



Electromagnetic Compatibility Test Report

Test Report No: MOB 130812 rev. 3.0
Issued on: October 25, 2012

Product Name
MCU-100
Mobile Communication Unit

Tested According to
FCC 47 CFR, Part 15.247

Tests Performed for
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ELECTRICAL TESTING
CERT #1633.01

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Tests Performed By: -----

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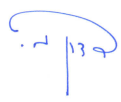
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Test Report details:

Test commencement date: 23.07.2012
Test completion date: 30.07.2012
Customer's representative: Yossi Segal
Issued on: 13.08.2012

Revision History:

Revision #	Date of issue	Reason of Rev. change
1.0	13.08.2012	---
2.0	27.09.12	FCC ID changed from PE9-MCU-100 to Q88-MCU-100
3.0	25.10.12	Added note in sec. 1 on the EUT powering via battery

Assessment information:

This report contains an assessment of the EUT against Electromagnetic Compatibility based upon tests carried out on the samples submitted. The results contained in this report relate only to the items tested. Manufactured products will not necessarily give identical results due to production and measurement tolerances. QualiTech, EMC Lab does not assume responsibility for any conclusion and generalization drawn from the test results with regards to other specimens or samples of type of the equipment represented by test item.

The EUT was set up and exercised using the configuration, modes of operation and arrangements defined in this report only.

Modifications:

Modifications made to the EUT

None

Modifications made to the Test Standard

None

Summary of Compliance Status

OFDM-TDMA

Test Spec. Clause	Test Case	Remarks
47 CFR §15.247 (a) (2)	6 dB Bandwidth	Comply
47 CFR §15.247 (b) (3) (4)	Maximum Conducted (Average) Output Power	Comply
47 CFR §15.247 (e)	Maximum Power Spectral Density in the Fundamental Emissions	Comply
47 CFR §15.247 (d)	Unwanted Conducted Emissions into Non-Restricted Bands	Comply
47 CFR §15.247 (d) & §15.205	Unwanted Radiated Emissions into Restricted Bands: 2310 – 2390 MHz & 2483.5 – 2500 MHz	Comply
47 CFR §15.247 (d), & §15.205, & §15.209(a)	Unwanted Radiated Emissions into Restricted Frequency Bands	Comply
47 CFR §15.203	Antenna Connector Requirements	Comply

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1. General Description

Description of the EUT system/test Item:

Mobile Communication Unit

Product name: MCU-100

FCC ID: Q88-MCU-100

Description:

MCU-100 is an Ad-Hoc Wireless Mobile Communication Unit, enabling broadband connectivity of Data, Video, and Voice and is based on 4G LTE technology Maximum Peak.

***The EUT was powered during the tests with a 12V Universal Battery.**

Output Power: 0.191 Watts

Frequency range: 2404-2474.5 MHz

Type of Modulation: QPSK

Antenna Gain:

2400MHz - 2483.5 MHz: +5 dBi

2. Method of Measurements

2.1. Conducted RF Measurements:

The RF output of the transmitter under test was directly connected to the input of the Spectrum analyzer through a specialized antenna connector provided by the manufacturer, and an attenuator as specified. The external attenuator and cable loss were added to the reading. Worst-case results of the various modulation modes (where applicable) were reported.

For PSD^[a1], emission peak was zoomed within the pass band with spectrum analyzer's settings as reported (Sweep time=Span/3 kHz)

For Maximum Conducted Output Power an Average Power Meter was used.

For spurious emissions measurement, the spectrum from 9 kHz to 40 GHz was investigated with the transmitter set to the lowest, middle and highest channel frequencies.

For bandedge measurement ^[a2] allow the trace to stabilize. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. The marker-delta value now displayed must comply with the limit specified in this Section. Submit this plot.

Radiated Emissions Measurements in the restricted bands:

For radiated emissions, which fall in the restricted bands the spectrum from 1MHz to 25GHz was investigated following the guidelines in ANSI C63.4-2003, with the transmitter set to the lowest, middle and highest channel frequencies. Measurements were performed with peak detector and repeated averaged with VBW=10 Hz. Only Peak detection plots are presented. Worst-case ^[a3] results of the various modulation modes (where applicable) were reported.

2.2. Radiated Emission measurements:

Measurements were performed at a 3-meter measurement distance in the semi-anechoic chamber in order to evaluate the radiated electromagnetic interference characteristics of the EUT. The EUT was placed on a non-metallic table/support, 0.8m above the turntable, was configured, arranged and operated in a manner consistent with typical application and load conditions. The test program of exercising the equipment ensured that various parts of the EUT were exercised to permit detection of all EUT disturbances.

An appropriate antenna depending upon the frequency range, per ANSI C63.4-2003 clause 4.1.5 was used. While the turntable was being rotated, the height of the antenna was varied from 1 to 4m for the frequency range of 30MHz to 1GHz. The highest radiated emission was detected by manipulating the ^[a4]EUT through three axis(x,y,z) and system cables, a worst-case results are reported by max hold function

This process was repeated for both antenna polarizations. The spectrum up to 40 GHz was investigated for spurious emissions, using a band-reject filter where appropriate.

The amplitudes of worst-case emission were measured with the detector modes and resolution bandwidths over various frequency ranges according to the requirements of ANSI C63.4-2003 clause 4.2.

2.3. Worst Case Results:

In order to determine the worst case emissions for all modes/data rates/tests, all modes/data rates were investigated for each required test to determine which produces the worst- case data and then full testing was performed in that mode/data rate^[a5]

3. Test Facility & Uncertainty of Measurement

3.1. Accreditation/ Registration reference:

- A2LA Certificate Number: 1633.01

3.2. Test Facility description

The tests were performed at the EMC Laboratory, QualiTech Division, ECI Telecom Group

Address: 30, Hasivim St., Petah Tikva, Israel.
Tel: 972-3-926-8443

3m Anechoic Chamber:

The 3m-screened chamber is used in two configurations: the semi-anechoic configuration for Radiated Emission measurements and the full-anechoic configuration for Radiated Immunity tests.

Semi Anechoic Configuration:

Measurement distance	3m
Chamber dimensions	9.5m x 6.5m x 5.2m
Antenna height	1 - 4m
Shielding Effectiveness	Magnetic field ≥ 80 dB at 15 kHz ≥ 90 dB at 100 kHz Electric field > 120 dB from 1MHz to 1GHz > 110 dB from 1GHz to 10GHz
Absorbing material	Ferrite tiles on the walls and ceiling Frankonia hybrid absorbing material in selected positions on the walls
Normalized Site Attenuation measured at 5 positions	± 3.49 dB, 30MHz to 1GHz
Transmission Loss measured at 5 positions, at 1.5m height	± 3 dB, 1GHz to 18GHz

Full-Anechoic Configuration:

Measurement distance	3m
Chamber dimensions	7m x 4m x 3m
Antenna height	1.55m at Horizontal & Vertical polarizations
Shielding Effectiveness	Magnetic field ≥ 80 dB at 15 kHz ≥ 90 dB at 100 kHz Electric field > 120 dB from 1MHz to 1GHz > 110 dB from 1GHz to 10GHz
Absorbing material	Ferrite tiles on the walls and ceiling Frankonia hybrid absorbing material in selected positions on the walls and floor
Field Uniformity to EN61000-4-3	± 3 dB 80MHz to 18GHz

3.3. Uncertainty of Measurement:

Test Name	Test Method & Range	Uncertainty	
		Combined std. Uc(y) [dB]	Expanded U [dB]
Radiated Emission	30MHz÷230MHz, Horiz. polar.	1.8	3.6
	30MHz÷230MHz, Ver. polar.	2.0	3.9
	230MHz÷1000MHz, Horiz. polar.	1.5	3.0
	230MHz÷1000MHz, Vert. polar.	1.5	3.0
Conducted Emission	9 kHz÷150 kHz	1.4	2.8
	150 kHz÷30MHz	1.1	2.2

4. OFDM-TDMA: Report of Measurements and Examinations

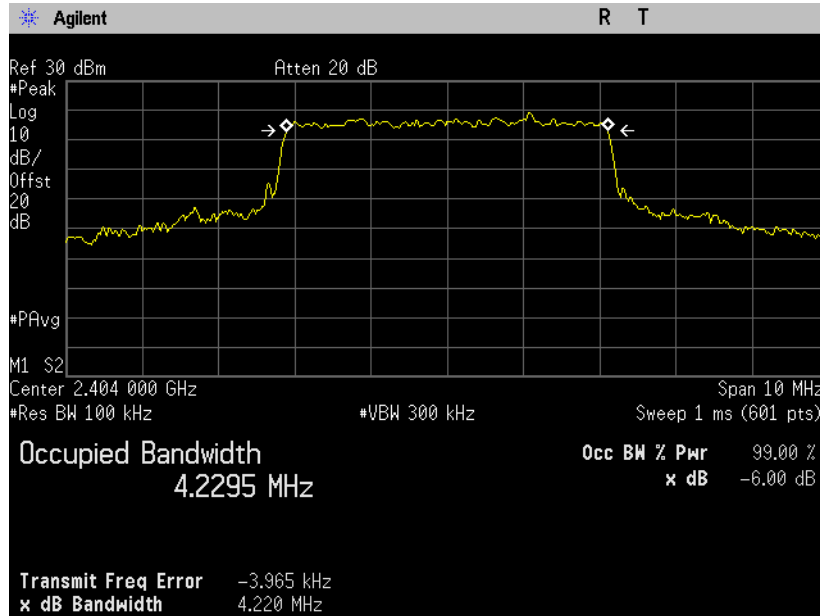
4.1. 6 dB Bandwidth

Reference document:	47 CFR §15.247 (a)(2)		
Test Requirements:	Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.		
Test setup:	See sec 2.1	Pass	
Method of testing:	KDB 558074 D01 v01, Sec.5.1.2 Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 100 kHz, VBW: 300 kHz		
Environment conditions:	Ambient Temperature: 23 °C	Relative Humidity: 50.5 %	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.1.1 – Plot 4.1.6	

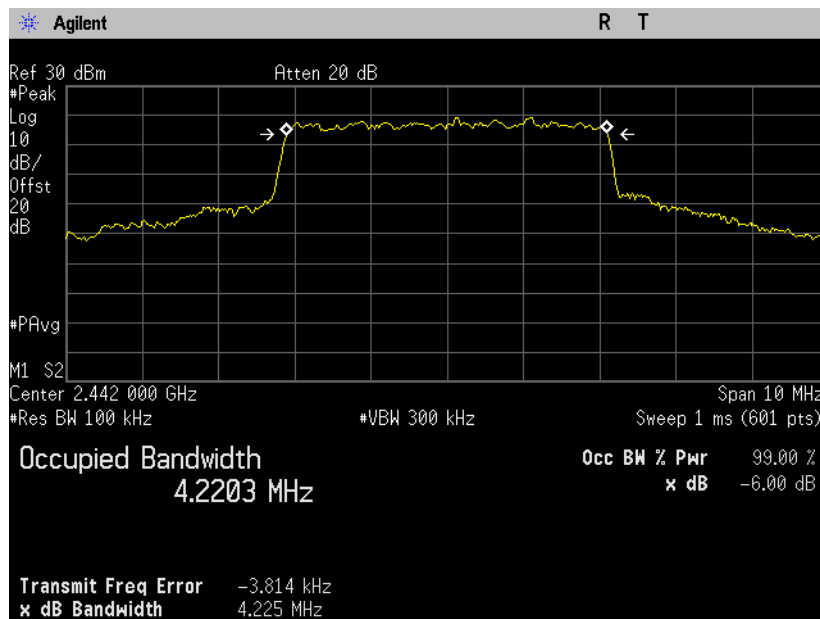
Test results

Fundamental Frequency [MHz]	Data Rate [Mbps]	6 dB Bandwidth [kHz][a6]	Limit [kHz]
Output A OFDM-TDMA, QPSK, FEC 3/4 , 99 % duty cycle			
2404	5.4	4220	>500
2442	5.4	4225	>500
2474.5	5.4	4231	>500
Output B OFDM-TDMA, QPSK, FEC 3/4 , 99 % duty cycle			
2404	5.4	4248	>500
2442	5.4	4236	>500
2474.5	5.4	4248	>500

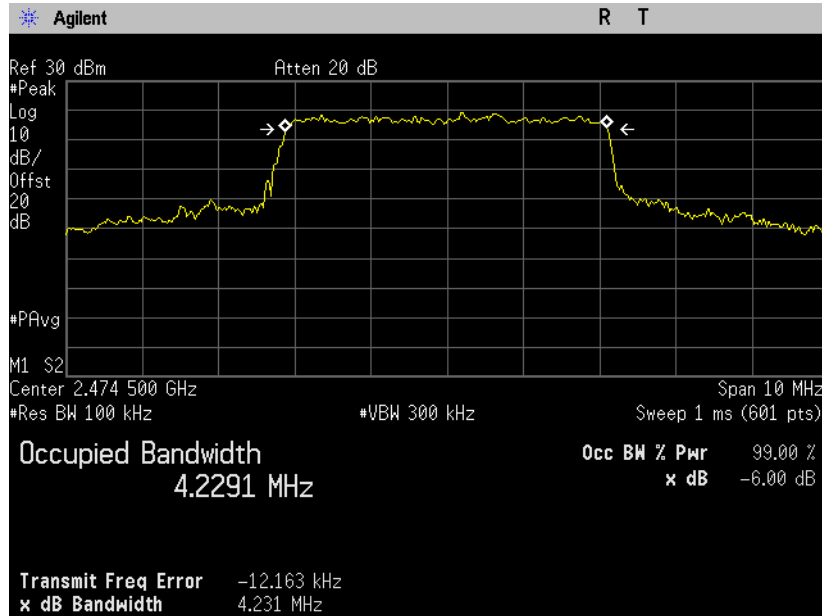
2404 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.1.1



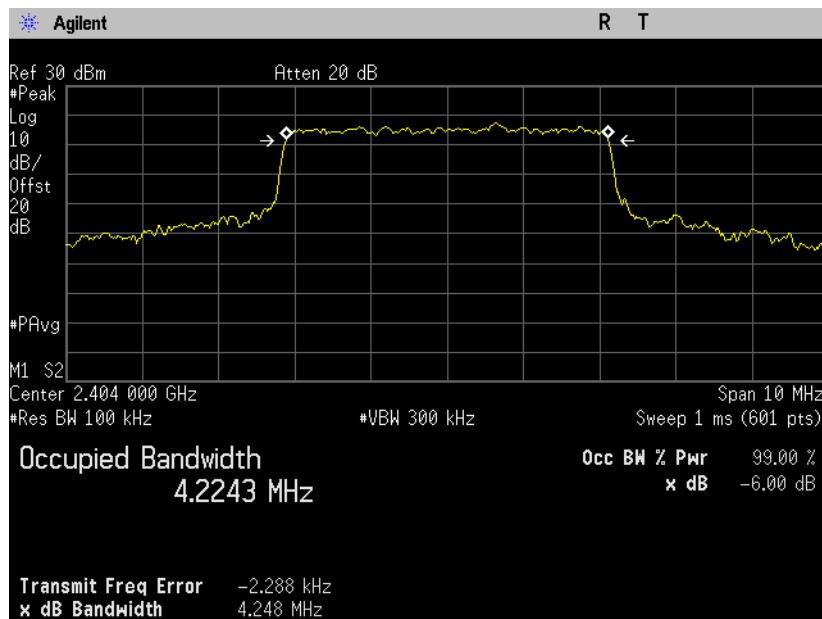
2442 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.1.2



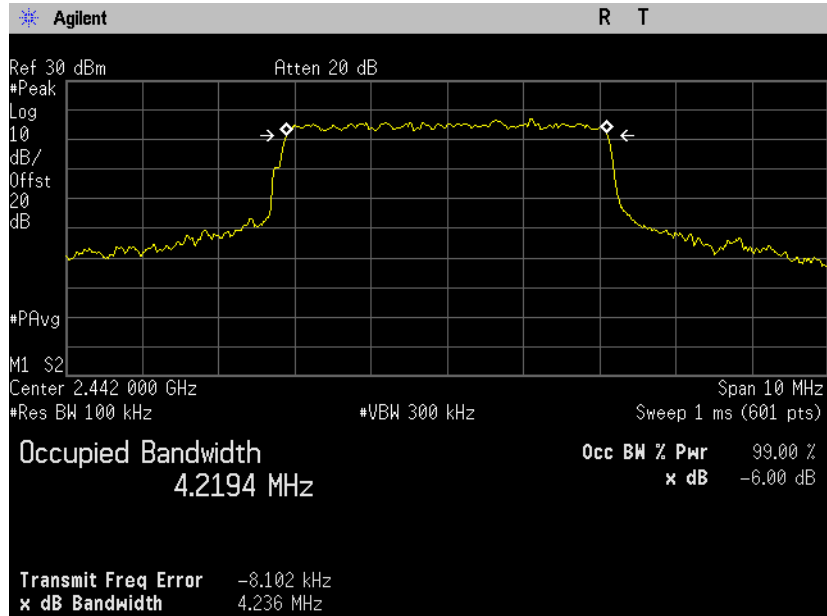
2474.5 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.1.3



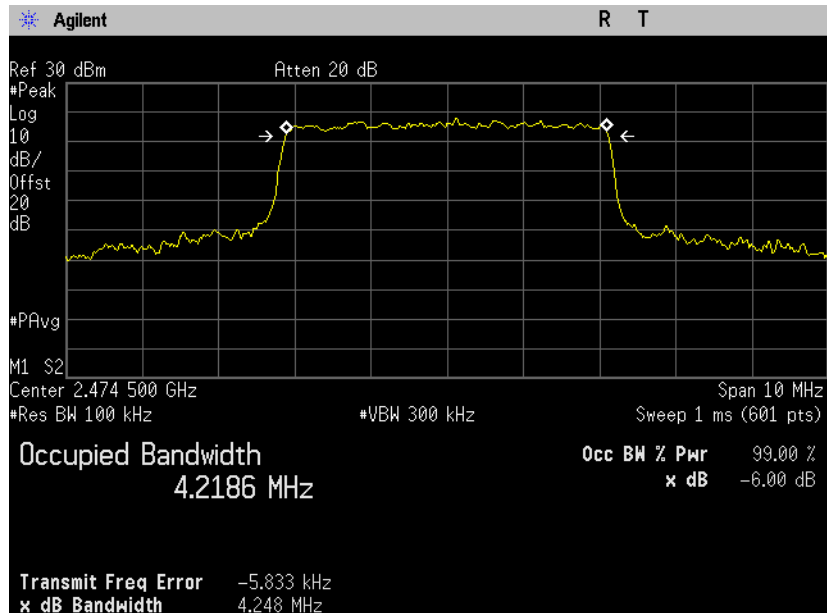
2404 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.1.4



2442 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.1.5



2474.5 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.1.6



4.2. Maximum Conducted (Average) Output Power

Reference document:	47 CFR §15.247 (b)(3)(4)		
Test Requirements:	The maximum peak conducted output power of the intentional radiator for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands shall not exceed 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted (average) output power. The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.		
Test setup:	See sec 2.1	Pass	
Method of testing:	KDB 558074 D01 v01, Sec.5.2.2.1 Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 1 MHz, VBW: 8 MHz, Sweep Time: 10 s		
Environment conditions:	Ambient Temperature: 23 °C	Relative Humidity: 50.5 %	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.2.1 – Plot 4.2.6	

Test Results:

Fundamental Frequency [MHz][a7]	Transmitter Output	Data Rate [Mbps]	Maximum Conducted (Average) Output Power [dBm]	Maximum Conducted (Average) Output Power [mW]	Total Conducted (Average) Output Power [mW]	Total Conducted (Average) Output Power [dBm]	*Limit [dBm]	Margin [dB]
OFDM-TDMA, QPSK, FEC ¾, 99 % duty cycle								
2404	A	5.4	19.51	89.33	168.40	22.26	28.00	5.74
	B	5.4	18.98	79.07				
2442	A	5.4	20.24	105.68	181.89	22.60	28.00	5.40
	B	5.4	18.82	76.21				
2474.5	A	5.4	20.33	107.89	191.45	22.82	28.00	5.18
	B	5.4	19.22	83.56				

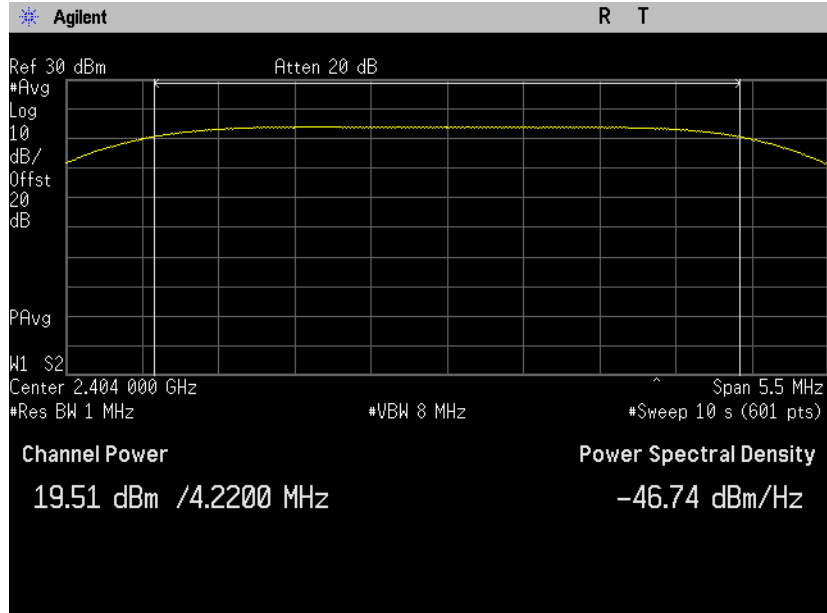
***Note:** a) Limit (P_{out}) = 30 – (G_{tx} – 6), where G_{tx} is the maximum transmitting antenna directional gain in dBi;

b) Per KDB 662911, directional gain of N transmit antennas in case of correlated transmit signals is computed as follows:

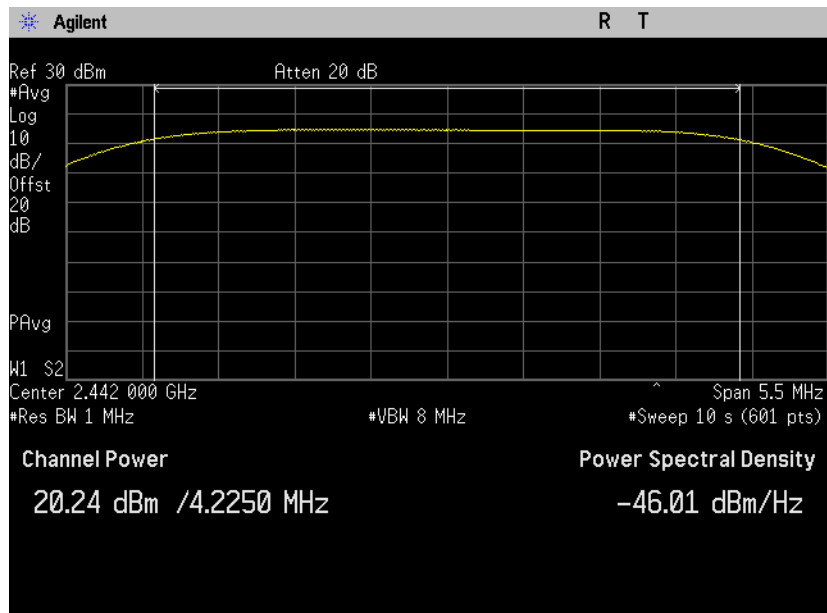
$$G_{tx} = G_{ant} + 10 \log(N) \text{ dBi}; G_{tx} = 5 + 10 \log(2) = 8 \text{ dBi}; G_{ant} = 5 \text{ dBi per customer's declaration.}$$

c) Hence, $P_{out} = 30 - (8 - 6) = 28 \text{ dBm}$;

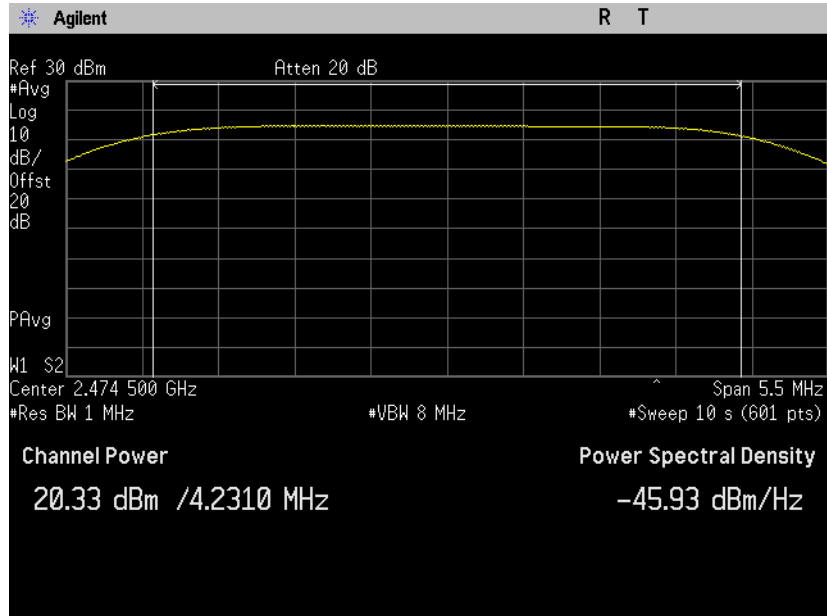
2404 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.2.1



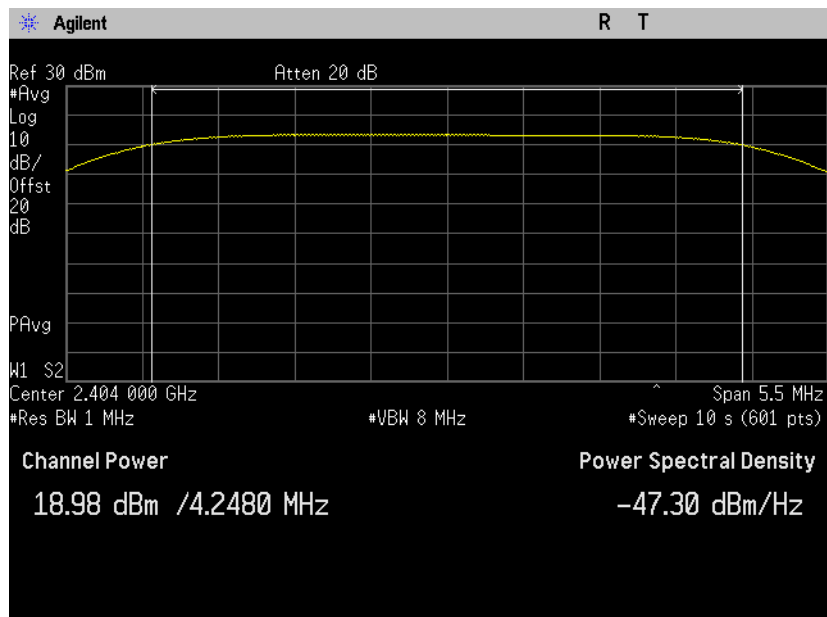
2442 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.2.2



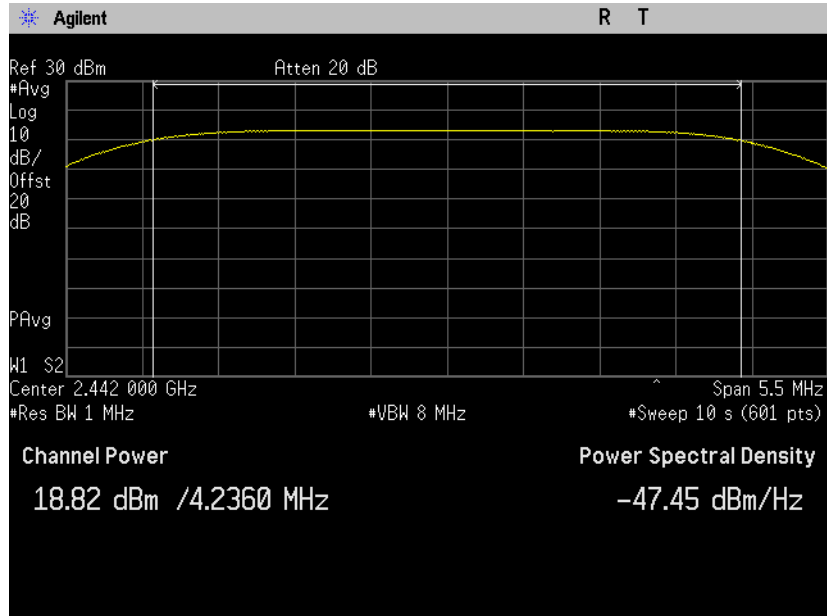
2474.5 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.2.3



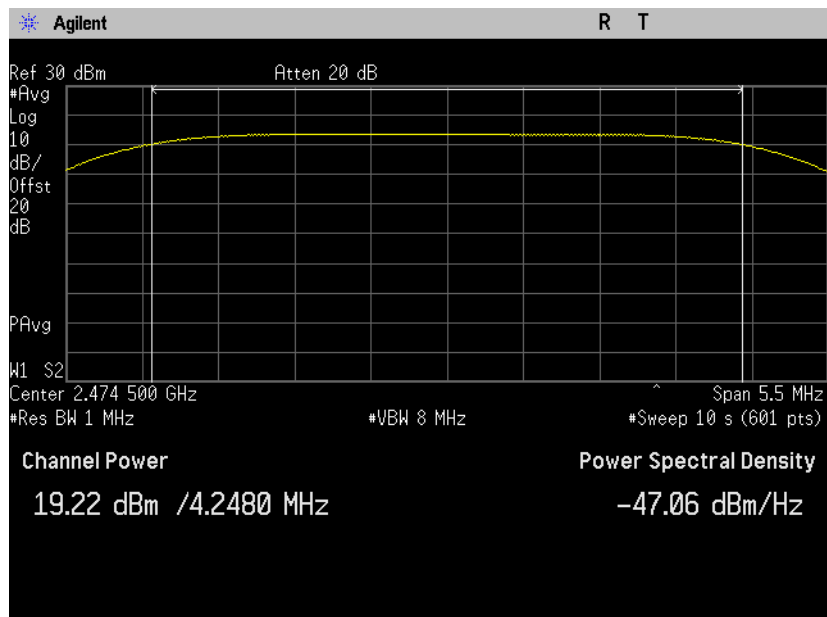
2404 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.2.4



2442 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.2.5



2474.5 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.2.6



4.3. Maximum Power Spectral Density Level in the Fundamental Emissions

Reference document:	47 CFR §15.247 (e)		
Test Requirements:	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.		
Test setup:	See sec 2.1	Pass	
Method of testing:	KDB 558074 D01 v01, Sec.5.3.2 Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 100 kHz, VBW: 300 kHz, Sweep Time: 100 s		
Environment conditions:	Ambient Temperature: 23 °C	Relative Humidity: 50.1 %	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.3.1 - Plot 4.3.6	

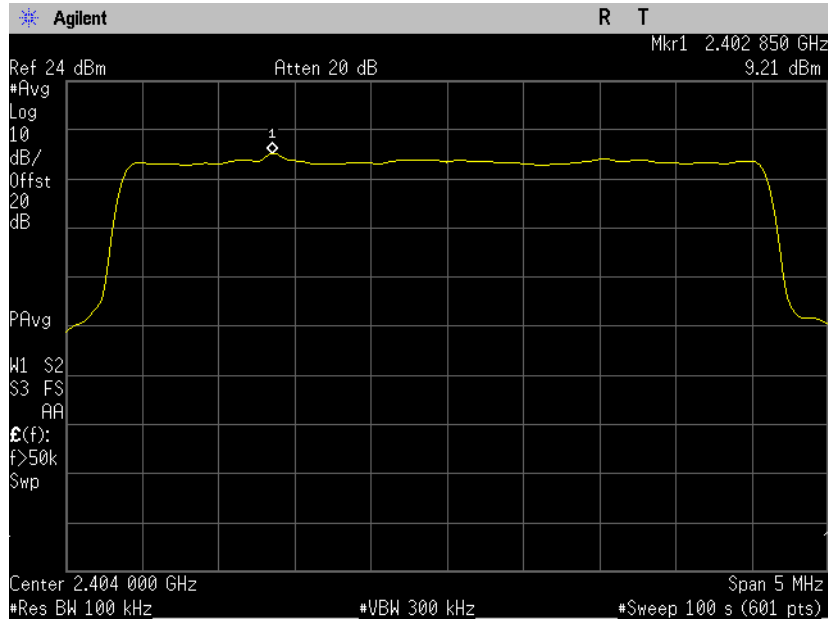
Test Results:

Fundamental Frequency [MHz][a8]	Transmitter Output	Data Rate [Mbps]	PSD Measured [dBm/100kHz][a9]	¹ Correction for N outputs [10 log (N) dB]	² Bandwidth Correction Factor (BWCF) [dB]	PSD Corrected [dBm/3kHz][a10]	PSD Limit [dBm/3kHz]	Margin [dB]
OFDM-TDMA, QPSK, FEC ¾, 99 % duty cycle								
2404	A	5.4	9.21	3.00	-15.20	-2.99	8.00	10.99
	B	5.4	7.75	3.00	-15.20	-4.45	8.00	12.45
2442	A	5.4	9.64	3.00	-15.20	-2.56	8.00	10.56
	B	5.4	7.38	3.00	-15.20	-4.82	8.00	12.82
2474.5	A	5.4	9.45	3.00	-15.20	-2.75	8.00	10.75
	B	5.4	8.25	3.00	-15.20	-3.95	8.00	11.95

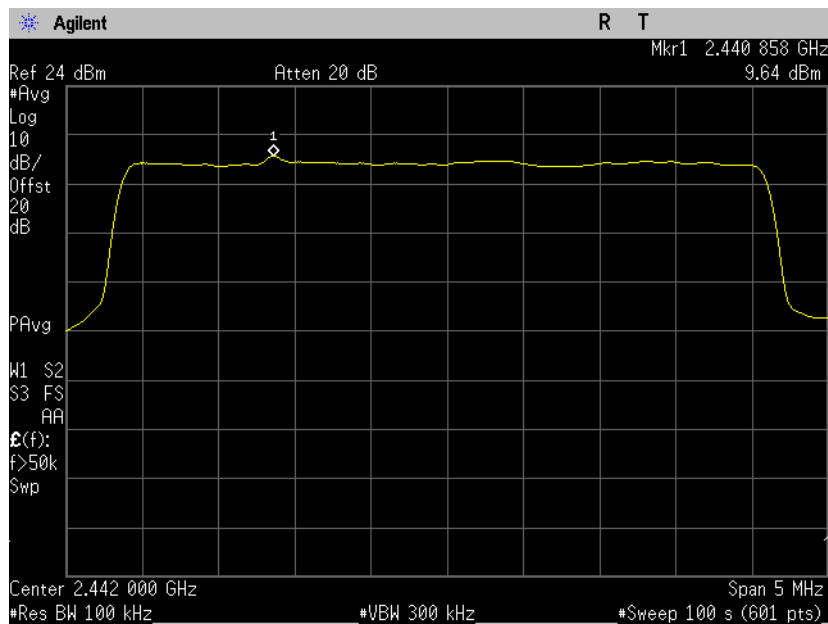
¹ - N = 2, hence 10 log (2) = 3 dB

² - BWCF = 10 log (3 kHz/ 100 kHz) = - 15.2 dB

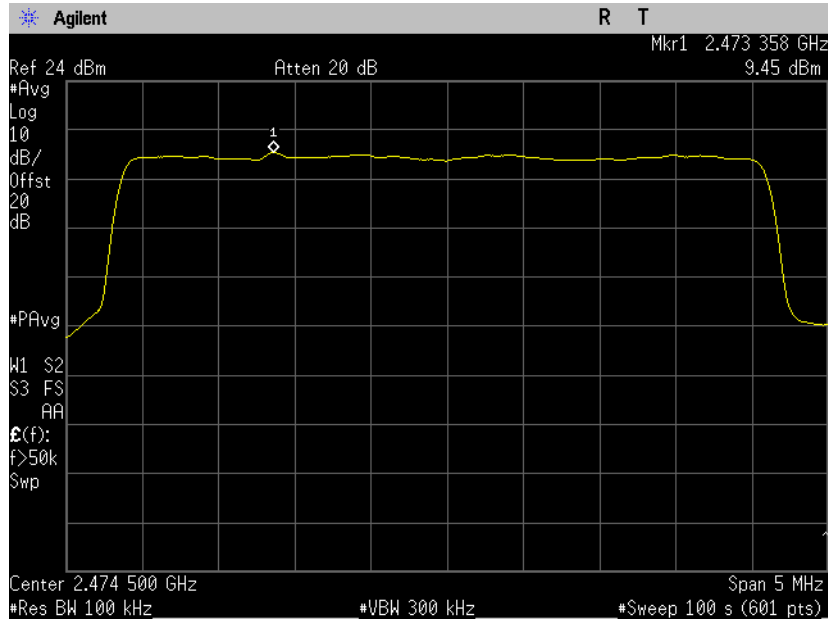
2404 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.3.1



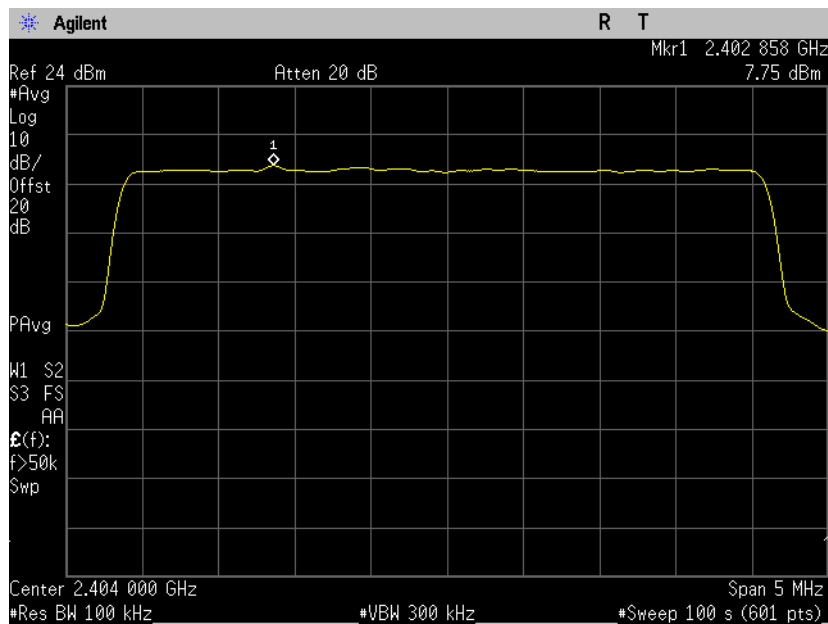
2442 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.3.2



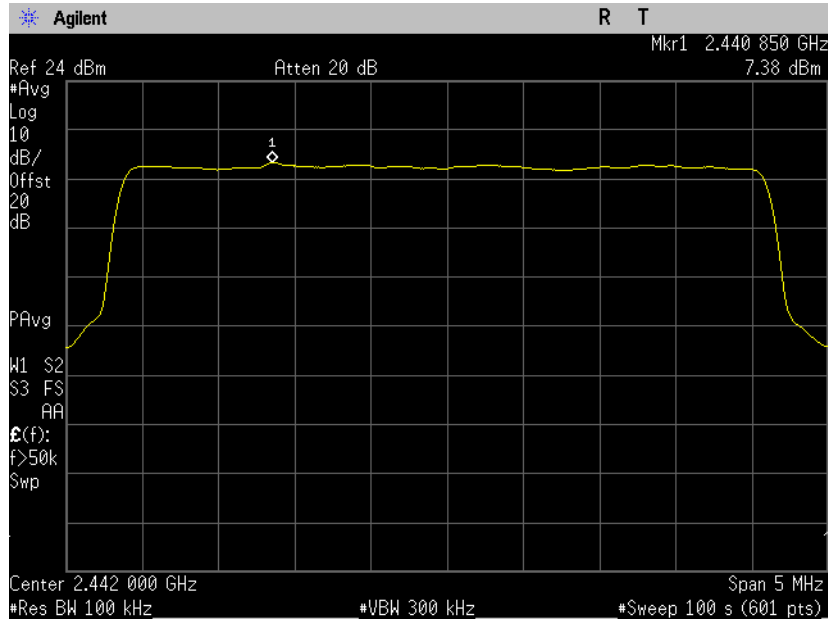
2474.5 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.3.3



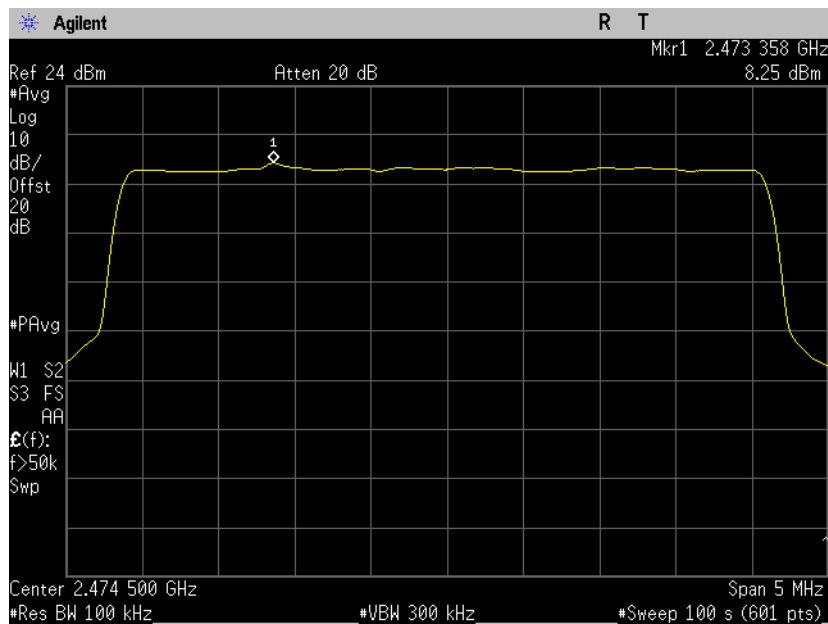
2404 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.3.4



2442 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.3.5



2474.5 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.3.6



4.4. Unwanted Conducted Emissions into Non-Restricted Frequency Bands

Reference document:	47 CFR §15.247 (d)		
Test Requirements:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30dB instead of 20dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (See §15.205(c)).		
Test setup:	See sec 2.1	Pass	
Method of testing:	KDB 558074 D01 v01, Sec.5.4.1 Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 100 kHz, VBW:300 kHz		
Environment conditions:	Ambient Temperature: 23 °C	Relative Humidity: 50.5 %	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.4.1- Plot 4.4.22	

Test results:

Unwanted Emissions Measurements:

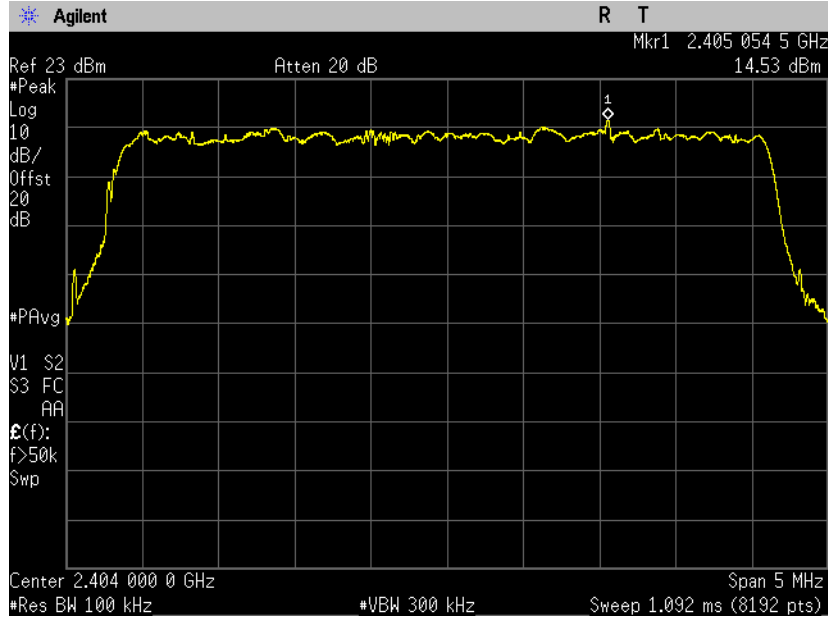
Fundamental Frequency [MHz][a11]	Transmitter Output	Data Rate [Mbps]	Fundamental Emission Reference Level [dBm][a12]	Unwanted Emissions Frequency [MHz]	Unwanted Emissions Level [dBm]	Calculated Attenuation below Reference Level [dB]	Limit for Attenuation below Reference Level [dB]	Margin [dB]
OFDM-TDMA, QPSK, FEC ¾ , 99 % duty cycle								
2404	A	5.4	14.53	*	*	*	≥ 30	> 15
	B	5.4	14.06	*	*	*	≥ 30	> 15
2442	A	5.4	16.12	*	*	*	≥ 30	> 15
	B	5.4	14.33	*	*	*	≥ 30	> 15
2474.5	A	5.4	15.90	*	*	*	≥ 30	> 15
	B	5.4	13.46	*	*	*	≥ 30	> 15

* - all unwanted emissions were at least 45 dB below the fundamental emissions reference level

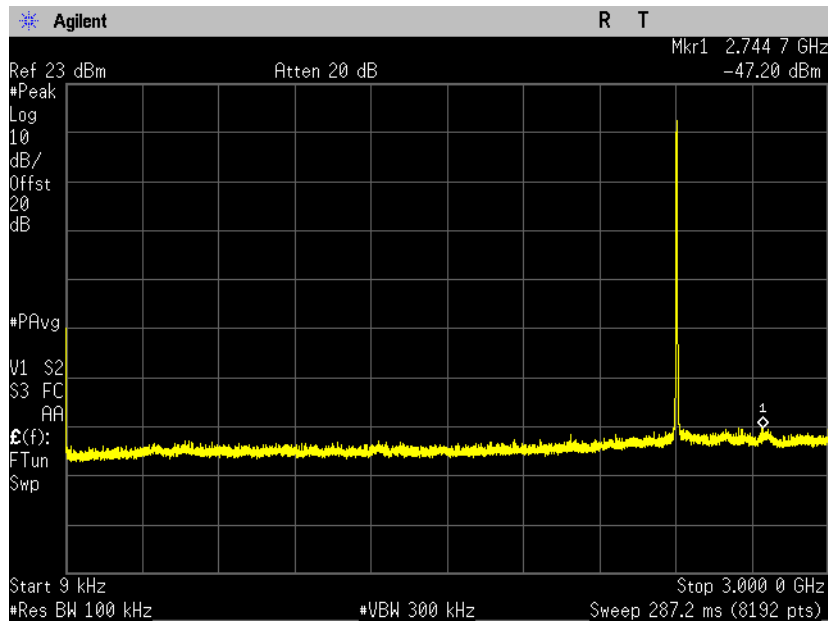
Band-Edge Measurements:

Fundamental Frequency [MHz][a13]	Transmitter Output	Data Rate [Mbps]	Fundamental Emission Reference Level [dBm][a14]	Unwanted Emissions Level [dBm]	Calculated Attenuation below Reference Level [dB]	Limit for Attenuation below Reference Level [dB]	Margin [dB]
OFDM-TDMA, QPSK, FEC 3/4 , 99 % duty cycle							
2404	A	5.4	16.54	-25.24	41.78	≥ 30	11.78
	B	5.4	14.44	-23.63	38.07	≥ 30	8.07
2474.5	A	5.4	15.09	-48.39	63.48	≥ 30	33.48
	B	5.4	13.33	-48.65	61.98	≥ 30	31.98

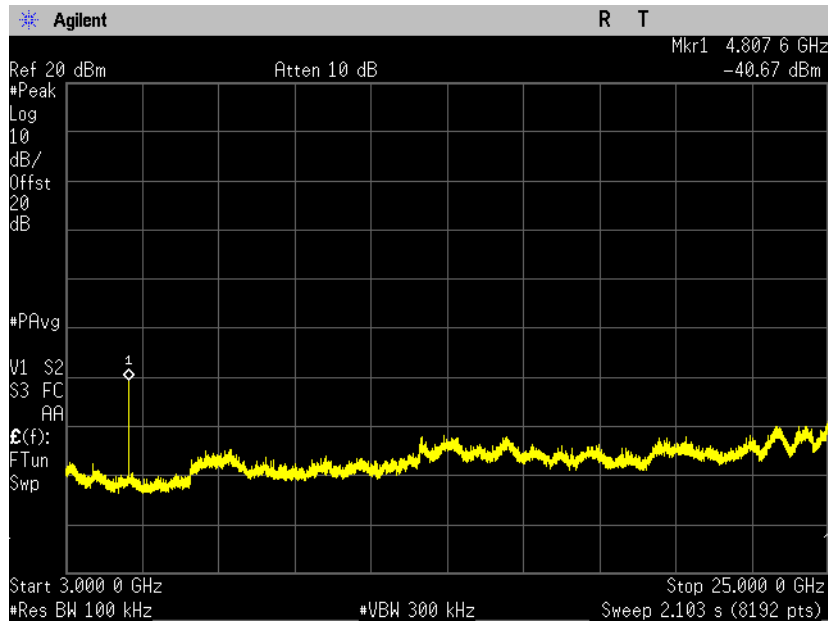
Fundamental Emission Reference Level
2404 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.1



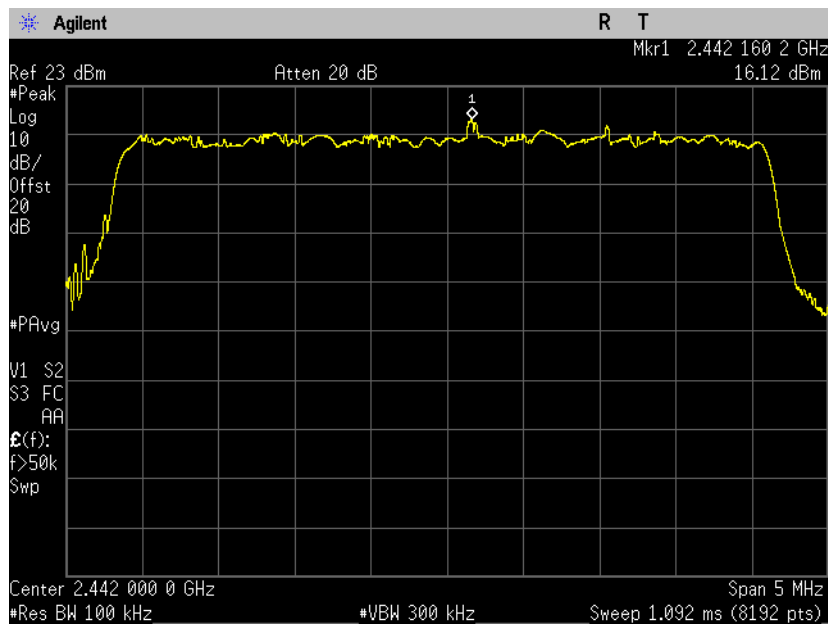
Unwanted Emissions, 2404 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.2



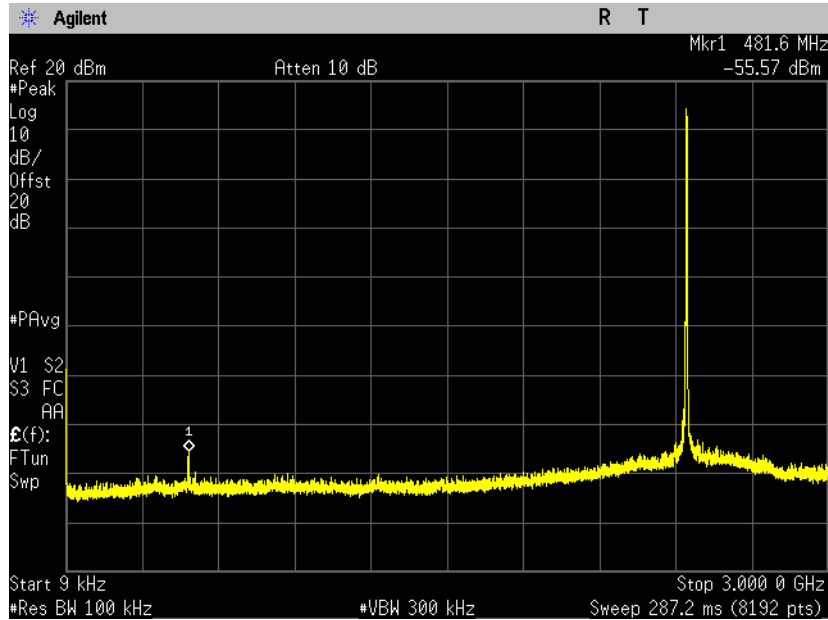
Plot 4.4.3



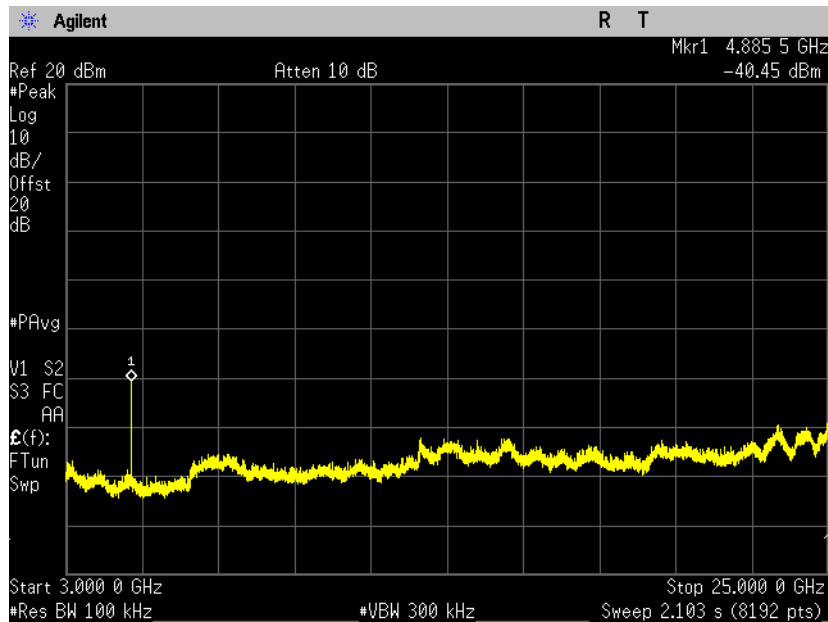
Fundamental Emission Reference Level
2442 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.4



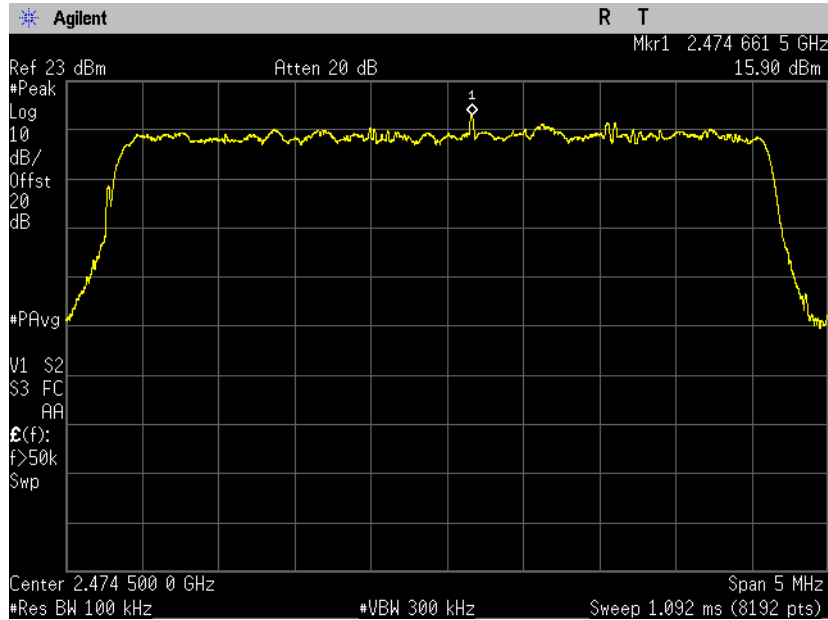
Unwanted Emissions, 2442 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.5



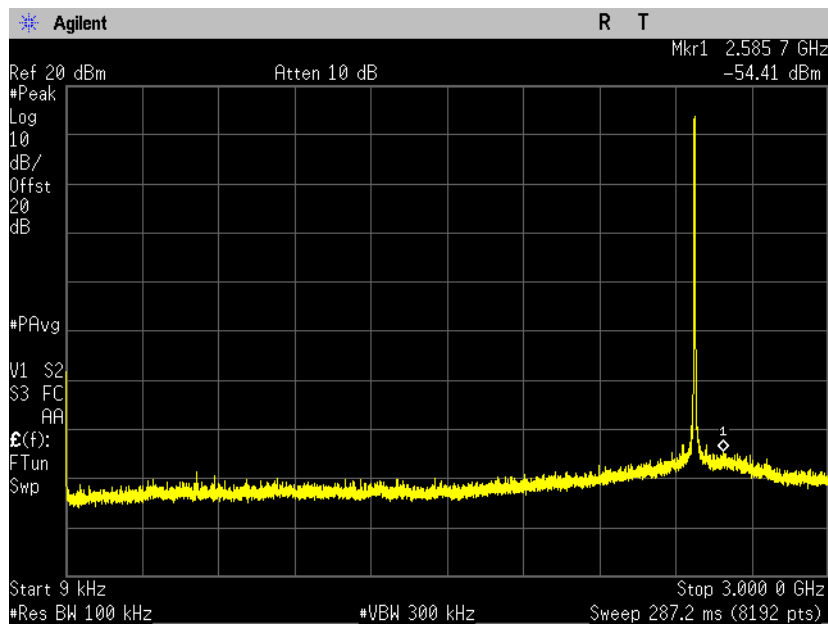
Plot 4.4.6



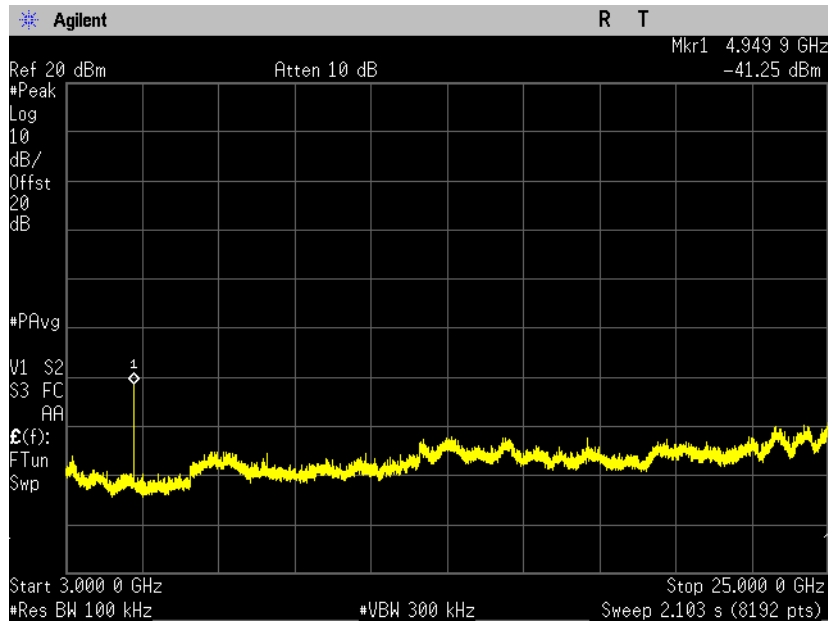
Fundamental Emission Reference Level
2474.5 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.7



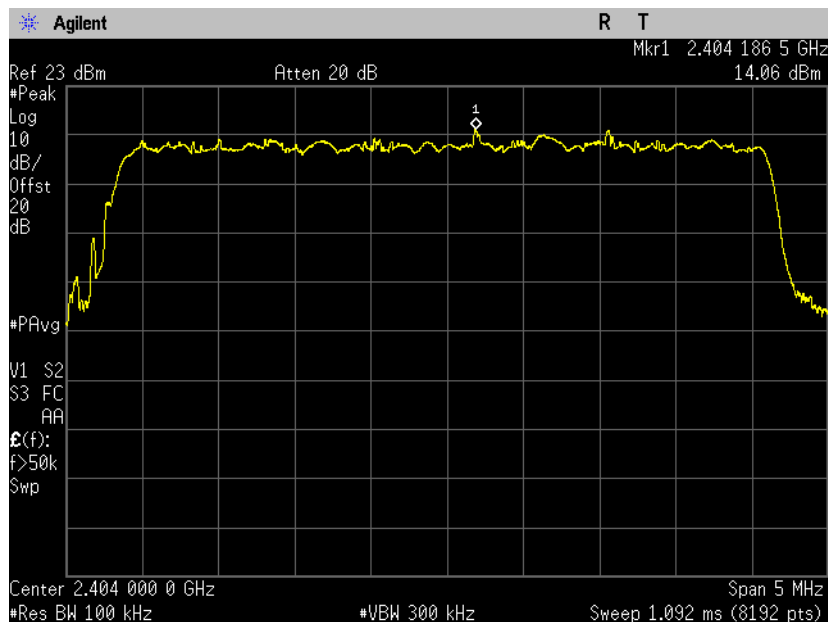
Unwanted Emissions, 2474.5 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.8



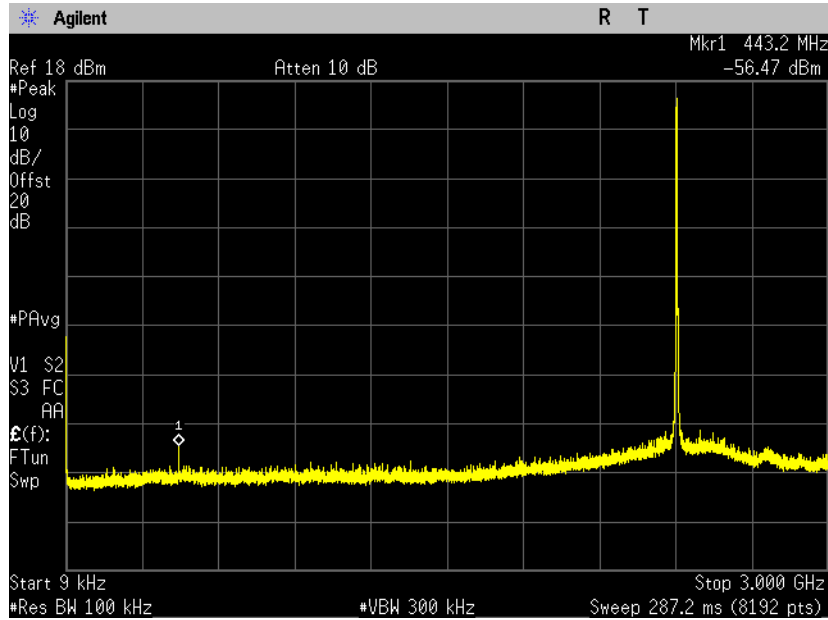
Plot 4.4.9



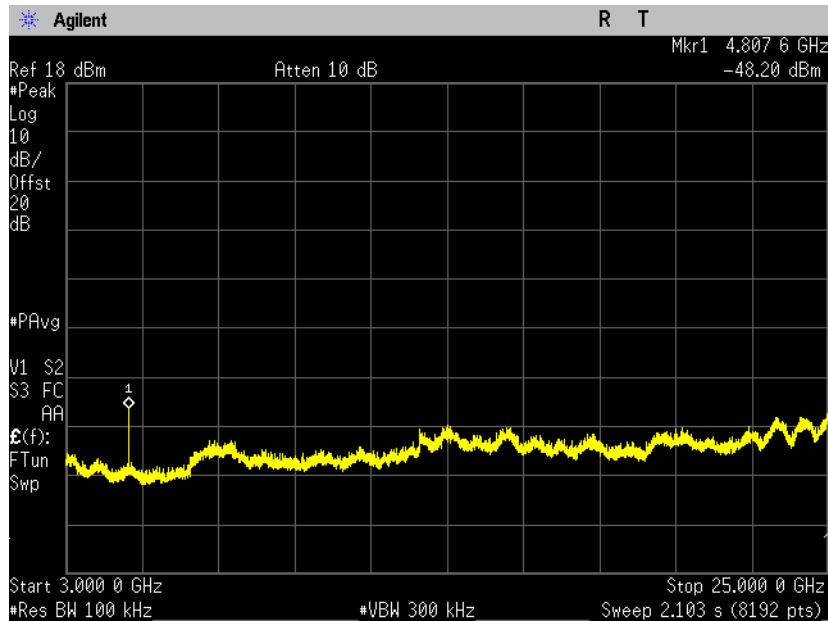
Fundamental Emission Reference Level
2404 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.10



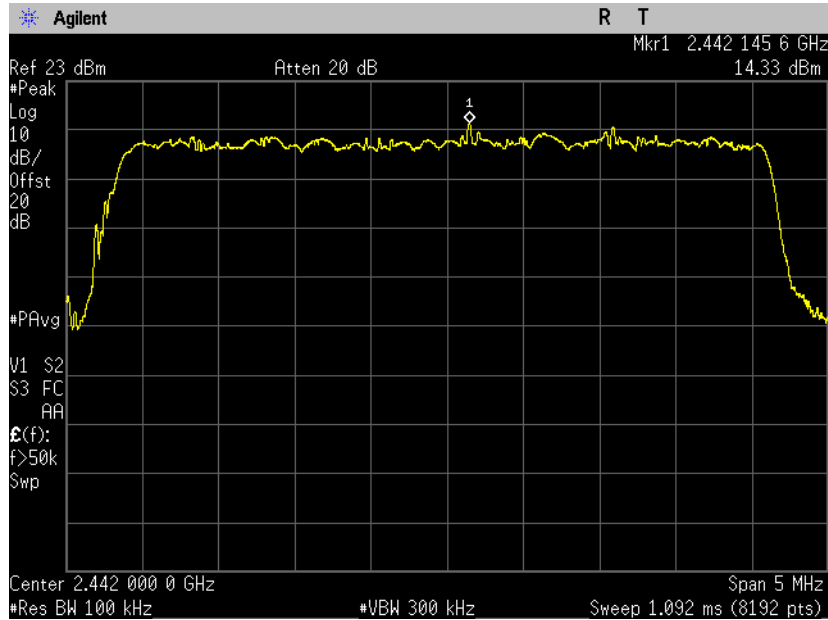
Unwanted Emissions, 2404 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.11



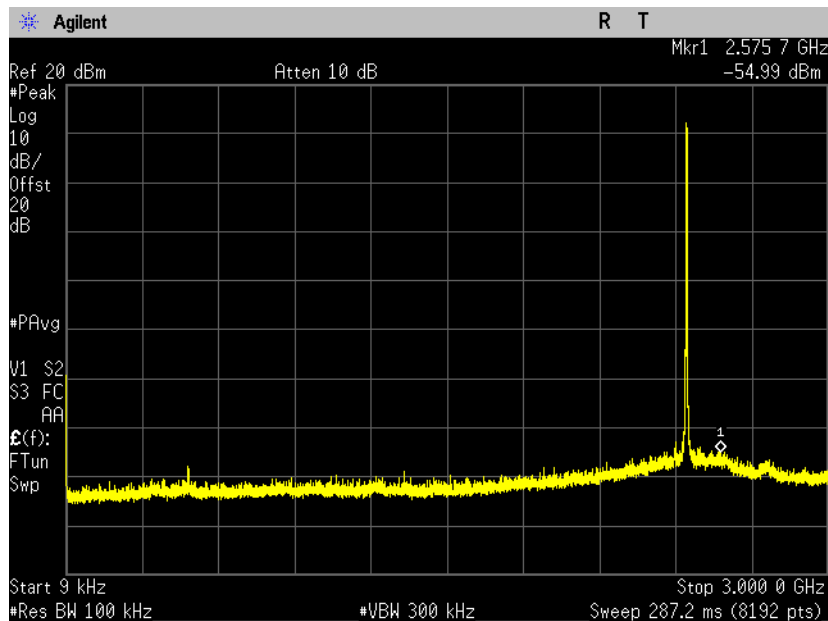
Plot 4.4.12



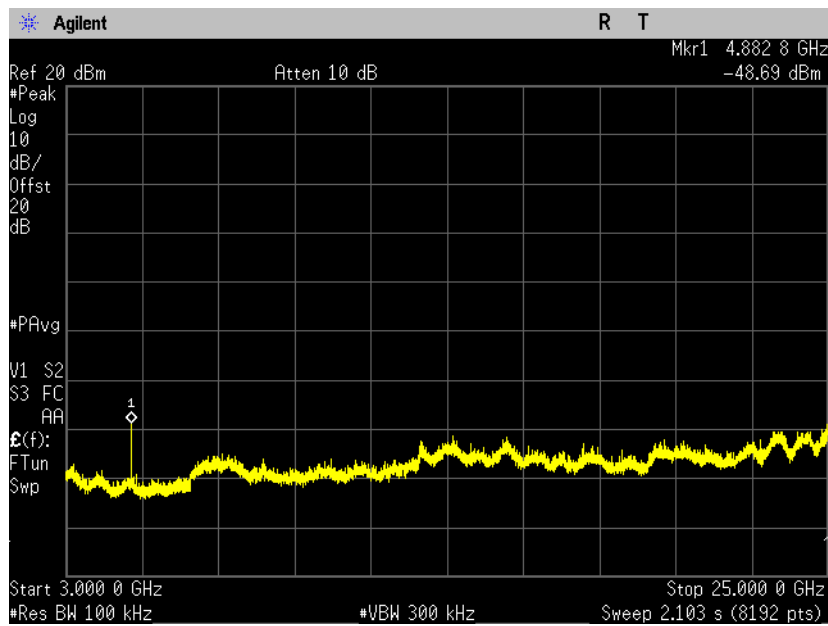
Fundamental Emission Reference Level
2442 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.13



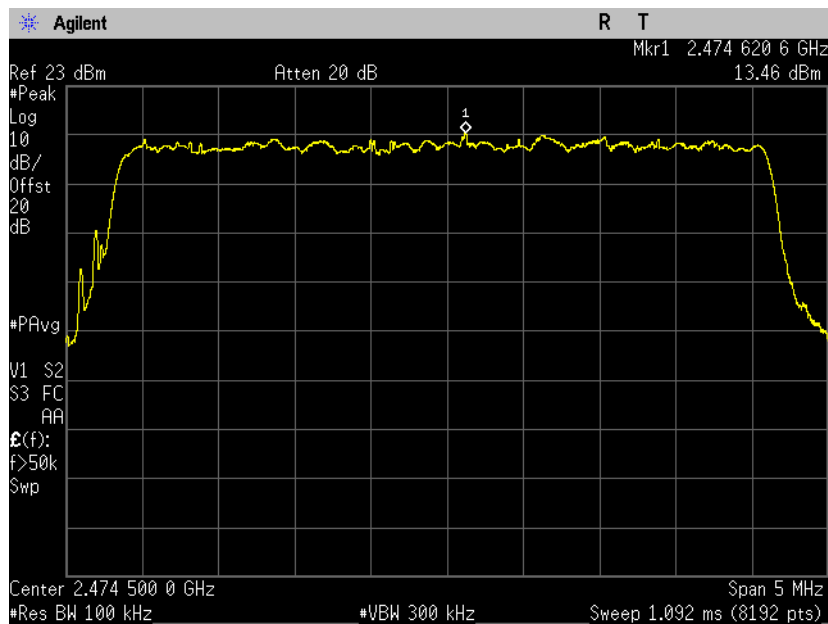
Unwanted Emissions, 2442 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.14



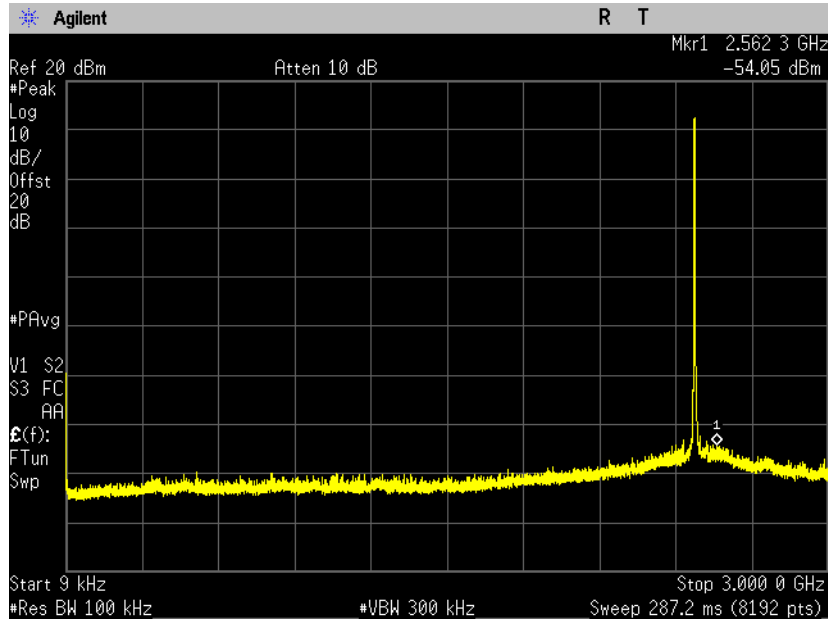
Plot 4.4.15



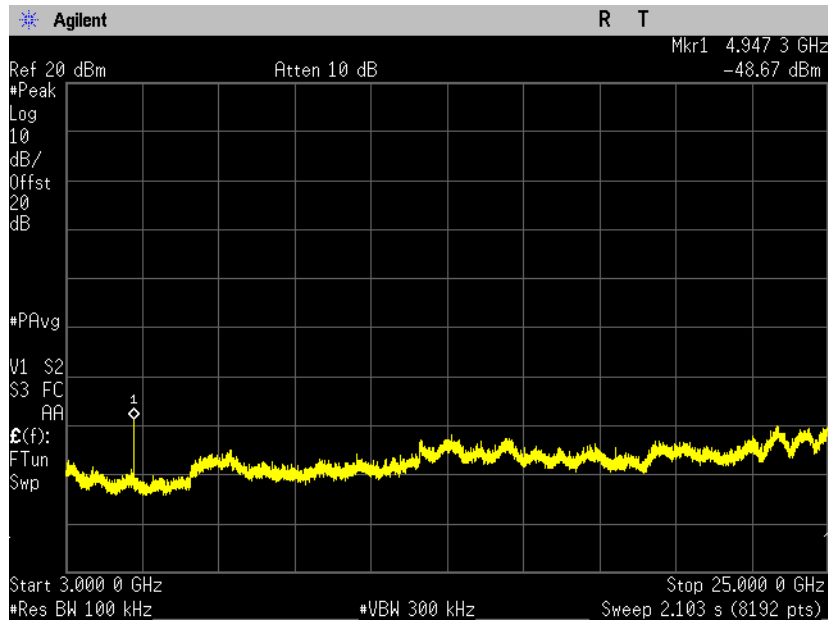
Fundamental Emission Reference Level
2474.5 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.16



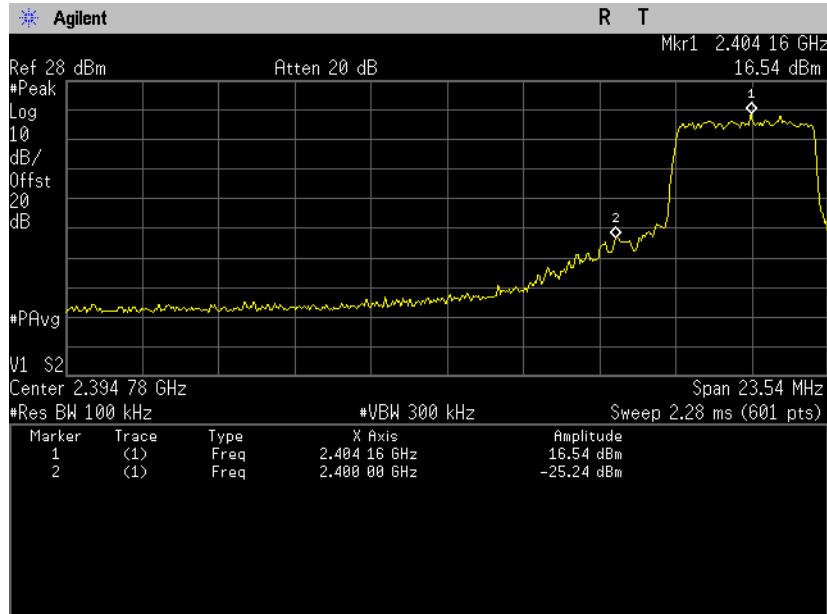
Unwanted Emissions, 2474.5 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.17



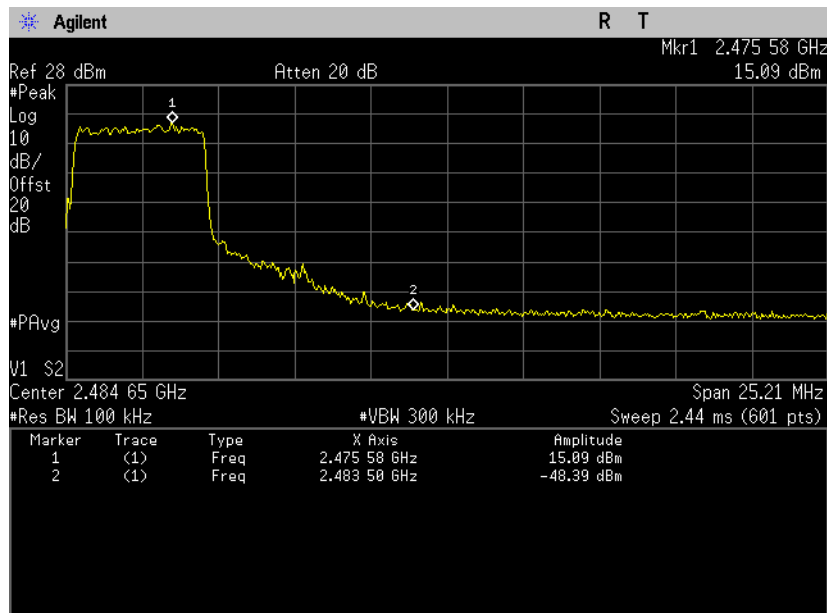
Plot 4.4.18



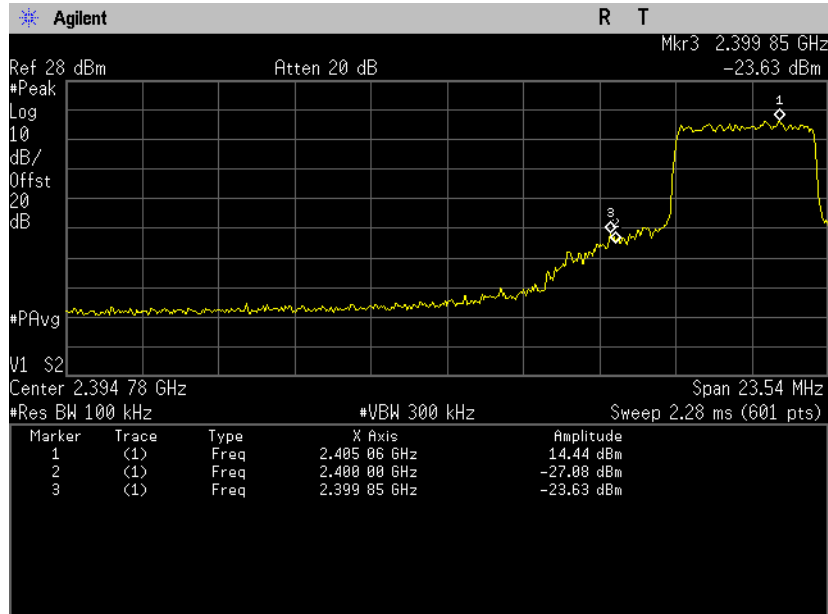
Band-Edge, 2404 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.19



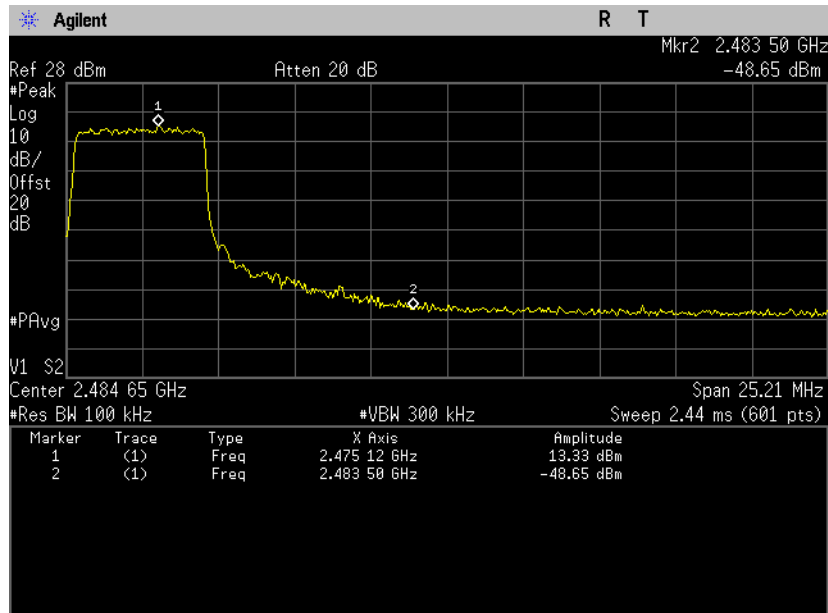
Band-Edge, 2474.5 MHz, Output A
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.20



Band-Edge, 2404 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.21



Band-Edge, 2474.5 MHz, Output B
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle
Plot 4.4.22



4.5. Unwanted Radiated Emissions into Restricted Bands: 2310-2390 MHz & 2483.5-2500 MHz

Reference document:	47 CFR §15.247 (d) & §15.205		
Test Requirements:	Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (See §15.205(c)).		
Test setup:	See sec 2.2	Pass	
Method of testing:	KDB 558074 D01 v01, Sec.5.4.2.1 Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	Peak: RBW= 1 MHz, VBW= 3 MHz Average: VBW= 30 Hz		
Environment conditions:	Ambient Temperature: 23 °C	Relative Humidity: 50.5 %	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.5.1 to Plot 4.5.8	

Test results:

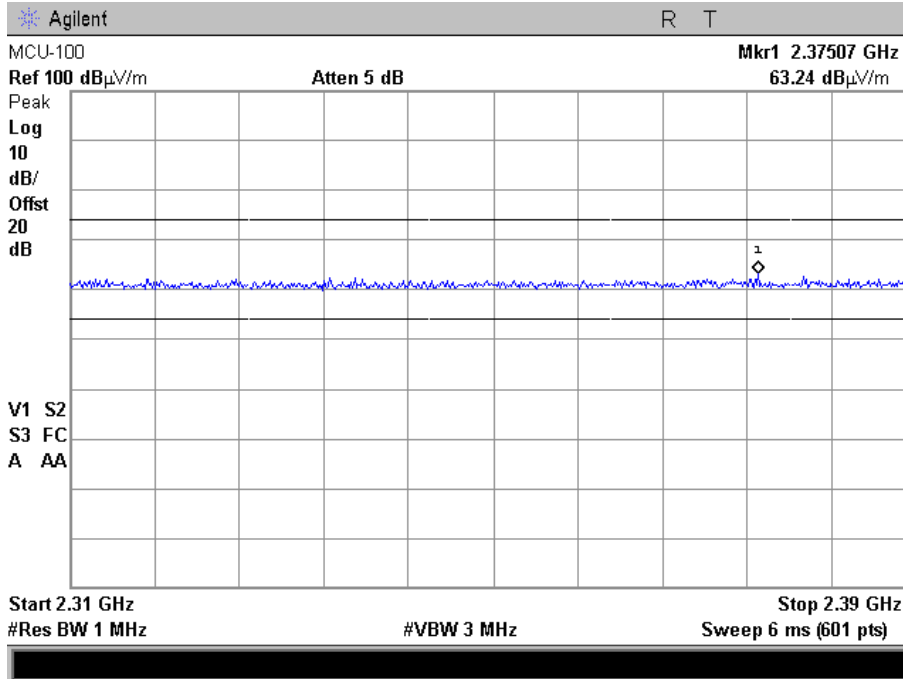
All measurements were performed in horizontal and vertical polarizations; the results show the worst case.

Fundamental Frequency [MHz] _[a15]	Data Rate [Mbps]	Unwanted Emission Frequency [MHz]	Detector Type	Polarization H/V	Unwanted Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
OFDM-TDMA, QPSK, FEC ¾ , 99 % duty cycle							
2404	5.4	2375.1	Peak	H	63.24	74	10.76
		2370.0	Average	H	48.89	54	5.11
2404	5.4	2389.3	Peak	V	66.42	74	7.58
		2390.0	Average	V	50.53	54	3.47
2474.5	5.4	2491.7	Peak	H	62.56	74	11.44
		2498.3	Average	H	48.93	54	5.07
2474.5	5.4	2483.6	Peak	V	71.67	74	2.33
		2483.5	Average	V	53.07	54	0.93

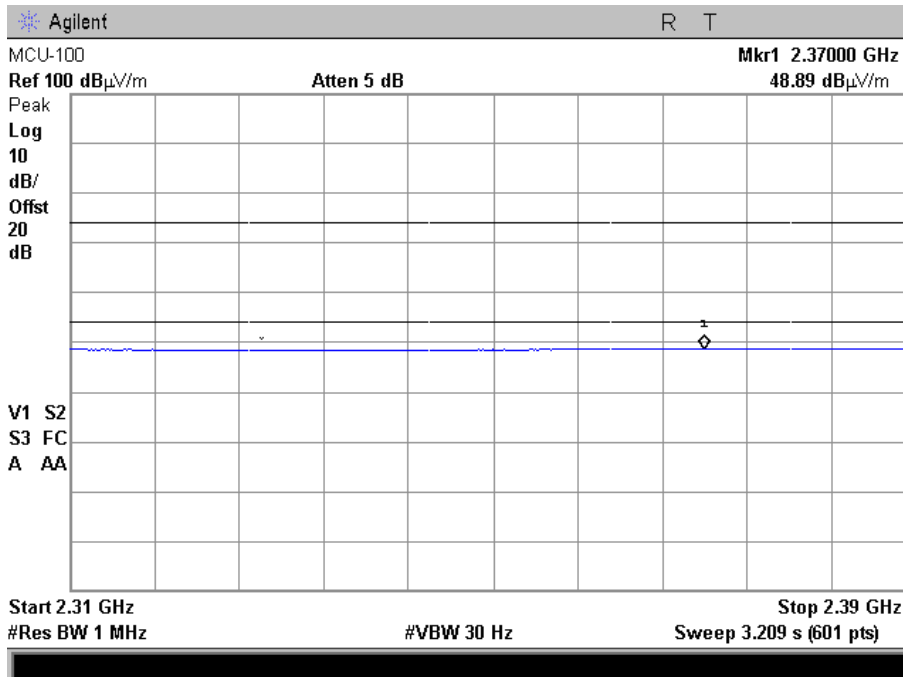
Note: Spurious Emission [dBμV/m] = measured [dBμV] + Correction-factor [dB (1/m)]
Correction Factor = Antenna factor + Cable Loss

2404 MHz
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle

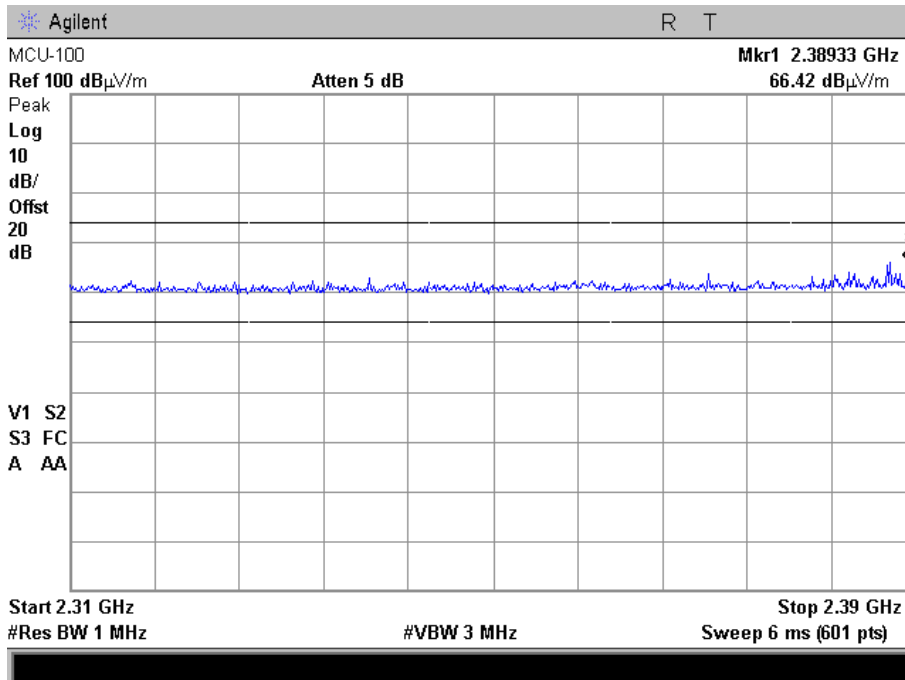
Horizontal Polarization
Peak
Plot 4.5.1



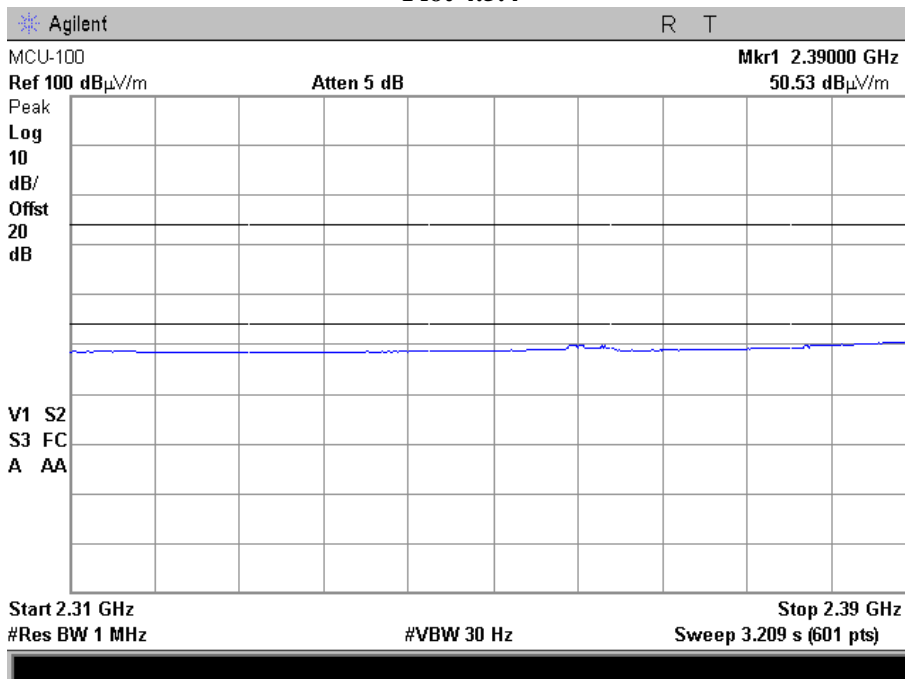
Horizontal Polarization
Average
Plot 4.5.2



**Vertical Polarization
Peak
Plot 4.5.3**

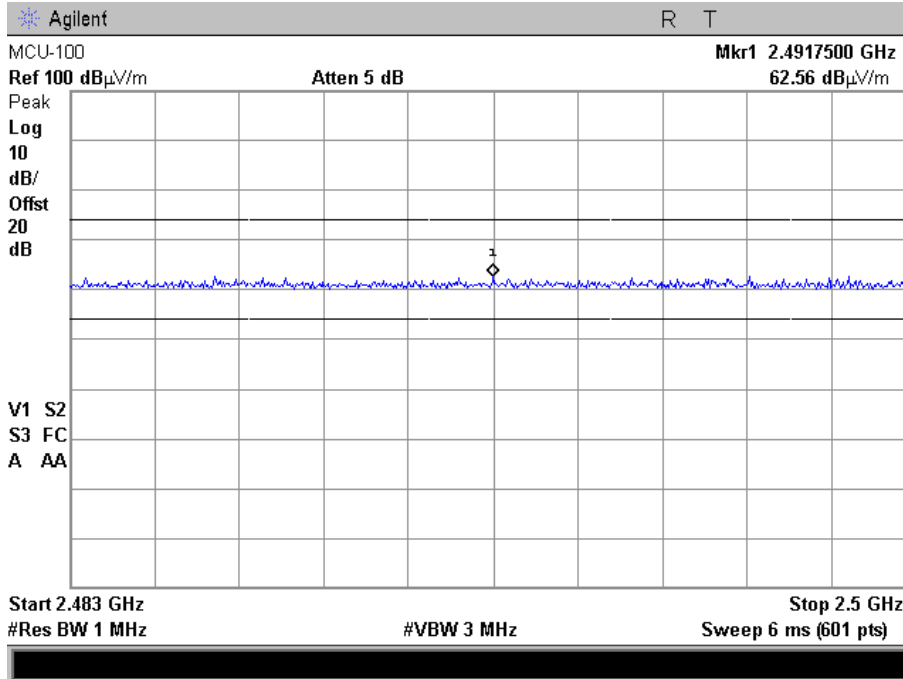


**Vertical Polarization
Average
Plot 4.5.4**

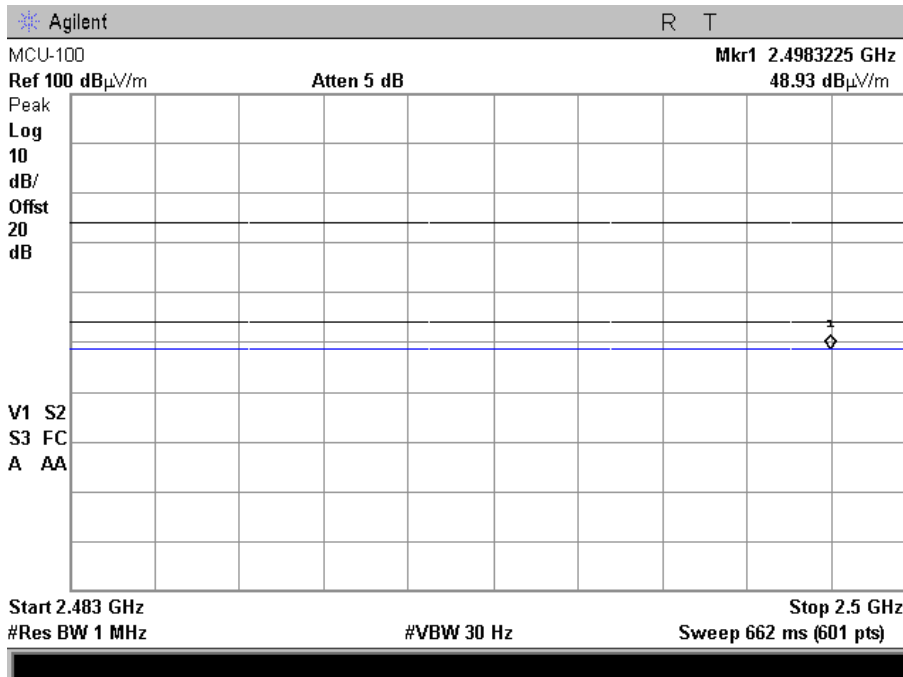


2474.5 MHz
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle

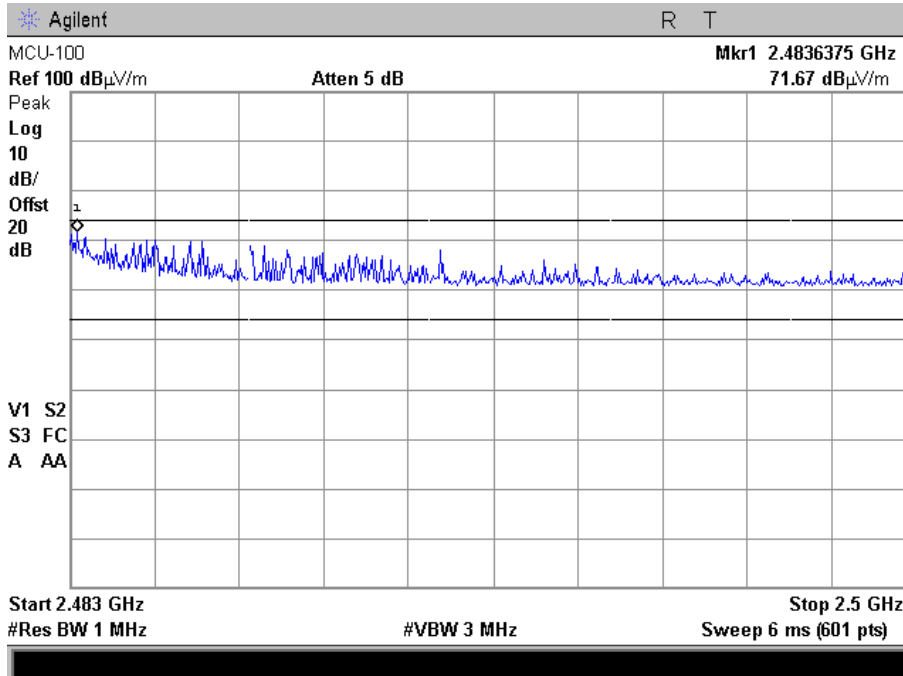
Horizontal Polarization
Peak
Plot 4.5.5



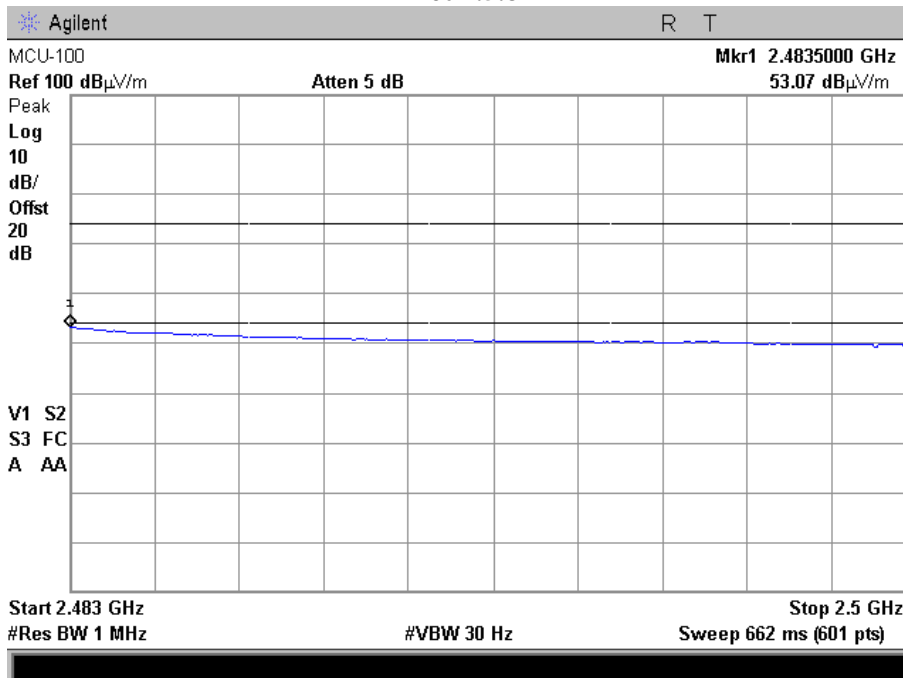
Horizontal Polarization
Average
Plot 4.5.6



**Vertical Polarization
Peak
Plot 4.5.7**



**Vertical Polarization
Average
Plot 4.5.8**



4.6. Unwanted Radiated Emissions into Restricted Frequency Bands

Reference document:	47 CFR §15.247 (d), & §15.205, & §15.209(a)		
Test Requirements:	The emissions from an intentional radiator shall not exceed the field strength levels specified in §15.209(a).		
Test setup:	See sec 2.2, with Band Reject filter	Pass	
Method of testing:	KDB 558074 D01 v01, Sec.5.4.2.1 Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	f > 1 GHz: Peak: RBW= 1 MHz, VBW= 3 MHz, Average: VBW= 10 Hz f < 1GHz: RBW: 120 kHz, VBW: 300 kHz		
Environment conditions:	Ambient Temperature: 23 °C		
Test Result:	See below	See Plot 4.6.1 - Plot 4.6.14	

Test results:

All measurements were performed in horizontal and vertical polarizations; the results show the worst case.

Fundamental Frequency [MHz][a16]	Data Rate [Mbps]	Unwanted Emission Frequency [MHz]	Detector Type	Polarization H/V	Unwanted Emission Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
OFDM-TDMA, QPSK, FEC ¾, 99 % duty cycle							
2404	5.4	4809	Peak	V	70.48	74	3.52
		4808	Average	V	53.13	54	0.87
2442	5.4	4885	Peak	V	73.12	74	0.88
		4884	Average	V	53.78	54	0.22
2474.5	5.4	4951	Peak	V	71.93	74	2.07
		4949	Average	V	53.46	54	0.54

Note: Spurious Emission [dBµV/m] = measured [dBµV] + Correction-factor [dB (1/m)]
Correction Factor = Antenna factor + Cable Loss

Test results below 1GHz:

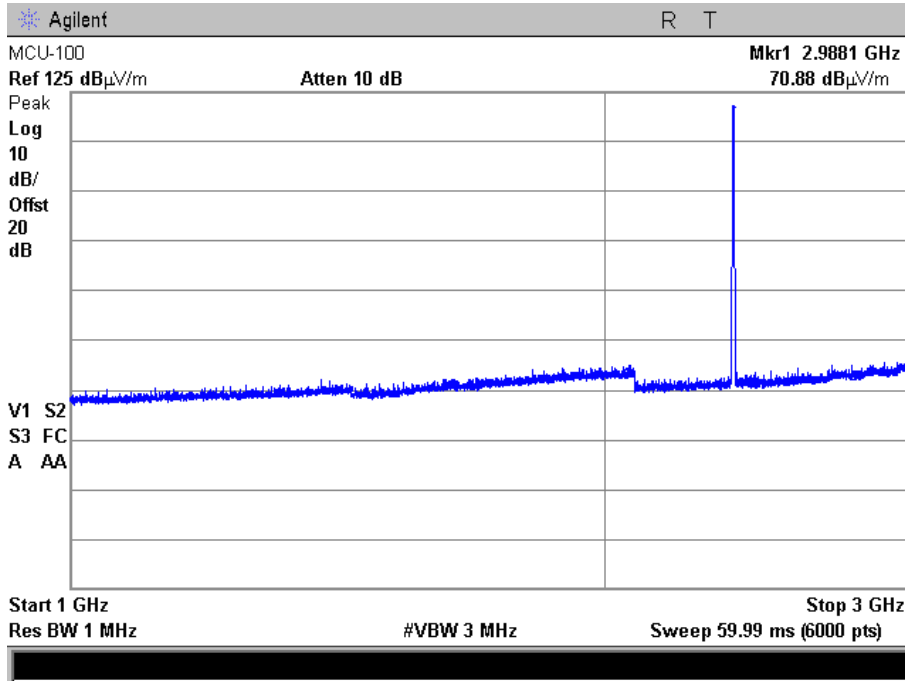
All measurements were done in horizontal and vertical polarizations; the results show the worst case for all modes and frequencies.

Unwanted Emission Frequency [MHz]	Detector Type	Polarization H/V	Unwanted Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
37.54	QP	V	31.76	40.00	8.24
75.03	QP	V	30.15	40.00	9.85
110.00	QP	V	38.55	43.50	4.95
123.20	QP	V	37.66	43.50	5.84
132.00	QP	V	35.26	43.50	8.24
249.90	QP	V	28.69	46.00	17.31
264.00	QP	V	28.53	46.00	17.47
990.00	QP	V	33.25	46.00	12.75

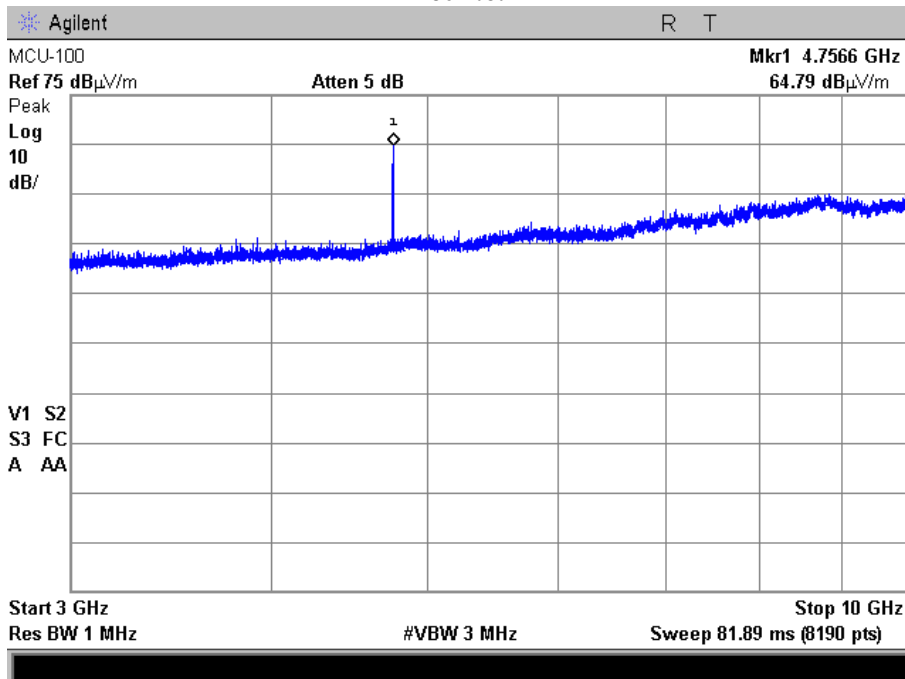
Note: Spurious Emission [dBμV/m] = measured [dBμV] + Correction-factor [dB (1/m)]
Correction Factor = Antenna factor + Cable Loss + Filter I/L.

2404 MHz
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle

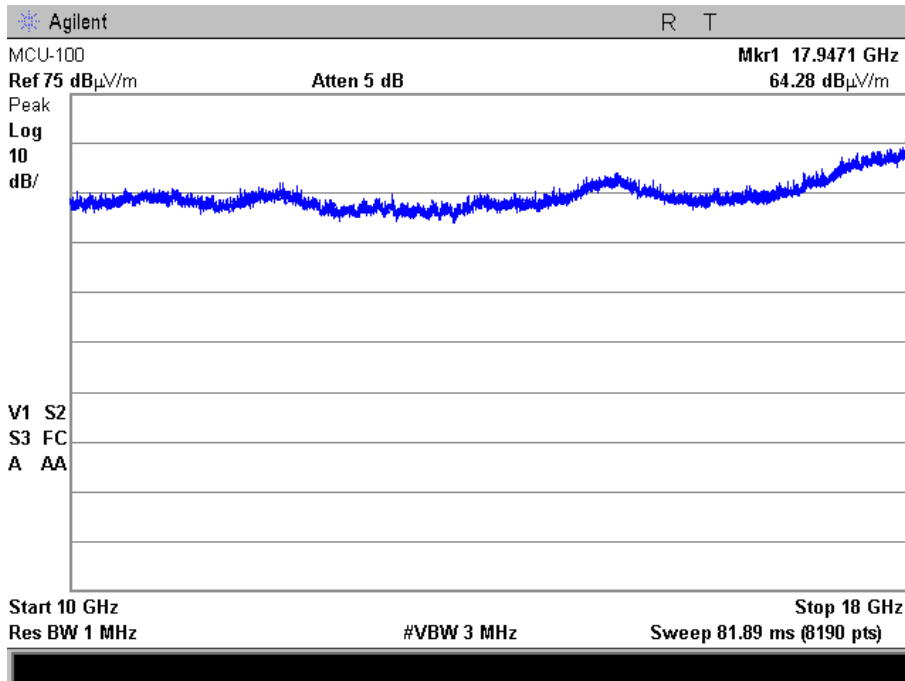
Horizontal & Vertical Polarization
Plot 4.6.1



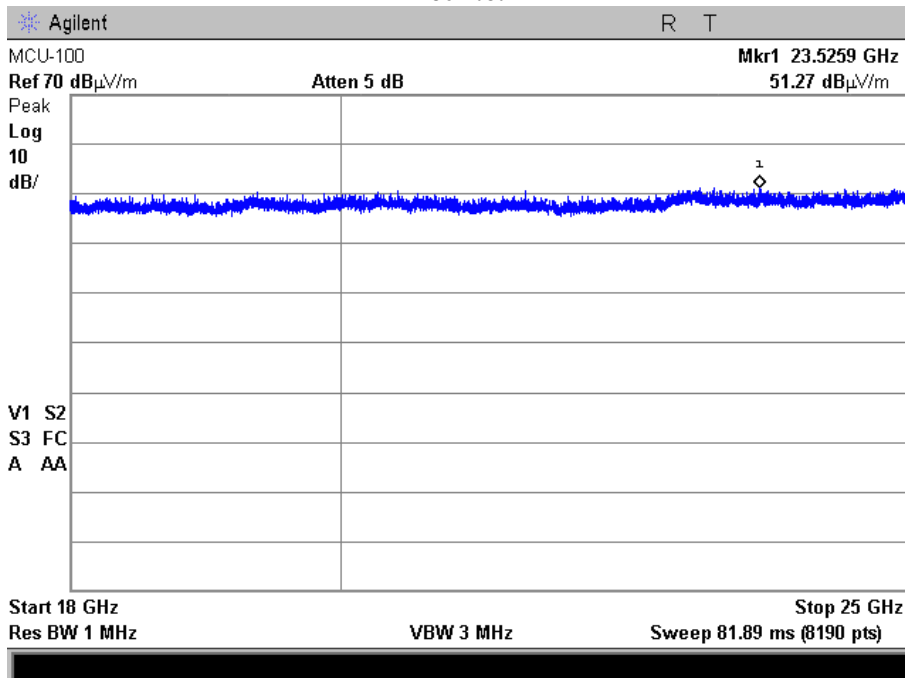
Horizontal & Vertical Polarization
Plot 4.6.2



Horizontal & Vertical Polarization
Plot 4.6.3

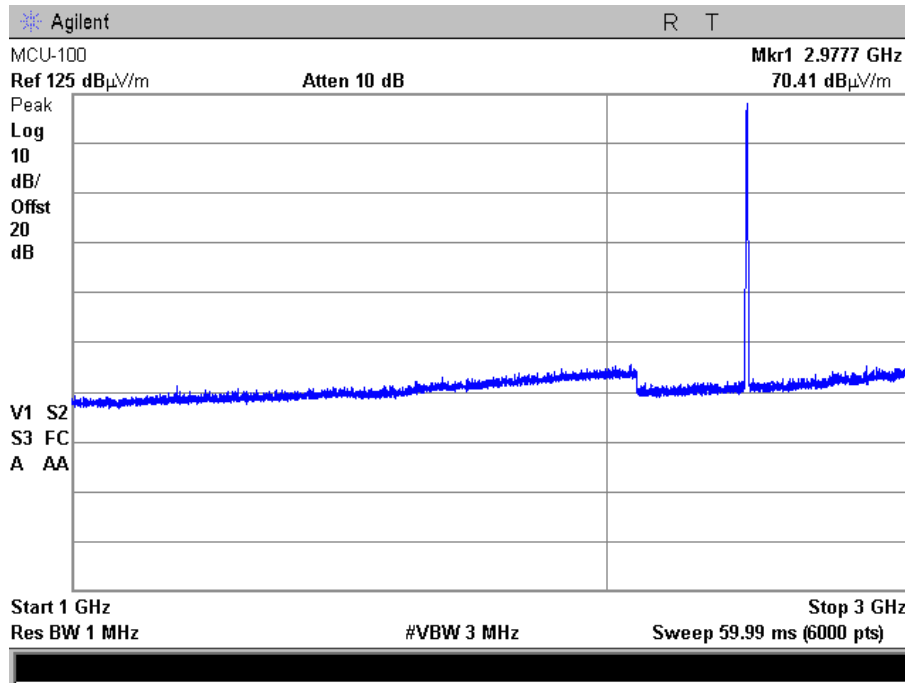


Horizontal & Vertical Polarization
Plot 4.6.4

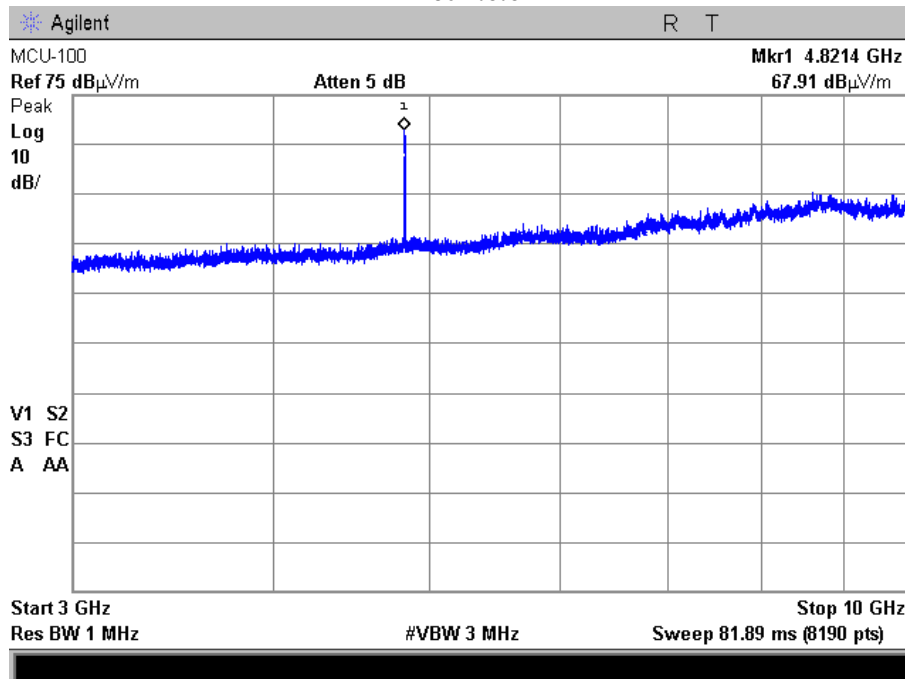


2442 MHz
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle

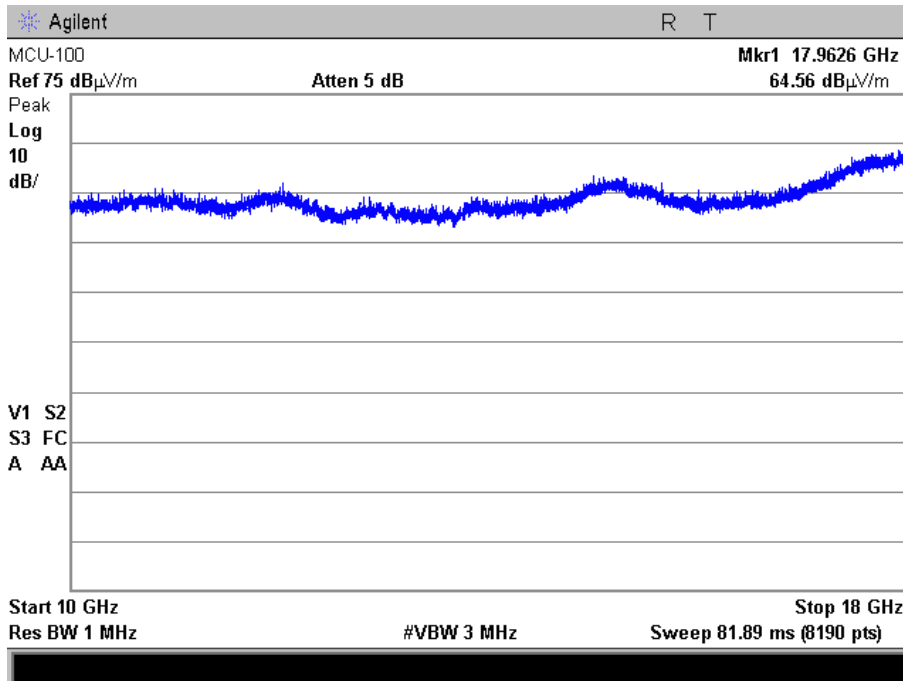
Horizontal & Vertical Polarization
Plot 4.6.5



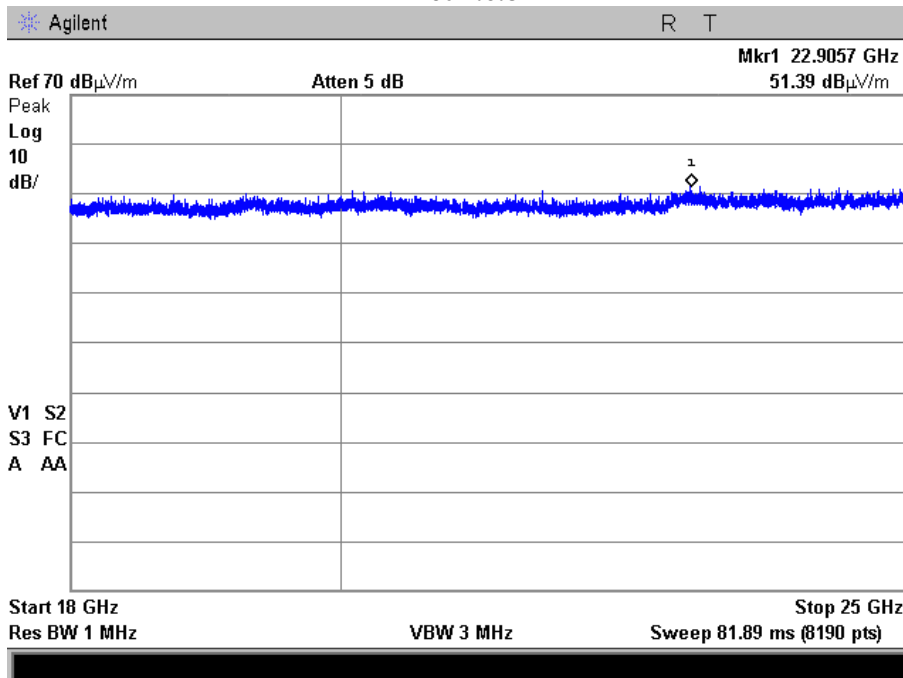
Horizontal & Vertical Polarization
Plot 4.6.6



**Horizontal & Vertical Polarization
Plot 4.6.7**

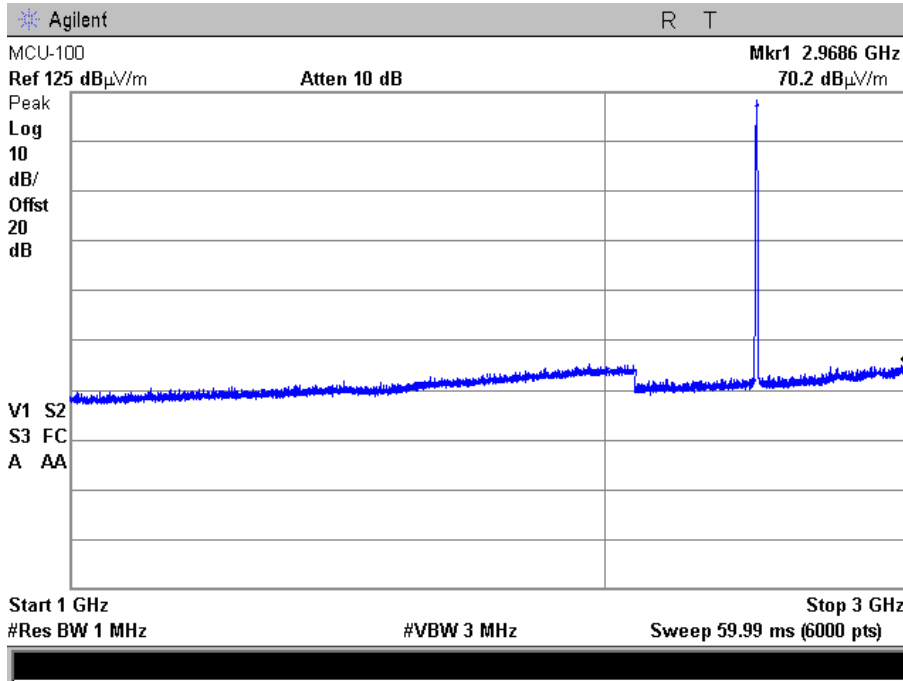


**Horizontal & Vertical Polarization
Plot 4.6.8**

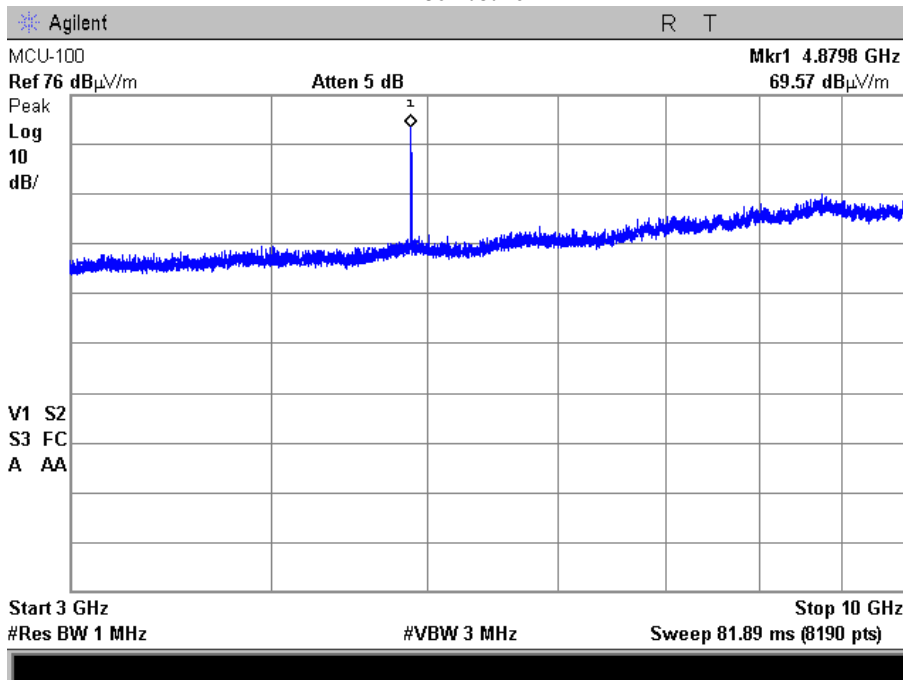


2474.5 MHz
OFDM-TDMA, QPSK, FEC 3/4, 5.4 Mbps, 99 % duty cycle

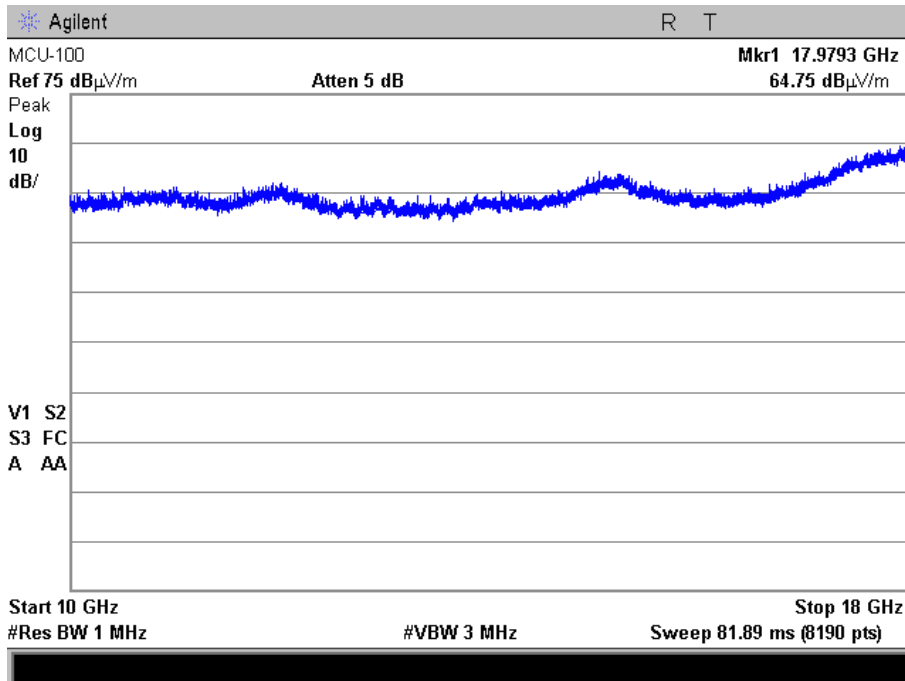
Horizontal & Vertical Polarization
Plot 4.6.9



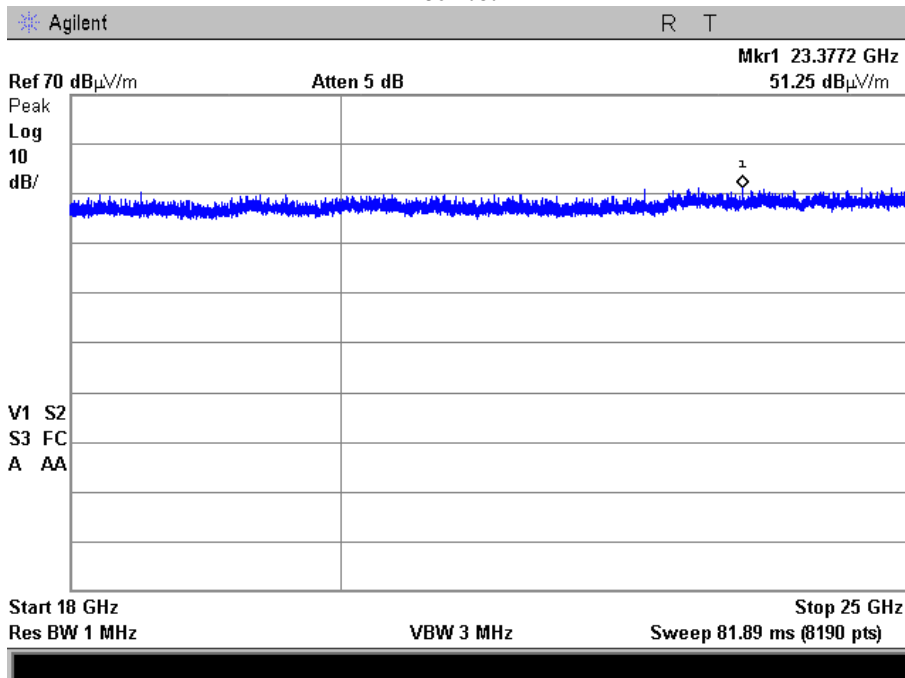
Horizontal & Vertical Polarization
Plot 4.6.10



Horizontal & Vertical Polarization
Plot 4.6.11

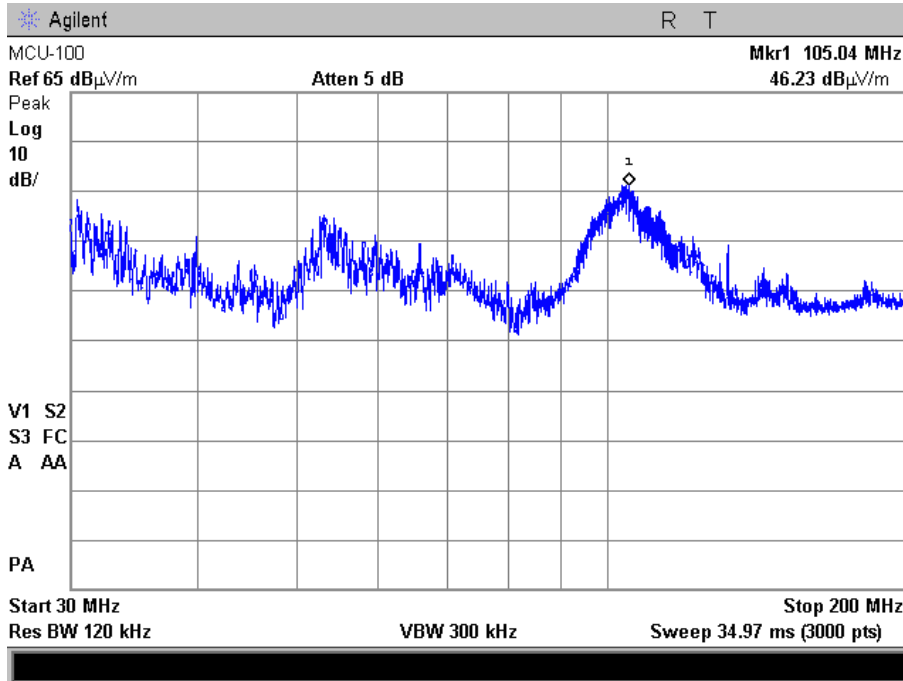


Horizontal & Vertical Polarization
Plot 4.6.12

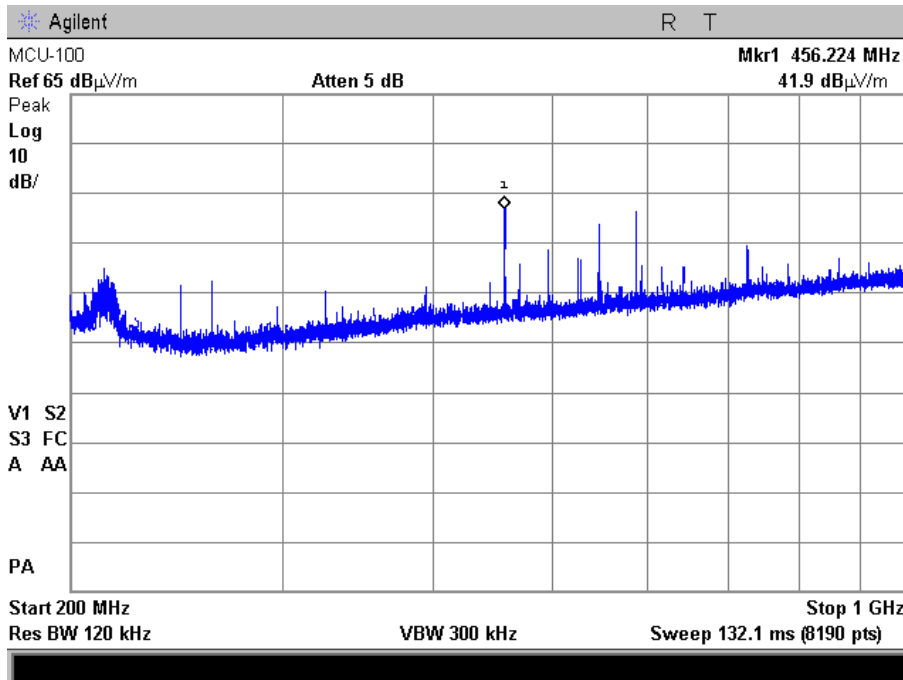


Unwanted Radiated Emissions Below 1 GHz
Worst case for all modes and frequencies

Horizontal & Vertical Polarization
Plot 4.6.13



Horizontal & Vertical Polarization
Plot 4.6.14



4.7. Antenna Connector Requirements

Reference document:	47 CFR §15.203	
Test Requirements:	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with provisions of this section.	
Test Result:	The EUT must be install as a professional installation equipment, see user manual.	Pass

5. Appendix

Appendix A: List of Measuring Equipment used:

Equipment	Manufacturer/ Model	Serial Number	Due date
CISPR 16 EMI Receiver, 9 kHz - 6.5 GHz	HP 8546A	3710A00392	30-06-2013
Spectrum Analyzer, 9 kHz - 22 GHz	HP 8593EM	3536A00131	30-06-2013
Spectrum Analyzer, 100 Hz - 26.5 GHz	Agilent E7405A	US41160436	30-06-2013
Spectrum Analyzer, 3 Hz - 44 GHz	Agilent E4446A	MY46180602	30-06-2013
Power Meter	Agilent N1911A	MY45100784	30-06-2013
Wideband power sensor	Agilent N1921A	MY45241242	30-06-2013
Power Meter	HP 437B	3110A03984	30-06-2013
Power Sensor	HP 8485A	3318A19676	30-06-2013
Power Splitter, DC -18 GHz	HP 11667A	17799	30-06-2013
Low-Noise Amplifier, 0.1 - 18 GHz	MITEQ, AMF-7D-00101800-30-10P	1544443	30-06-2013
Low-Noise Amplifier, 18 - 26.5 GHz	MITEQ, AMF-5F-18002650-30-10P	945372	16-05-2013
Biconical Antenna, 20 - 200 MHz	Schwarzbeck VHBB 9124	9124/0255	16-05-2013
Log-Periodic Antenna, 200 - 1000 MHz	Schwarzbeck VUSLP 9111	VUSLP 9111184	16-05-2013
Double Ridged Guide Antenna, 1 - 18 GHz	A.R.A., DRG-118/A	17188	30-06-2013
SHF-EHF Horn, 15 - 40 GHz	Schwarzbeck BBHA 9170	BBHA9170214	30-06-2013
Turn table	HD 100	100/693	-
Antenna Mast	HD 100	100/693	-
LISN	Fischer 50/250-25-2	9705	30-06-2013
Transient Limiter, 9 kHz ÷ 200 MHz	HP 11947A	3107A04119	30-06-2013
Notch Filter	Micro-Tronics, BRM50702-05	0001	16-05-2013
Tunable Bandreject Filter	K&L, 3TNF-800/1000-0.2-N/N	336	16-05-2013
Tunable Bandreject Filter	K&L, 5TNF-1700/2000-0.1-N/N	212	16-05-2013
Highpass Filter, 1.2 ÷ 15 GHz	WAINWRIGHT, WHK1.2/15G-10EF	SN 3	16-05-2013
Highpass Filter, 2.4 ÷ 18 GHz	WAINWRIGHT, WHK2.4/18G-10EF	SN 1	16-05-2013
Highpass Filter, 7 ÷ 18 GHz	WAINWRIGHT, WHKX7.0/18G-8SS	SN 12	16-05-2013

Appendix B: Accreditation Certificate

  **The American Association for Laboratory Accreditation**
World Class Accreditation

Accredited Laboratory
A2LA has accredited
QUALITECH (ECI TELECOM)
Petach-Tikva, ISRAEL
for technical competence in the field of
Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-LAF Communiqué dated 8 January 2009).

Presented this 22nd day of March 2011.

 
President & CEO
For the Accreditation Council
Certificate Number 1633.01
Valid to September 30, 2012

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

End of the Test Report