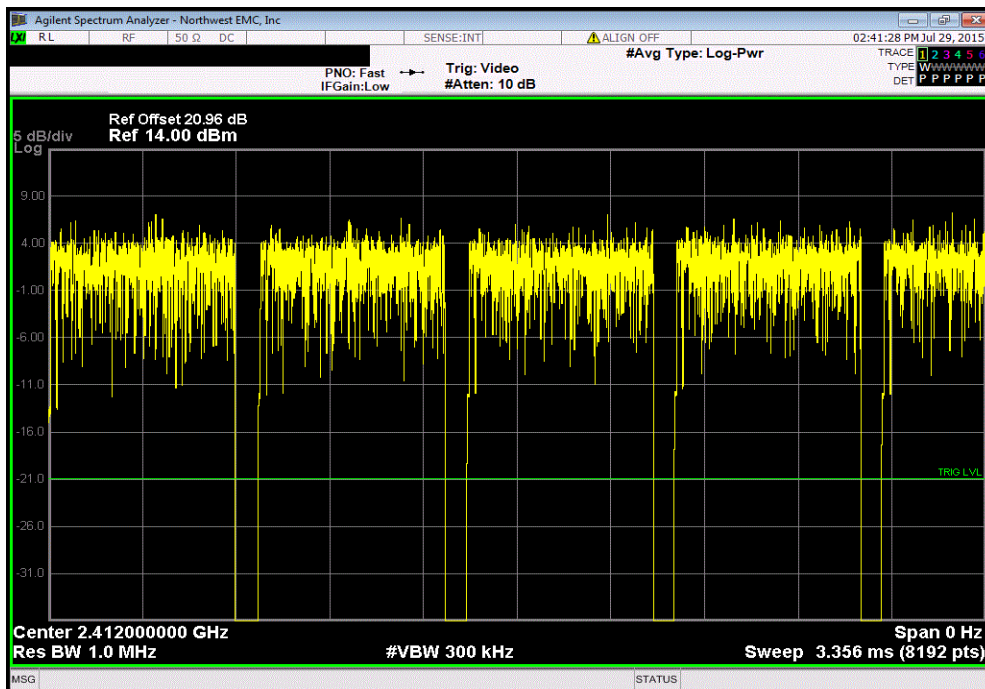
EUT: Firebox T50-W (BS5AE7W)		Work Order: VDEI0009				
Serial Number: 70AF00069-3EB6		Date: 07/29/15				
Customer: WatchGuard Technologies, Inc.		Temperature: 24.9°C				
Attendees: None		Humidity: 47%				
Project: None		Barometric Pres.: 1014 mbar				
Tested by: Jonathan Kiefer		Power: 110VAC/60Hz				
Job Site: TX09						
TEST SPECIFICATIONS		Test Method				
FCC 15.247:2015		ANSI C63.10:2013				
COMMENTS						
3x3 MIMO mode, Chain ABC (Chains 0, 1 and 2). Transmit power setting 17.0.						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	1	Signature <i>Jonathan Kiefer</i>				
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
Chain A						
20 MHz						
2400 MHz - 2483.5 MHz Band						
802.11(n) MCS16						
Low Channel 1, 2412 MHz	659.23 us	745.69 us	1	88.4	N/A	N/A
Low Channel 1, 2412 MHz	N/A	N/A	5	N/A	N/A	N/A
Mid Channel 6, 2437 MHz	659.97 us	742.7 us	1	88.9	N/A	N/A
Mid Channel 6, 2437 MHz	N/A	N/A	6	N/A	N/A	N/A
High Channel 11, 2462 MHz	658.5 us	742.4 us	1	88.7	N/A	N/A
High Channel 11, 2462 MHz	N/A	N/A	5	N/A	N/A	N/A
802.11(n) MCS23						
Low Channel 1, 2412 MHz	104.212 us	186.3 us	1	55.9	N/A	N/A
Low Channel 1, 2412 MHz	N/A	N/A	4	N/A	N/A	N/A
Mid Channel 6, 2437 MHz	104.212 us	186.3 us	1	55.9	N/A	N/A
Mid Channel 6, 2437 MHz	N/A	N/A	5	N/A	N/A	N/A
High Channel 11, 2462 MHz	104.256 us	186.3 us	1	56	N/A	N/A
High Channel 11, 2462 MHz	N/A	N/A	4	N/A	N/A	N/A
Chain B						
20 MHz						
2400 MHz - 2483.5 MHz Band						
802.11(n) MCS16						
Low Channel 1, 2412 MHz	659.601 us	742.4 us	1	88.8	N/A	N/A
Low Channel 1, 2412 MHz	N/A	N/A	5	N/A	N/A	N/A
Mid Channel 6, 2437 MHz	659.63 us	742.8 us	1	88.8	N/A	N/A
Mid Channel 6, 2437 MHz	N/A	N/A	5	N/A	N/A	N/A
High Channel 11, 2462 MHz	659.269 us	742.8 us	1	88.8	N/A	N/A
High Channel 11, 2462 MHz	N/A	N/A	5	N/A	N/A	N/A
802.11(n) MCS23						
Low Channel 1, 2412 MHz	102.747 us	186.3 us	1	55.2	N/A	N/A
Low Channel 1, 2412 MHz	N/A	N/A	5	N/A	N/A	N/A
Mid Channel 6, 2437 MHz	103.579 us	186.1 us	1	55.7	N/A	N/A
Mid Channel 6, 2437 MHz	N/A	N/A	5	N/A	N/A	N/A
High Channel 11, 2462 MHz	103.091 us	185.633 us	1	55.5	N/A	N/A
High Channel 11, 2462 MHz	N/A	N/A	5	N/A	N/A	N/A
Chain C						
20 MHz						
2400 MHz - 2483.5 MHz Band						
802.11(n) MCS16						
Low Channel 1, 2412 MHz	656.704 us	742.4 us	1	88.5	N/A	N/A
Low Channel 1, 2412 MHz	N/A	N/A	4	N/A	N/A	N/A
Mid Channel 6, 2437 MHz	658.202 us	742.8 us	1	88.6	N/A	N/A
Mid Channel 6, 2437 MHz	N/A	N/A	6	N/A	N/A	N/A
High Channel 11, 2462 MHz	658.535 us	746.8 us	1	88.2	N/A	N/A
High Channel 11, 2462 MHz	N/A	N/A	5	N/A	N/A	N/A
802.11(n) MCS23						
Low Channel 1, 2412 MHz	102.967 us	186.3 us	1	55.3	N/A	N/A
Low Channel 1, 2412 MHz	N/A	N/A	5	N/A	N/A	N/A
Mid Channel 6, 2437 MHz	102.967 us	186 us	1	55.4	N/A	N/A
Mid Channel 6, 2437 MHz	N/A	N/A	4	N/A	N/A	N/A
High Channel 11, 2462 MHz	102.047 us	186.3 us	1	54.8	N/A	N/A
High Channel 11, 2462 MHz	N/A	N/A	5	N/A	N/A	N/A

DUTY CYCLE

Chain A, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, Low Channel 1, 2412 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
659.23 us	745.69 us	1	88.4	N/A	N/A	

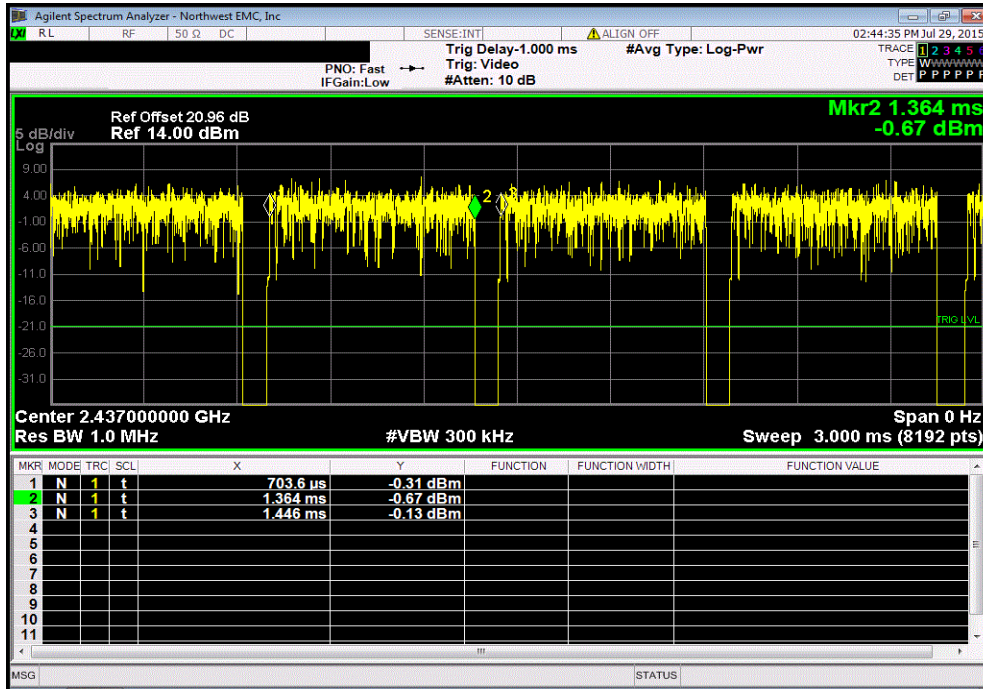


Chain A, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, Low Channel 1, 2412 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	5	N/A	N/A	N/A	



DUTY CYCLE

Chain A, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, Mid Channel 6, 2437 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
659.97 us	742.7 us	1	88.9	N/A	N/A	

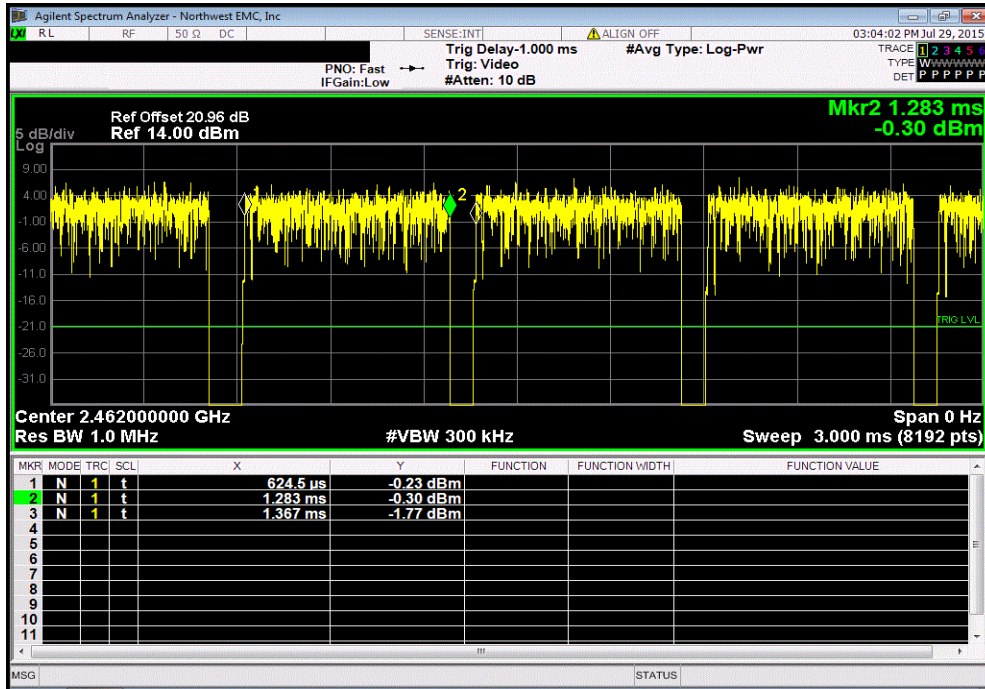


Chain A, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, Mid Channel 6, 2437 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	6	N/A	N/A	N/A	

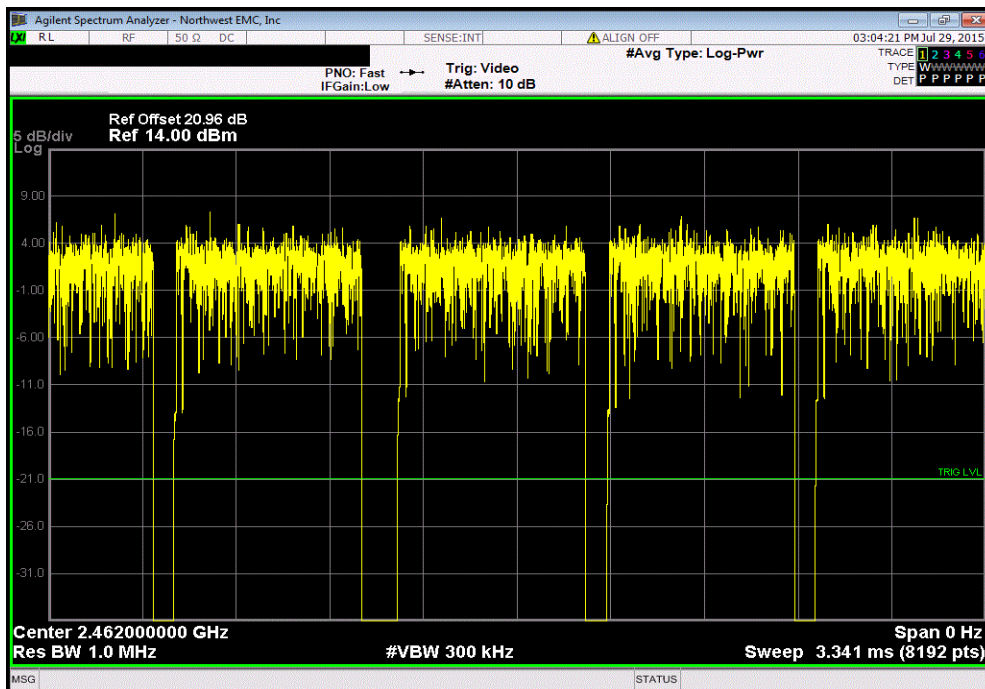


DUTY CYCLE

Chain A, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, High Channel 11, 2462 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
658.5 us	742.4 us	1	88.7	N/A	N/A	

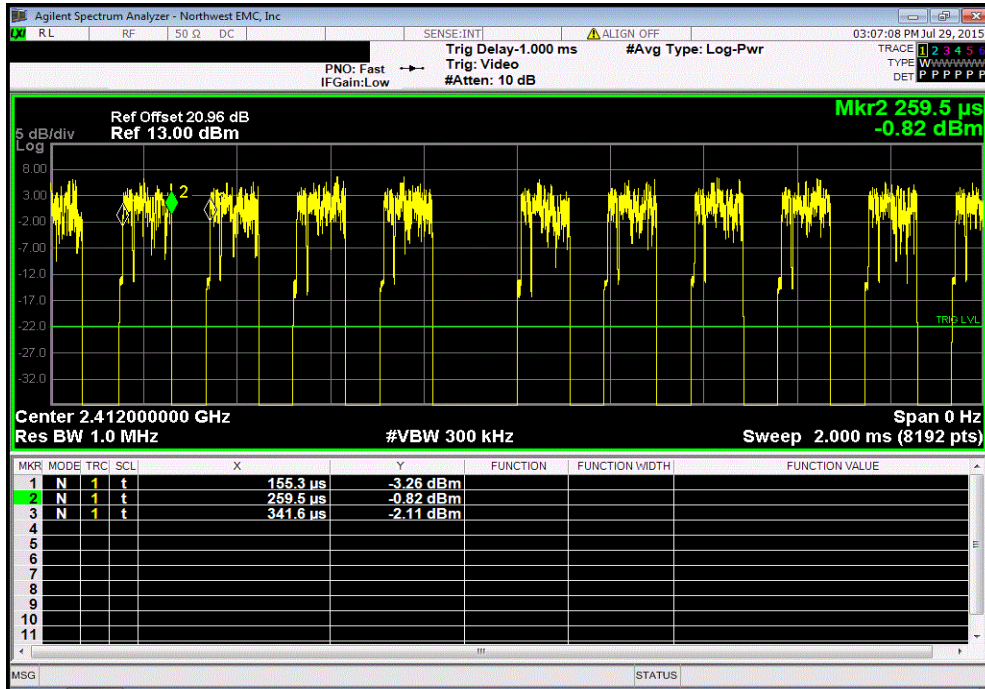


Chain A, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, High Channel 11, 2462 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	5	N/A	N/A	N/A	

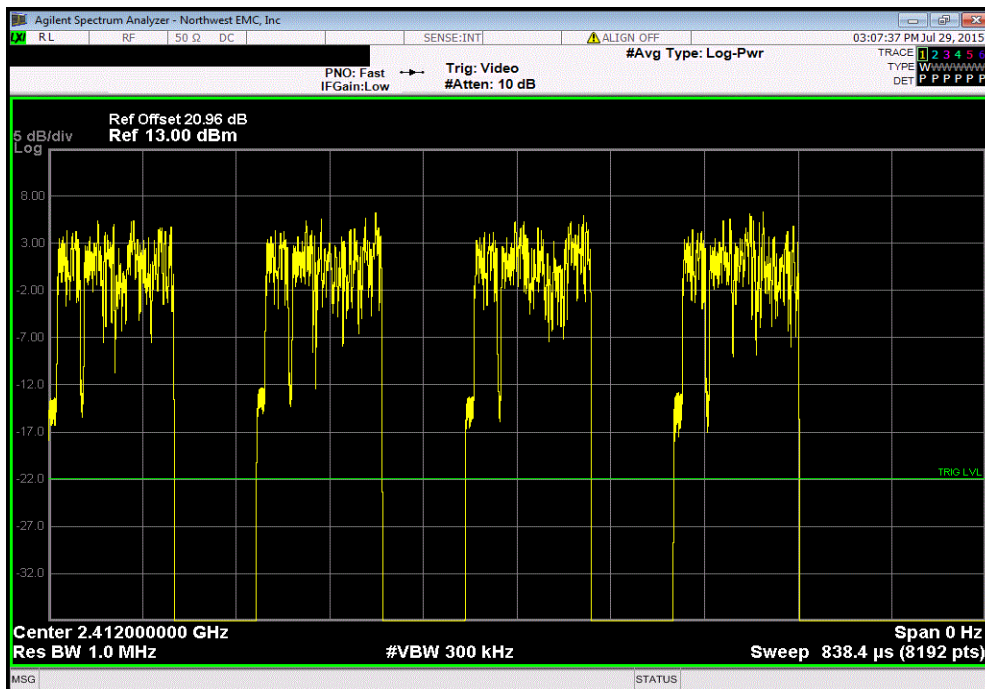


DUTY CYCLE

Chain A, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, Low Channel 1, 2412 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
104.212 us	186.3 us	1	55.9	N/A	N/A	

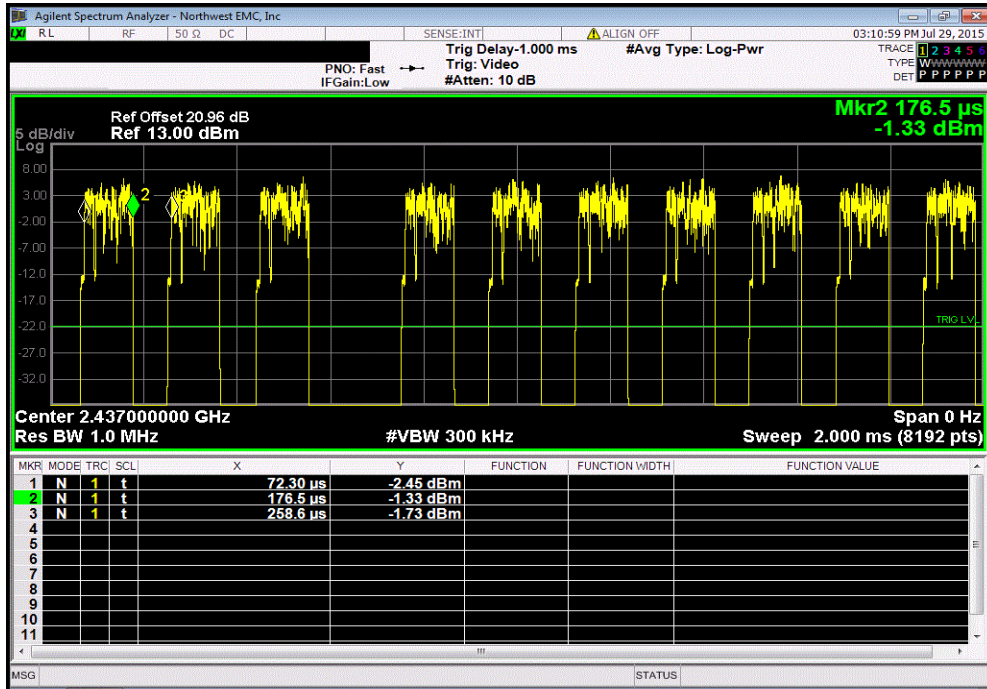


Chain A, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, Low Channel 1, 2412 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	4	N/A	N/A	N/A	

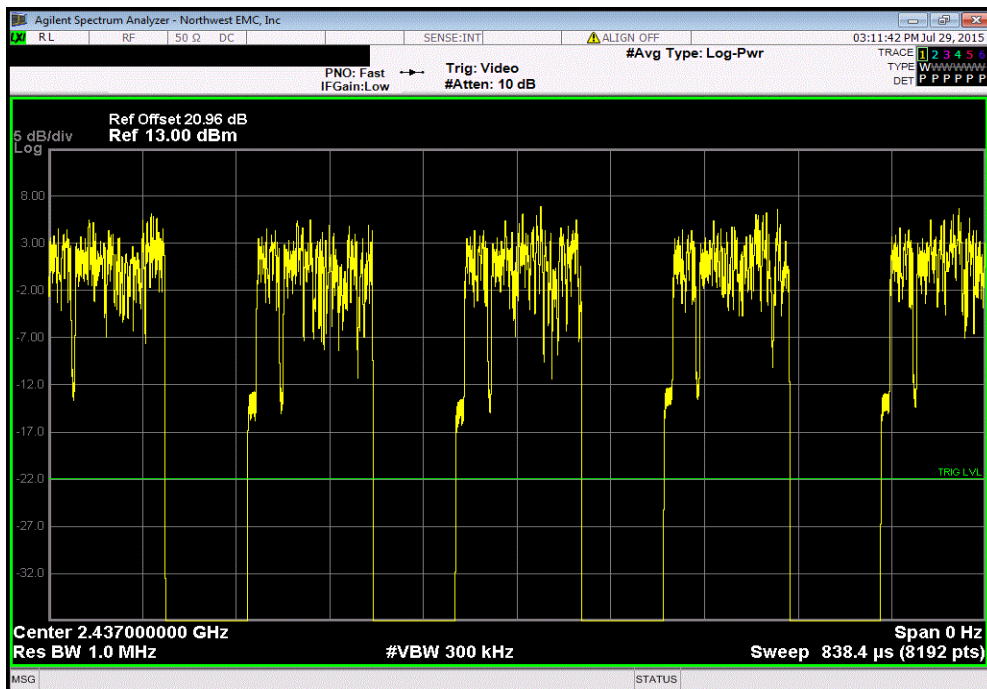


DUTY CYCLE

Chain A, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, Mid Channel 6, 2437 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
104.212 us	186.3 us	1	55.9	N/A	N/A	

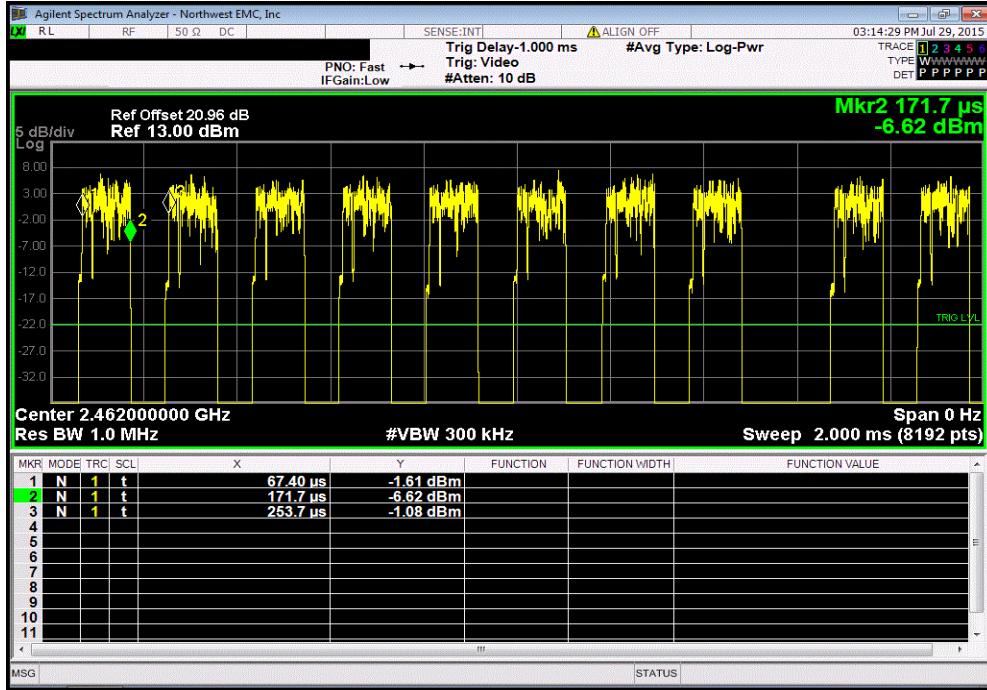


Chain A, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, Mid Channel 6, 2437 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	5	N/A	N/A	N/A	

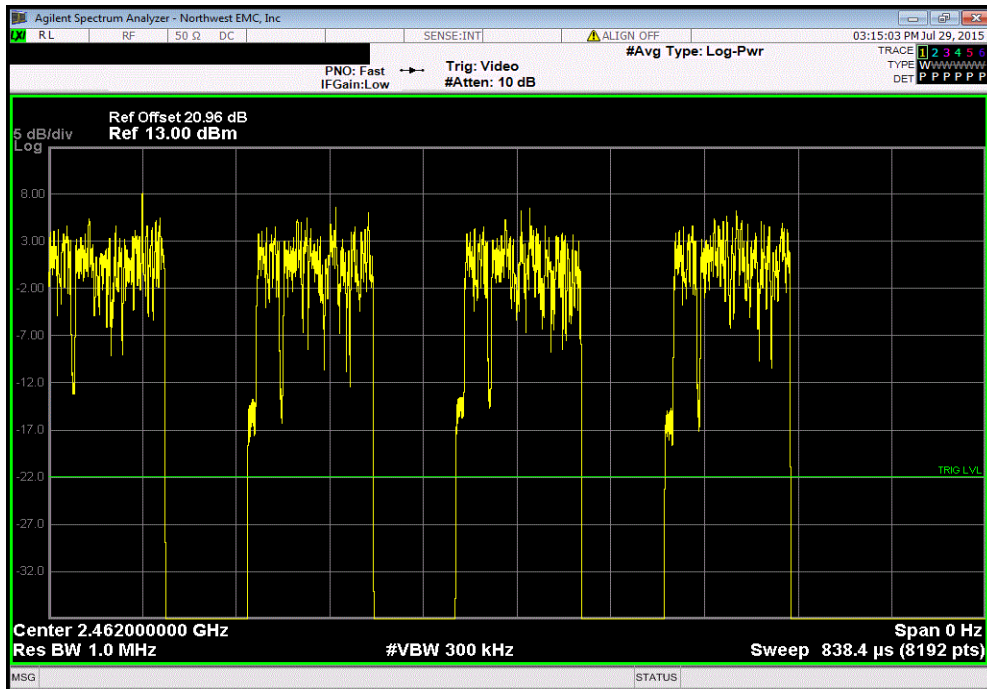


DUTY CYCLE

Chain A, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, High Channel 11, 2462 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
104.256 us	186.3 us	1	56	N/A	N/A	

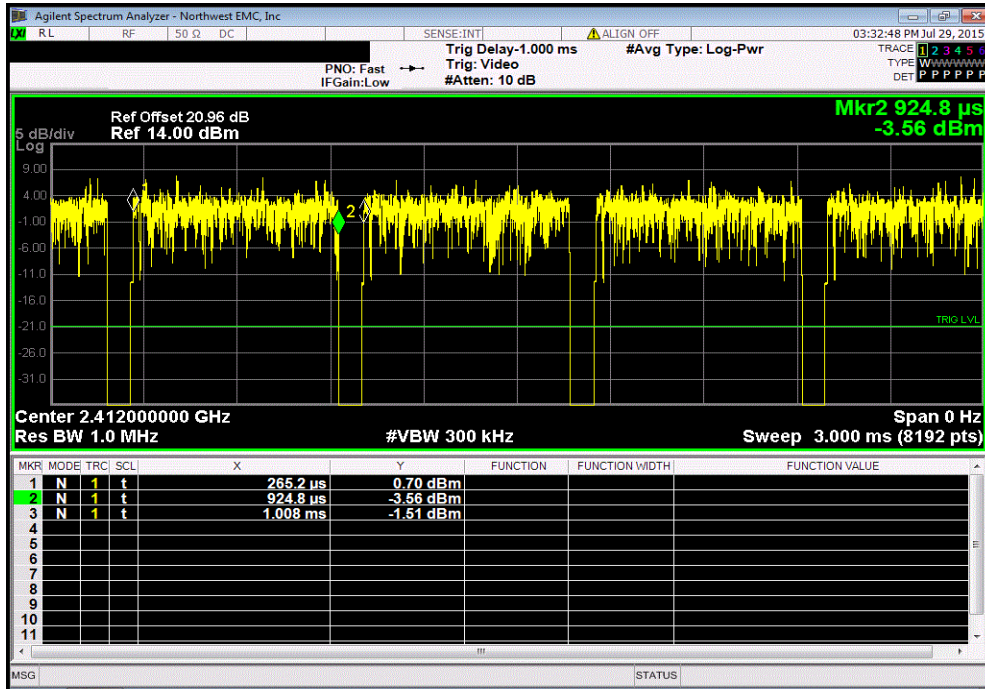


Chain A, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, High Channel 11, 2462 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	4	N/A	N/A	N/A	



DUTY CYCLE

Chain B, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, Low Channel 1, 2412 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
659.601 us	742.4 us	1	88.8	N/A	N/A	

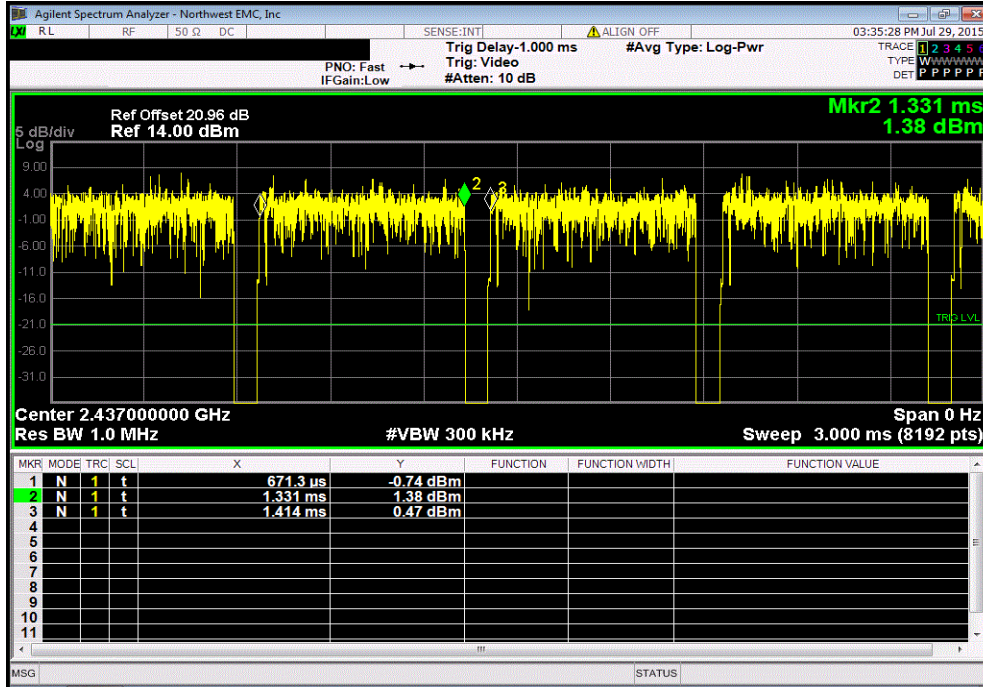


Chain B, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, Low Channel 1, 2412 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	5	N/A	N/A	N/A	

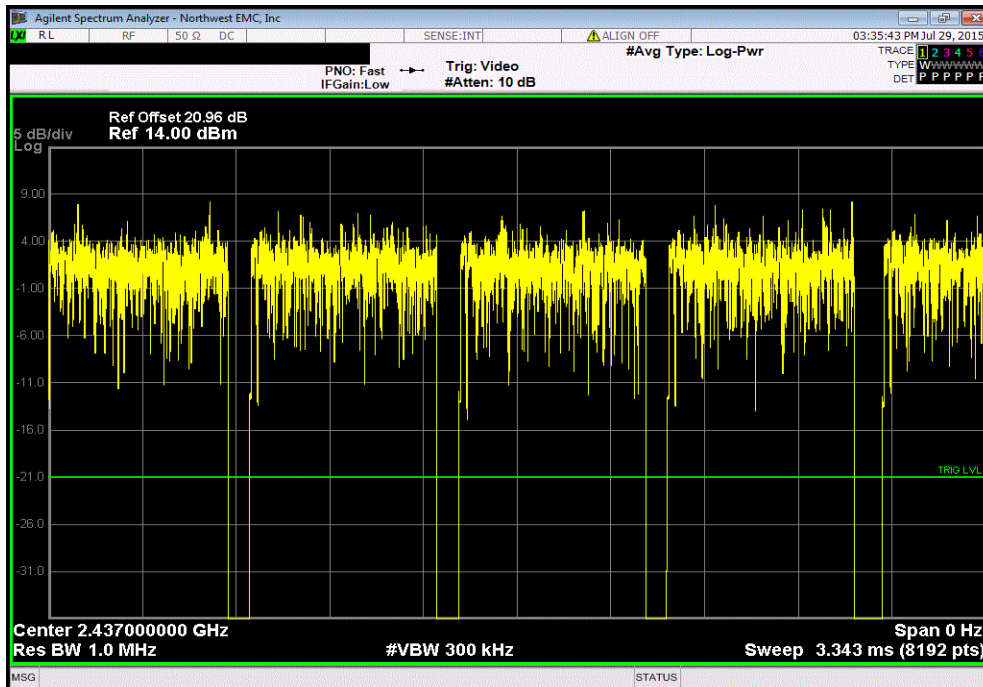


DUTY CYCLE

Chain B, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, Mid Channel 6, 2437 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
659.63 us	742.8 us	1	88.8	N/A	N/A	

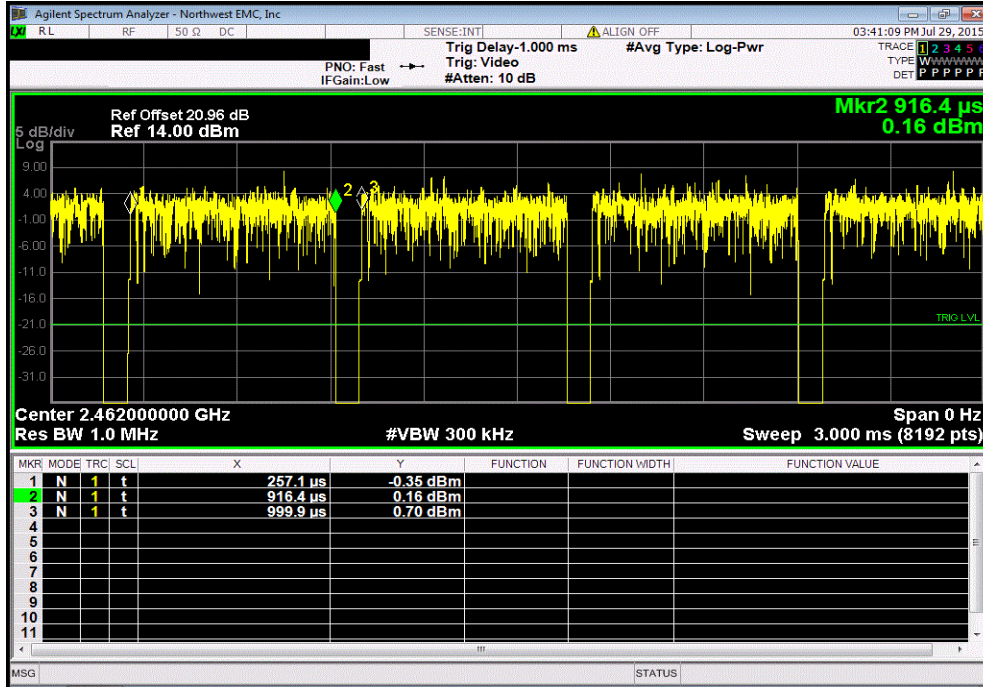


Chain B, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, Mid Channel 6, 2437 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	5	N/A	N/A	N/A	

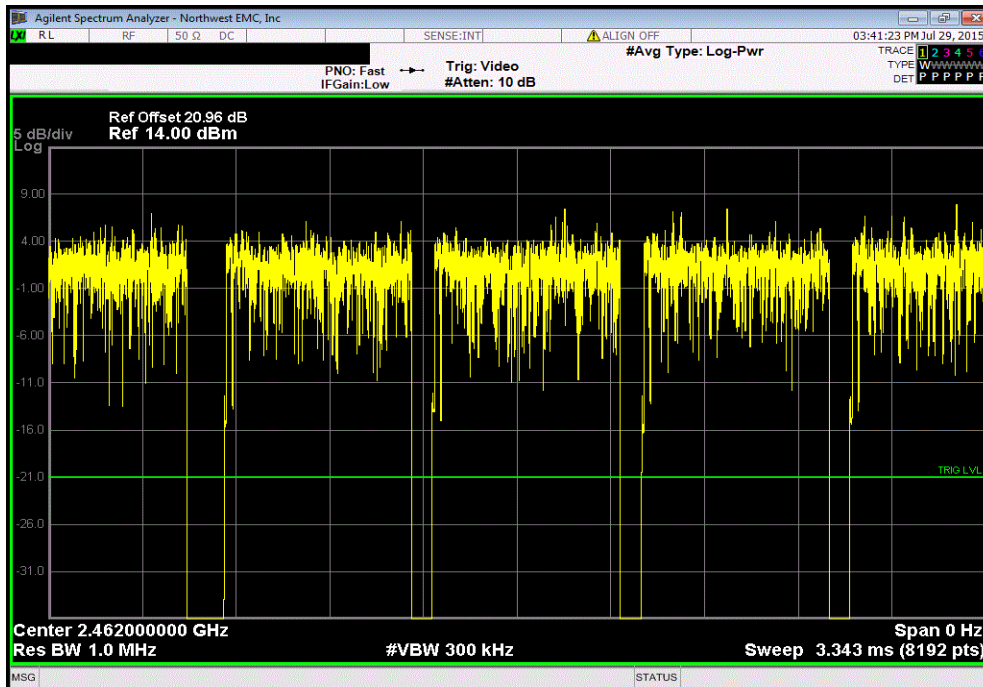


DUTY CYCLE

Chain B, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, High Channel 11, 2462 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
659.269 us	742.8 us	1	88.8	N/A	N/A	

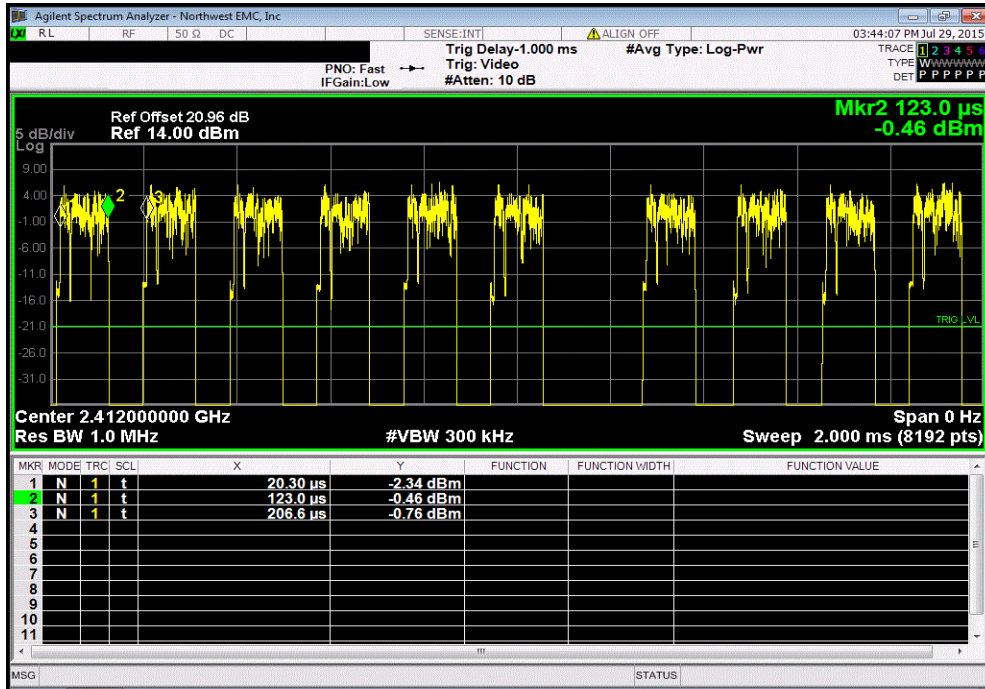


Chain B, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, High Channel 11, 2462 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	5	N/A	N/A	N/A	

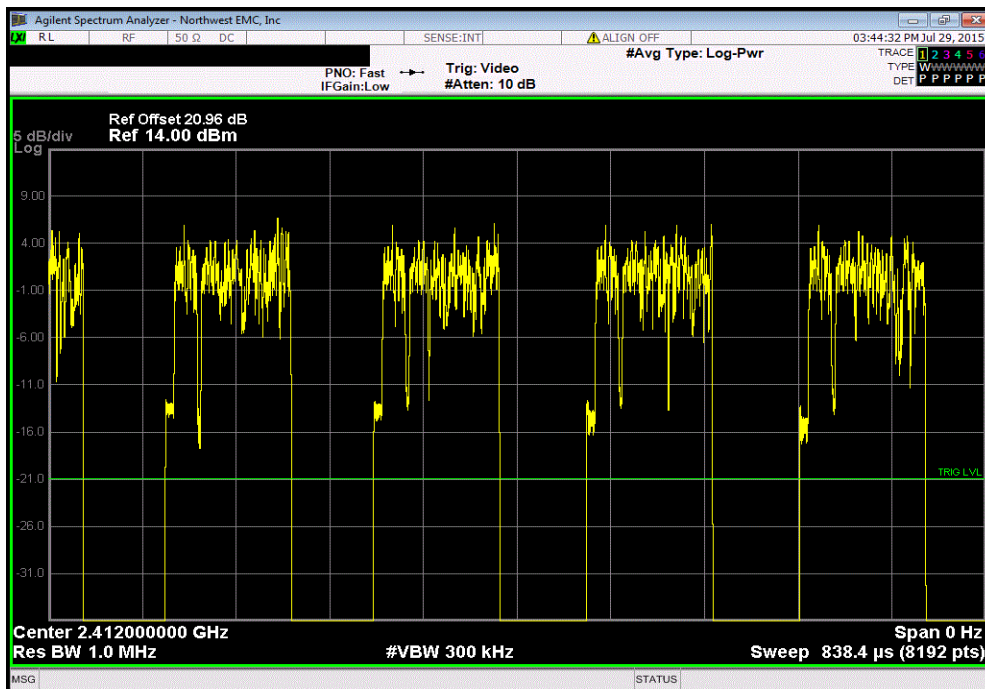


DUTY CYCLE

Chain B, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, Low Channel 1, 2412 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
102.747 us	186.3 us	1	55.2	N/A	N/A	

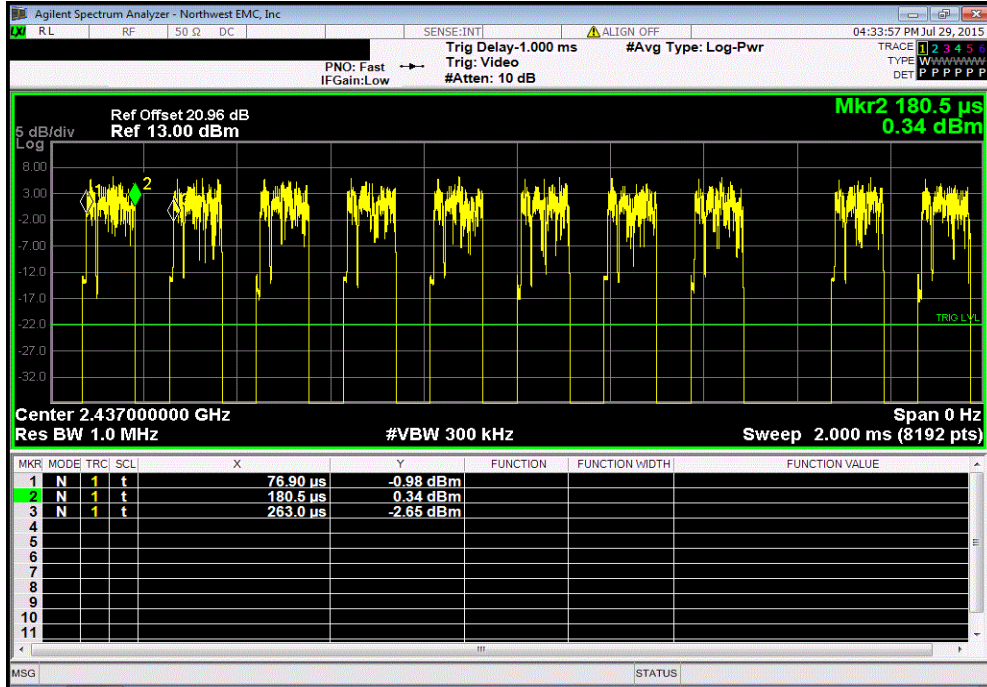


Chain B, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, Low Channel 1, 2412 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	5	N/A	N/A	N/A	

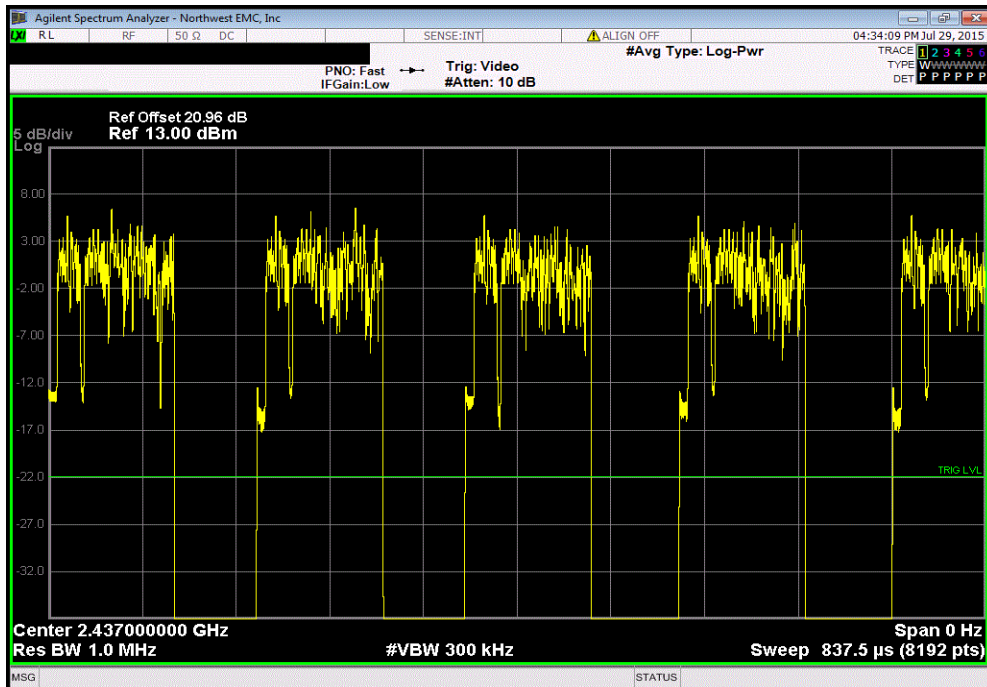


DUTY CYCLE

Chain B, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, Mid Channel 6, 2437 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
103.579 us	186.1 us	1	55.7	N/A	N/A	

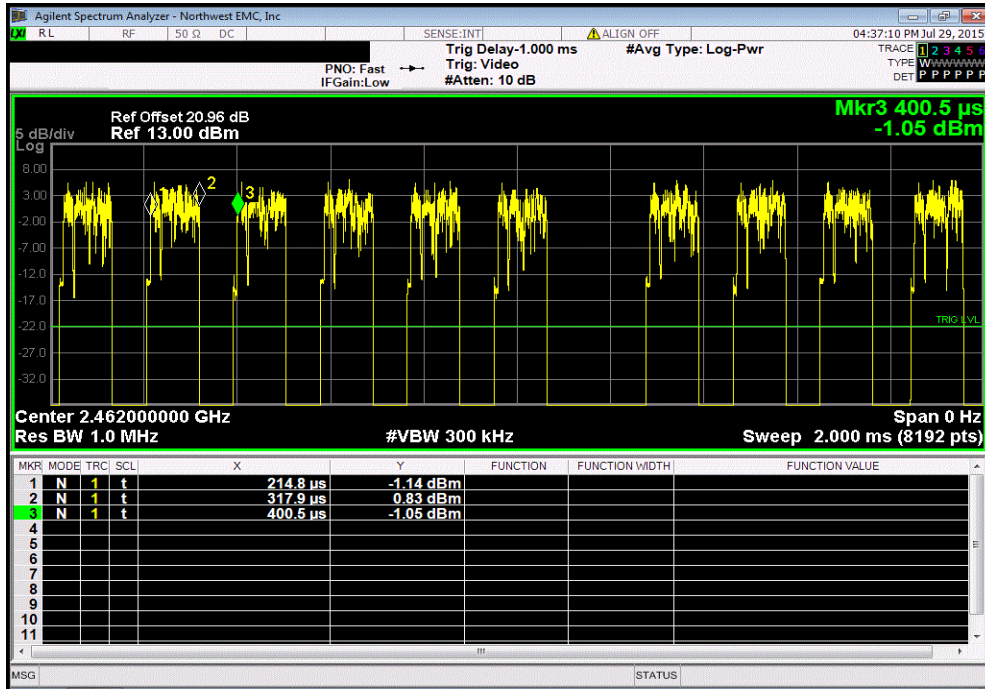


Chain B, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, Mid Channel 6, 2437 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	5	N/A	N/A	N/A	

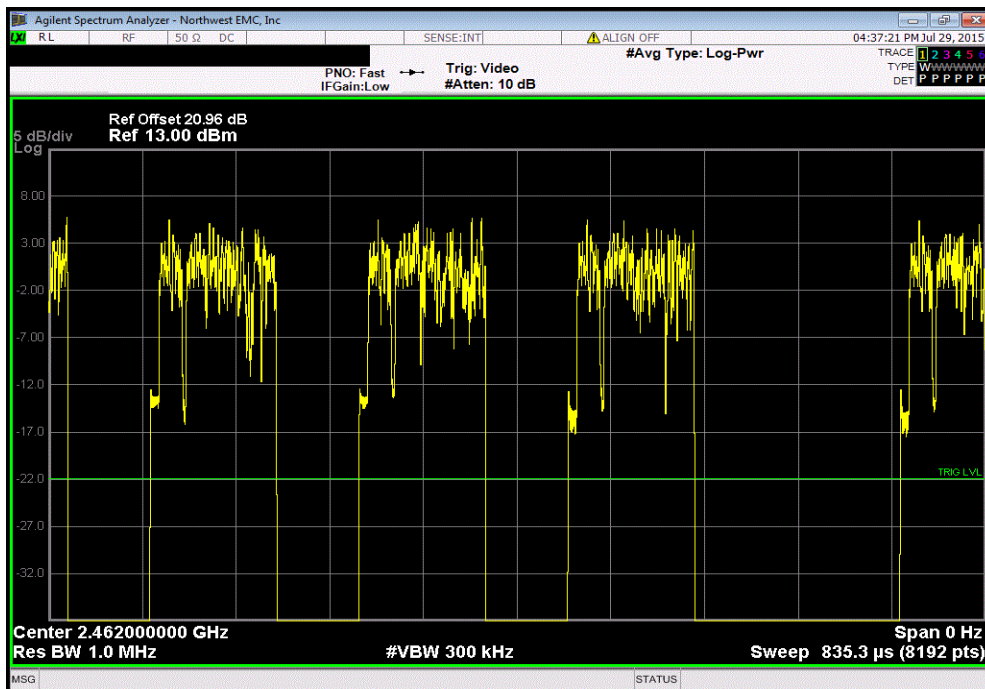


DUTY CYCLE

Chain B, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, High Channel 11, 2462 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
103.091 us	185.633 us	1	55.5	N/A	N/A	

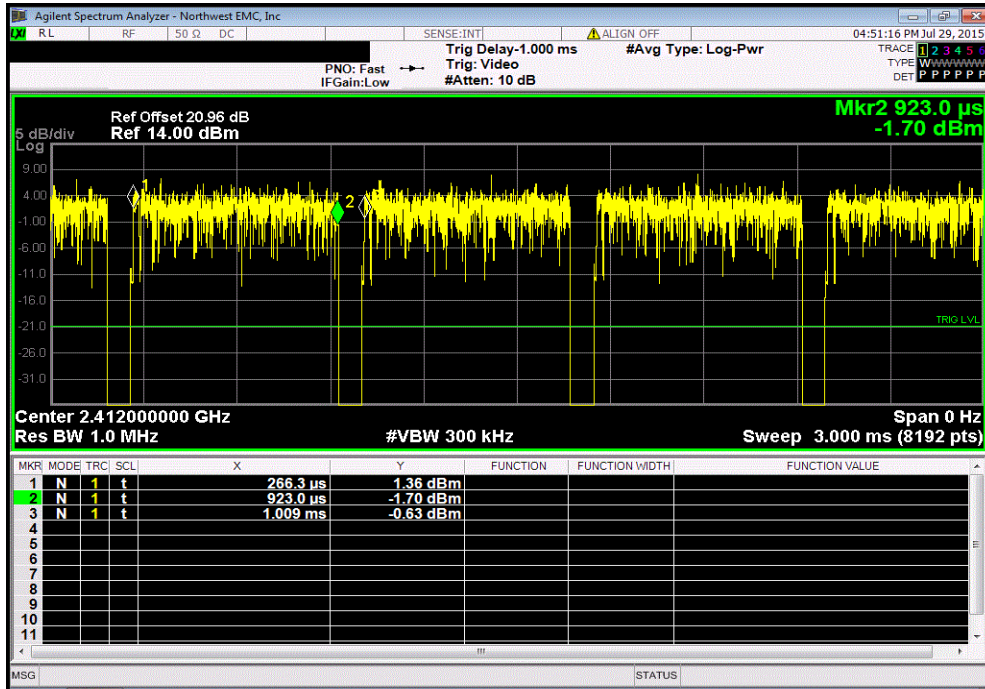


Chain B, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, High Channel 11, 2462 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	5	N/A	N/A	N/A	

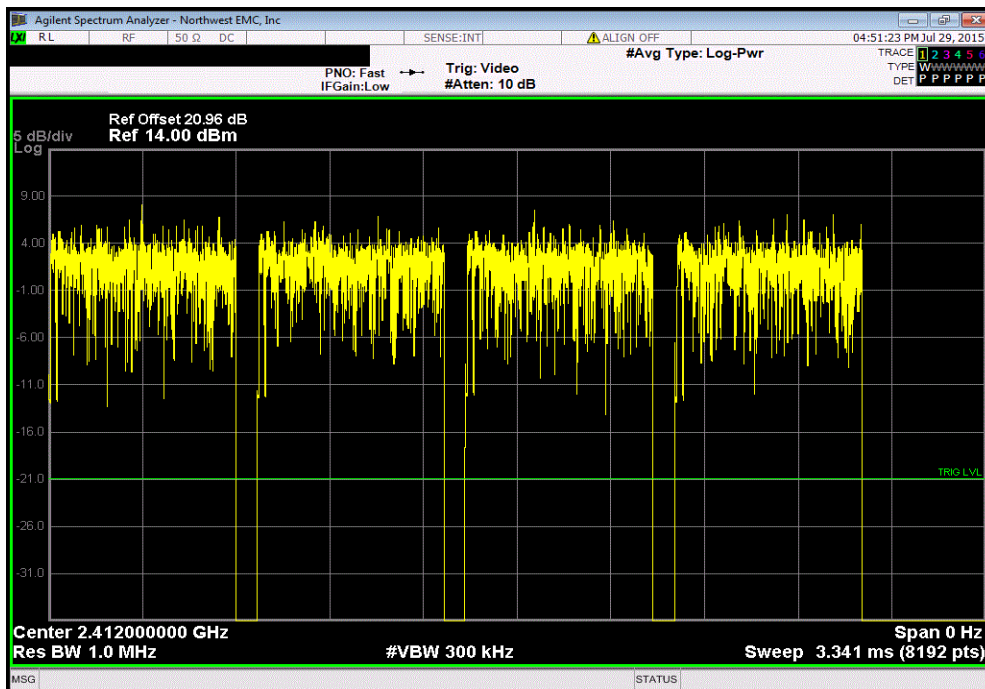


DUTY CYCLE

Chain C, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, Low Channel 1, 2412 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
656.704 us	742.4 us	1	88.5	N/A	N/A	

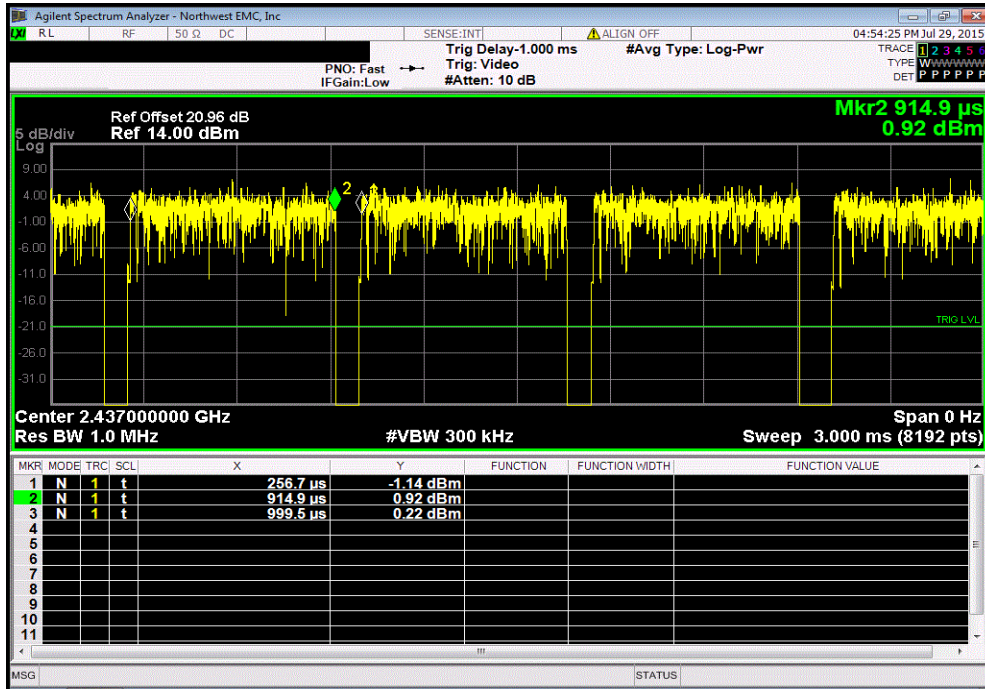


Chain C, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, Low Channel 1, 2412 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	4	N/A	N/A	N/A	



DUTY CYCLE

Chain C, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, Mid Channel 6, 2437 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
658.202 us	742.8 us	1	88.6	N/A	N/A	

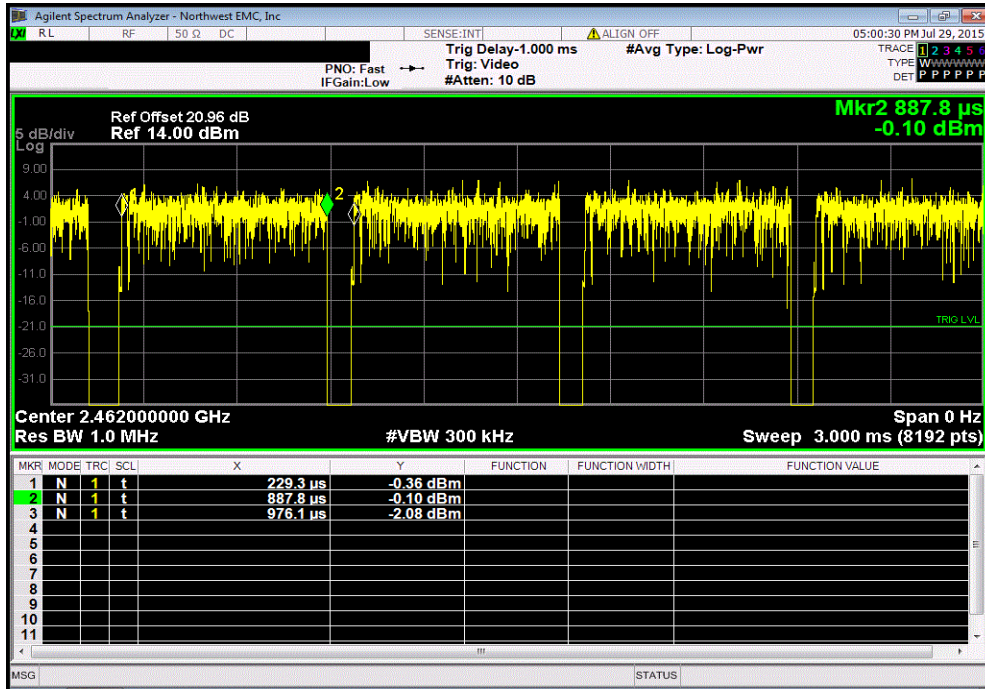


Chain C, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, Mid Channel 6, 2437 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	6	N/A	N/A	N/A	



DUTY CYCLE

Chain C, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, High Channel 11, 2462 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
658.535 us	746.8 us	1	88.2	N/A	N/A	

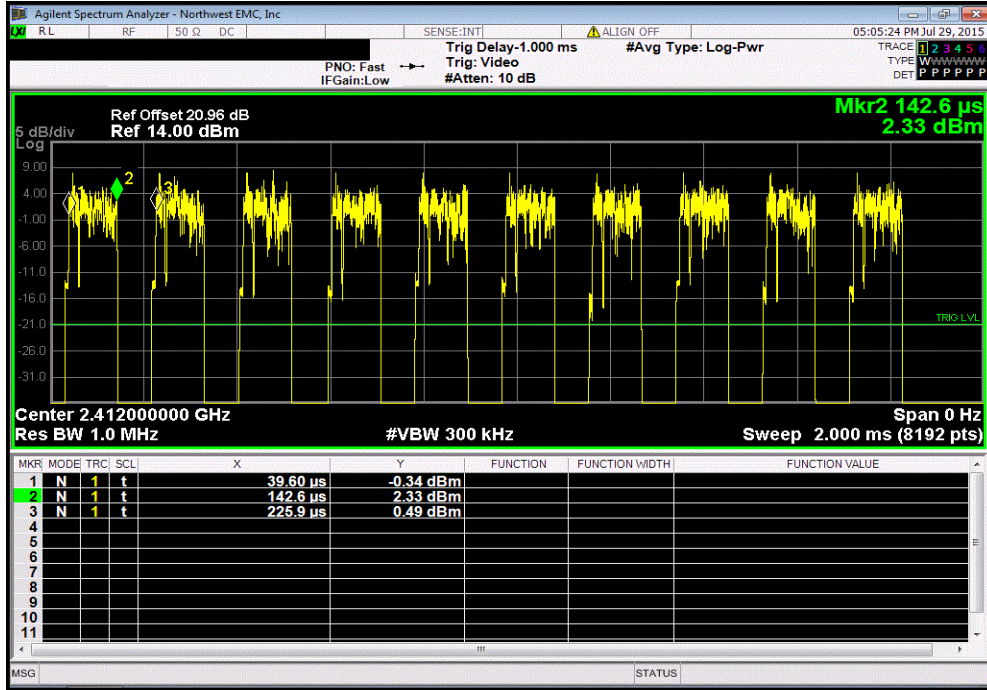


Chain C, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS16, High Channel 11, 2462 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	5	N/A	N/A	N/A	

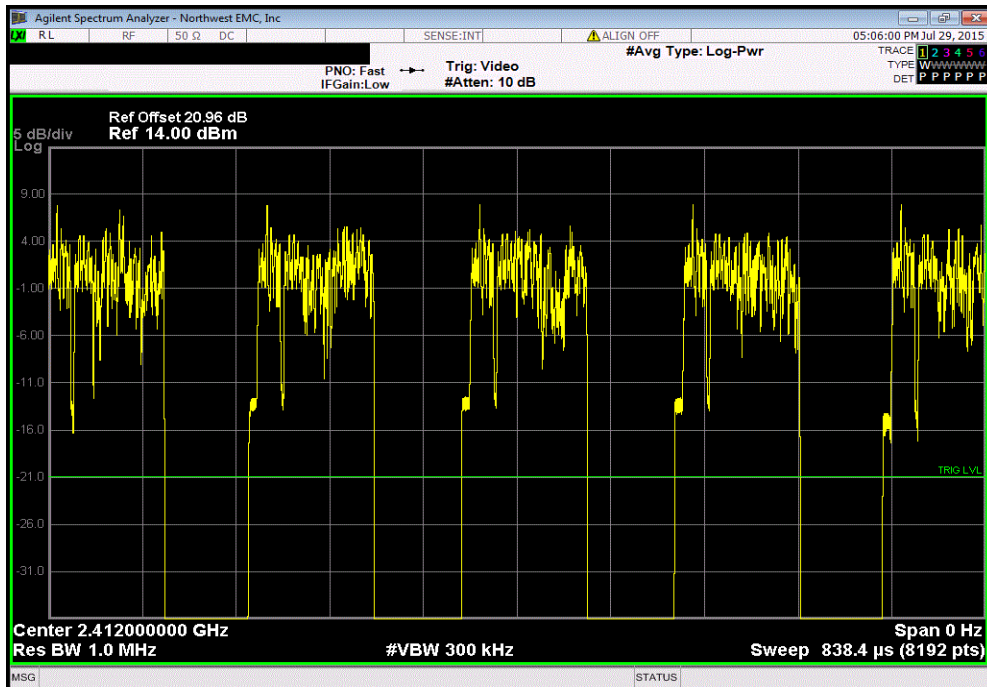


DUTY CYCLE

Chain C, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, Low Channel 1, 2412 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
102.967 us	186.3 us	1	55.3	N/A	N/A	

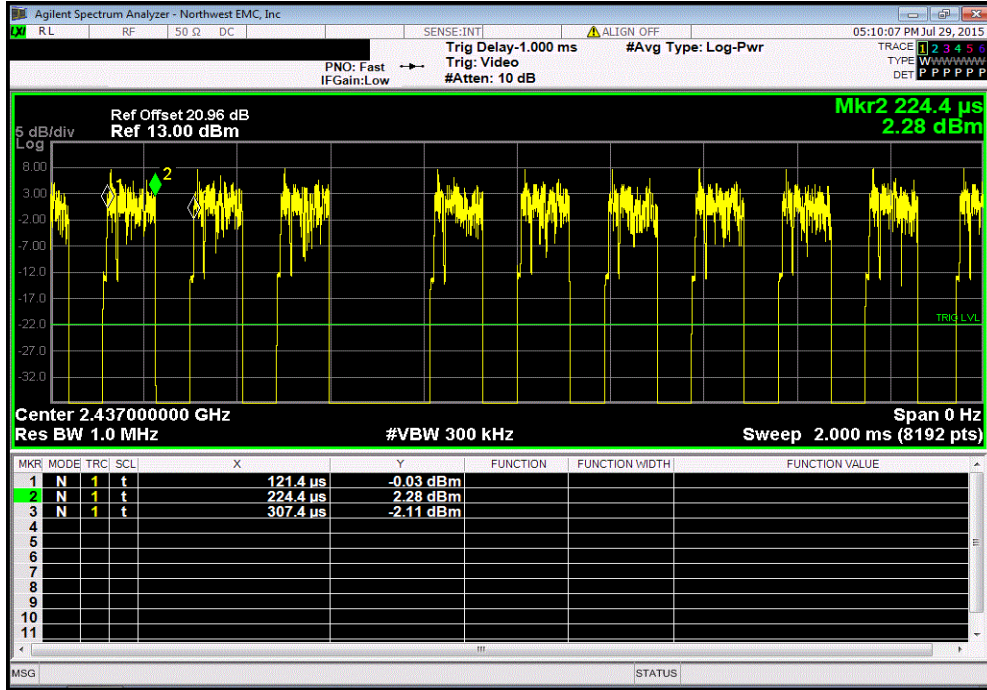


Chain C, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, Low Channel 1, 2412 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	5	N/A	N/A	N/A	

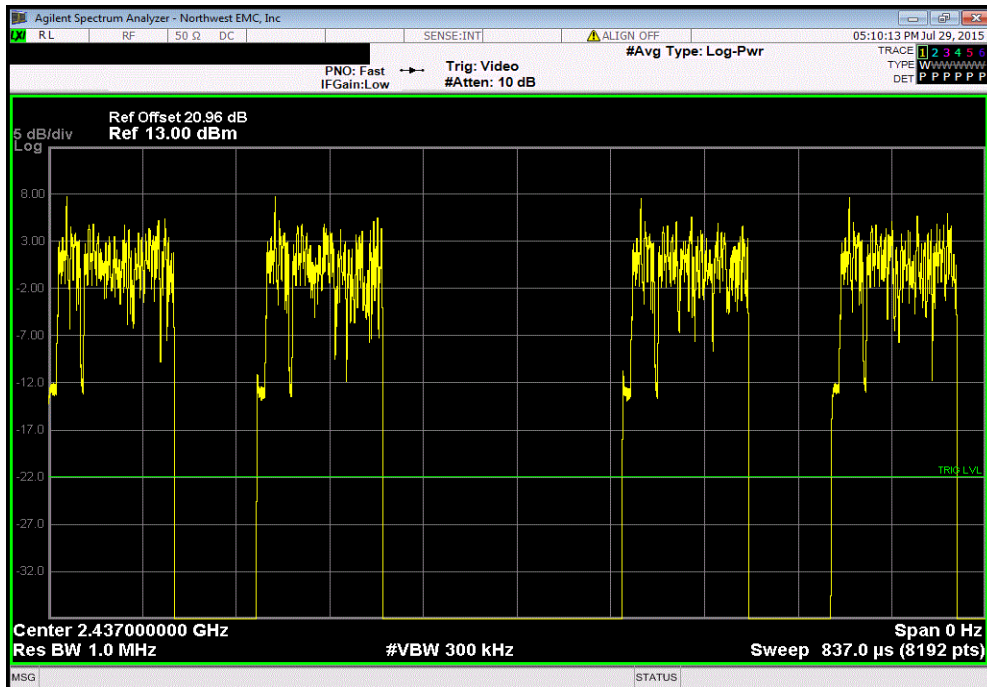


DUTY CYCLE

Chain C, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, Mid Channel 6, 2437 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
102.967 us	186 us	1	55.4	N/A	N/A	

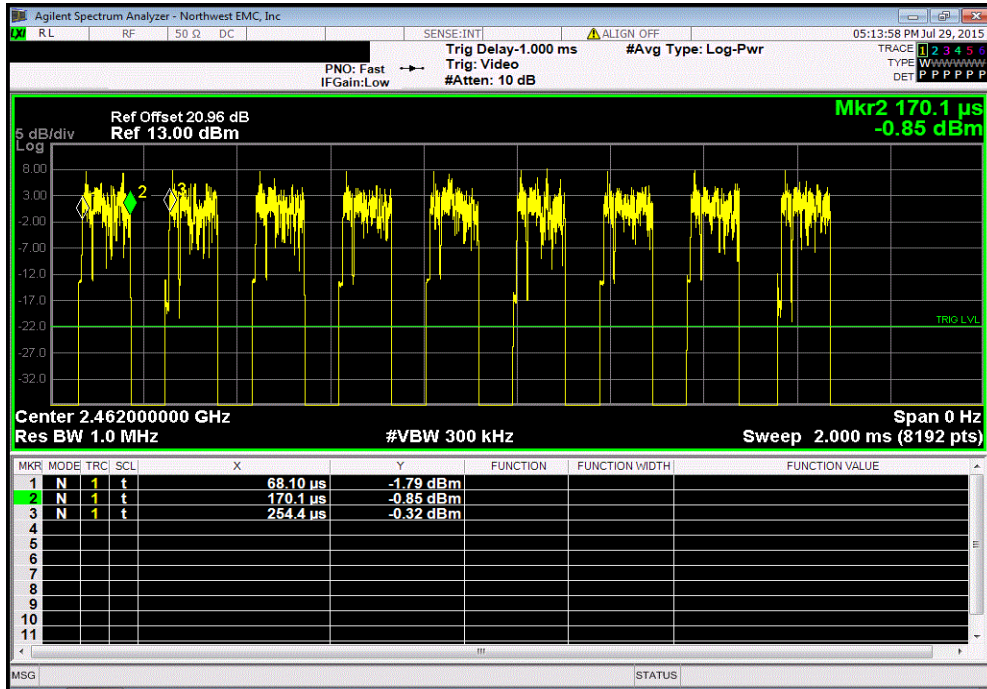


Chain C, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, Mid Channel 6, 2437 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	4	N/A	N/A	N/A	



DUTY CYCLE

Chain C, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, High Channel 11, 2462 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
102.047 us	186.3 us	1	54.8	N/A	N/A	



Chain C, 20 MHz, 2400 MHz - 2483.5 MHz Band, 802.11(n) MCS23, High Channel 11, 2462 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	5	N/A	N/A	N/A	

