RF Test Report

EUT Name: FreeStyle Precision Pro

Model No.: FreeStyle Precision Pro

CFR 47 Part 15.247: 2018 and RSS 247: 2017

Prepared for:

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Prepared by:

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Project Number: 0000160430

Revisions

Revision No.	Date MM/DD/YYYY	Reason for Change	Author
0	09/23/2019	Original Document	

Note: Latest revision report will replace all previous reports.

Statement of Compliance

Applicant:	Abbott Diabetes Care, Inc 1360 South Loop Road Alameda, CA 94502 +1 (888) 522-5226
Requester / Applicant:	William Matievich
Name of Equipment:	FreeStyle Precision Pro
Model No.	FreeStyle Precision Pro
Type of Equipment:	Intentional Radiator
Application of Regulations:	CFR 47 Part 15.247: 2018 and RSS 247: 2017
Test Dates:	Sept 09, 2019 to Sept 11, 2019

Guidance Documents:

Emissions: ANSI C63.10-2013, KDB 558074 D01 15.247 Measurement Guidance v05r02

Test Methods:

Emissions: ANSI C63.10-2013, KDB 558074 D01 15.247 Measurement Guidance v05r02

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that the equipment described above has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written authorization of TUV Rheinland of North America.

Colton Aliff & Kerwinn Corpuz		Richard Decker	
Test Engineer	Date September 23, 2019	A2LA Signatory	Date September 23, 2019

Testing Cert #3331.02 **US1131** **2932M-1**

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the CFR 47 Part 15.247: 2018 and RSS 247: 2017 based on the results of testing performed on Sept 09, 2019 to Sept 11, 2019 on the FreeStyle Precision Pro Model FreeStyle Precision Pro manufactured by Abbott Diabetes Care, Inc This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

The 2400 MHz – 2483.5 MHz and 5725 MHz – 5850 MHz frequency band is covered in this document.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Test Method ANSI C63.10	Test Parameters (Measured)	Result
Spurious Emission in Transmitted Mode	CFR47 15.209, CFR47 15.247 (d) RSS-GEN Sect.8.9, RSS 247 Sect. 5.5	Class B	**Complied**
Restricted Bands of Operation	CFR47 15.205, RSS-GEN Sect.8.10	Class B	**Complied**
AC Power Conducted Emission	CFR47 15.207, RSS-GEN Sect.8.8	N/A	**Not tested***
Occupied Bandwidth	CFR47 15.247 (a2), RSS 247 sect.5.2 (a)	N/A	**Not tested***
Maximum Output Power	CFR47 15.247 (b)(3), RSS 247 sect.5.4 (d)	18.19 dBm	**Complied**
Peak Power Spectral Density	CFR47 15.247 (e), RSS 247 sect.5.2 (b)	N/A	**Not tested***
RF Exposure	CFR47 15.247 (i), 2.1093, RSS-102 Issue 5	General Population	**Complied**

Notes: This test report covers 2400 MHz – 2483.5 MHz and 5725 MHz – 5850 MHz. According to Original Grant of the WiFi that it is a full modular approval and requires radiated spurious emissions for new HOST.

*Refer to original Redpine Signals test report, FCC ID: XF6-RS9113DB; IC: 8407A-RS9113DB

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

None

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America at 1279 Quarry Ln, Pleasanton, CA 94566 is recognized by the commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (US1131). The laboratory scope of accreditation includes: Title 47 CFR Parts 15, 18, and 90. The accreditation is updated every 3 years.

2.1.2 NIST / A2LA

TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:2005 (Lab Code Testing Cert #3331.02). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Canada – Industry Canada

TUV Rheinland of North America at the 1279 Quarry Ln, Pleasanton, CA 94566 address is accredited by Industry Canada for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by Industry Canada (File Number 2932M-1). This reference number is the indication to the Industry Canada Certification Officers that the site meets the requirements. The accreditation is updated every 3 years.

2.1.4 Japan – VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America at 1279 Quarry Ln, Pleasanton, CA 94566 has been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No. for Pleasanton: A-0326

2.1.5 Acceptance by Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at 1279 Quarry Ln, Pleasanton, CA 94566 test results and test reports within the scope of the laboratory NIST / A2LA accreditation will be accepted by each member country.

2.2 Test Facilities

All of the test facilities are located at 1279 Quarry Lane, Pleasanton, California 94566, USA. The 5015 Brandin Ct, Fremont, 94538, USA location is considered a Pleasanton annex.

2.2.1 Emission Test Facility

The Semi-Anechoic chamber and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, at a test distance of 3 and 5 meters. The site is listed with the FCC and accredited by A2LA (Lab Code Testing Cert #3331.02). The 3/5-meter semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, at a test distance of 3 meter and 5 meters. A report detailing this site can be obtained from TUV Rheinland of North America.

2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7 m x 4.8 m x 3.175 mm thick aluminum floor connected to PE ground.

For ESD testing, tabletop equipment is placed on an insulated mat with a surface resistivity of 10^9 Ohms/square on a 1.6 m x 0.8 m x 0.8 m high non-conductive table with a 3.175 mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470-kΩ resistors. The Vertical Coupling Plane consists of an aluminum plate 50 cm x 50 cm x 3.175 mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470-kΩ resistors.

For EFT, Surge, PQF, the HCP and VCP are removed.

RF Field Immunity testing is performed in a 7.3m x 4.3m x 4.1m anechoic chamber.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.8m x 3.7m x 3.175mm thick aluminum ground plane.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities; it is equal to the positive square root of the sum of the variances or co-variances of these other quantities, weighted according to how the measurement result varies with changes in these quantities. The term *standard uncertainty* is the result of a measurement expressed as a standard deviation.

2.3.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

2.3.2 Measurement Uncertainty

Per CISPR 16-4-2	**U_{lab}**	**U_{cispr}**
Radiated Disturbance @ 10 meters		
30 – 1,000 MHz	2.25 dB	4.51 dB
Radiated Disturbance @ 3 meters		
30 – 1,000 MHz	2.26 dB	4.52 dB
1 – 6 GHz	2.12 dB	4.25 dB
6 – 18 GHz	2.47 dB	4.93 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	1.09 dB	2.18 dB
Disturbance Power		
30 MHz – 300 MHz	3.92 dB	4.3 dB

Voltech PM6000A

The estimated combined standard uncertainty for harmonic current and flicker measurements is ± 5.0%.	Per CISPR 16-4-2 Methods

2.3.3 Measurement Uncertainty Immunity

The estimated combined standard uncertainty for ESD immunity measurements is ± 8.2%.	Per IEC 61000-4-2
The estimated combined standard uncertainty for radiated immunity measurements is ± 4.10 dB.	Per IEC 61000-4-3
The estimated combined standard uncertainty for conducted immunity measurements with CDN is ± 3.66 dB	Per IEC 61000-4-6
The estimated combined standard uncertainty for power frequency magnetic field immunity is ± 2.9%.	Per IEC 61000-4-8

Thermo KeyTek EMC Pro

The estimated combined standard uncertainty for EFT fast transient immunity measurements is ± 2.6%.
The estimated combined standard uncertainty for surge immunity measurements is ± 2.6%.
The estimated combined standard uncertainty for voltage variation and interruption measurements is ± 1.74%.

The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005. Equipment calibration records are kept on file at the test facility.

3 Product Information

3.1 Product Description

The Model FreeStyle Precision Pro is blood glucose and beta-Ketone monitoring meter.

The WiFI modular approved contains FCC ID: XF6-RS9113DB, IC: 8407A-RS9113DB.

3.2 Equipment Configuration

A description of the equipment configuration is given in the Test Plan Section. The EUT was tested as called for in the test standard and was configured and operated in a manner consistent with its intended use. The EUT was connected to rated power and allowed to reach intended operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of an EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce the worst case radiation for emissions testing and to place the EUT in the most susceptible state for immunity testing.

3.3 Operating Mode

A description of the operation mode is given in the Test Plan Section. In the case of an EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

The final operating mode was selected to produce the worst case radiation for emissions testing and to place the EUT in the most susceptible state for immunity testing.

3.4 Unique Antenna Connector

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 the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of CFR47 Parts 15.211, 15.213, 15.217, 15.219, or 15.221.

3.4.1 Results

The FreeStyle Precision Pro uses PCB antenna.

Antenna	Internal / External	Antenna Type	Frequency Range (MHz)	Antenna Gain (dBi)
802.11 a/b/g/n	Internal	PCB	2400 – 2483.5	1.8
			5000 – 6000	3

3.5 Duty Cycle

The FreeStyle Precision Pro was measured for the duty cycle.

Calculation of transmit duty cycle. The duty cycle (%) = (ON time / Period) * 100%

3.5.1 Result

Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11b	--	--	100.00	0.00
802.11a	--	--	100.00	0.00
Notes: EUT configured and measured for duty cycle. Duty factor will be used toward RF measurement offset.				

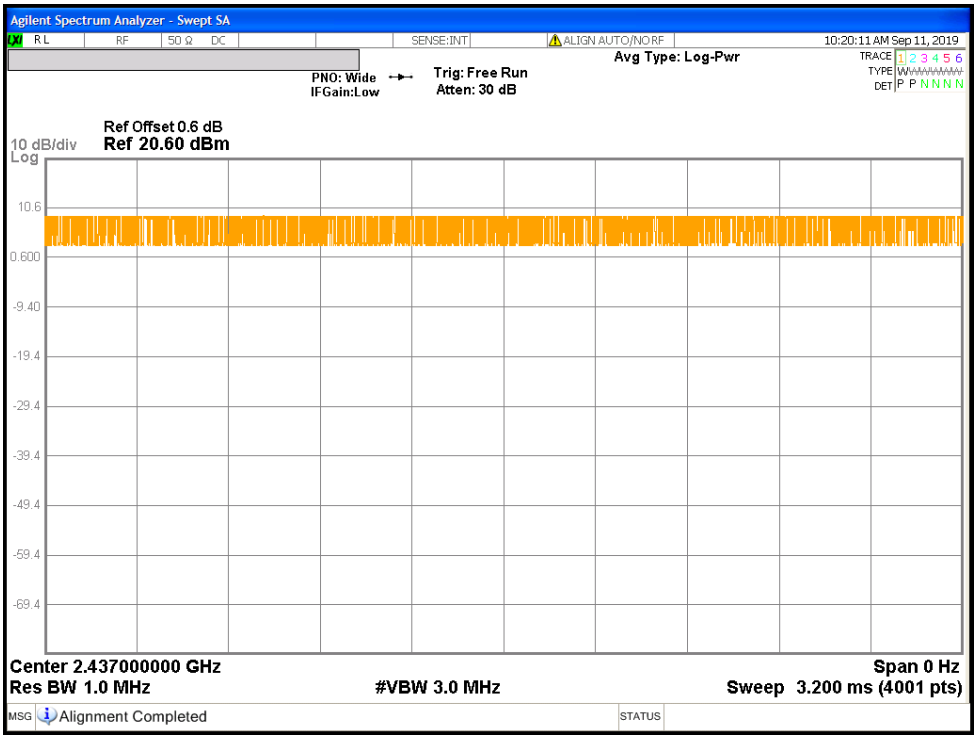


Figure 1: 2437MHz_802.11b_Duty Cycle_100%

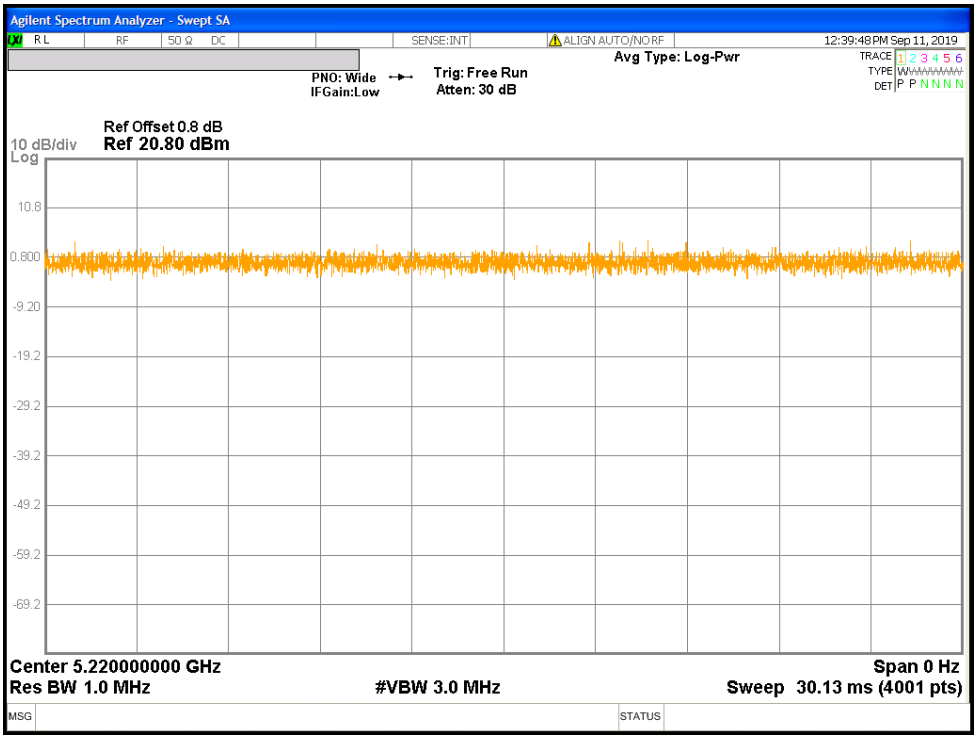


Figure 2: 5220MHz_802.11a_Duty Cycle_100%

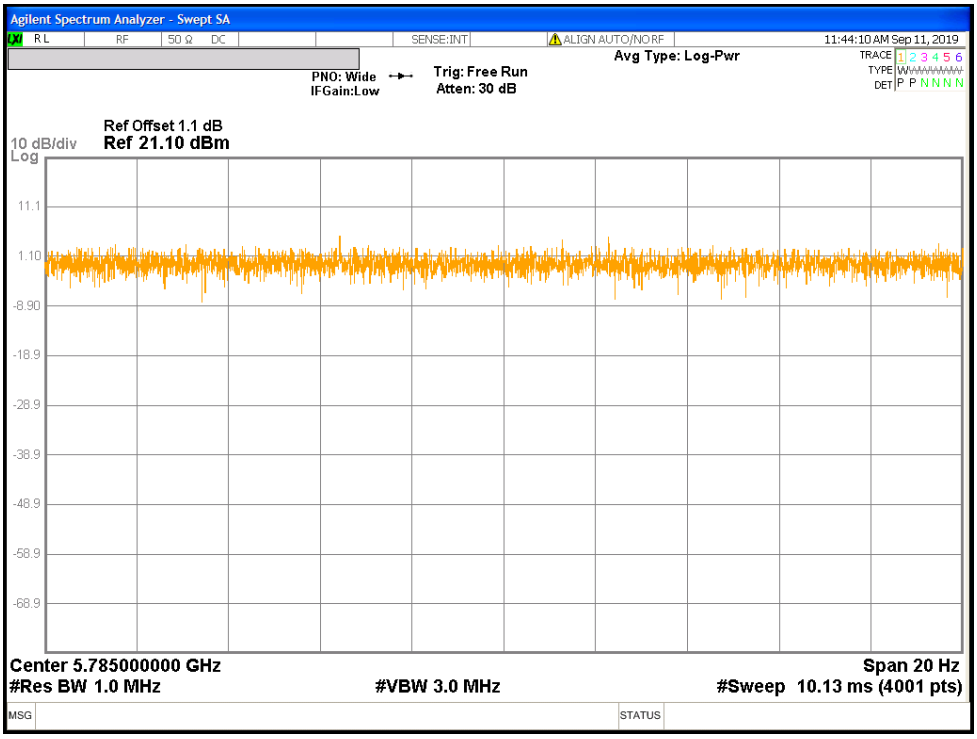


Figure 3: 5785MHz_802.11a_Duty Cycle _100%

4 Emissions

Testing was performed in accordance with CFR 47 Part 15.247: 2018 and RSS 247: 2017. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Procedures described in section 8 of the standard were used.

4.1 Output Power Requirements

The maximum output power requirement is the maximum equivalent isotropic radiated power delivering at the transmitting antenna under specified conditions of measurements in the presence of modulation.

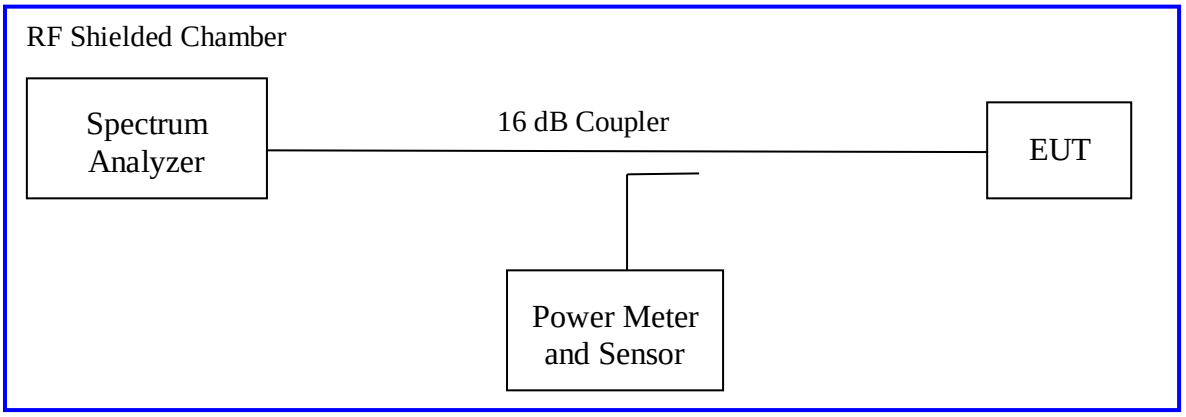
The maximum peak conducted output power shall not exceed CFR47 Part 15.247 (b)(3):2018 and RSS 247: 2017 Sect. 5.4 (d).

Band 2400-2483.5 MHz and 5725-5850 MHz: 1 W.

4.1.1 Test Method

The ANSI C63.10-2013 Section 12.3.2.3 conducted method was used to measure the channel power output. The preliminary investigation was performed at different data rate / chain to determine the highest power output for each mode. The worst findings were conducted on 3 channels in each operating range per CFR47 Part 15.247: 2018 and RSS 247: 2017. The worst mode results indicated below. Conducted measurements is in peak detector.

Test Setup:



Method SA-1A of "Procedures for Compliance Testing of Unlicensed Wireless Devices" applies since the EUT continuously transmit; where duty cycle is greater than 98%. Sample detector was used.

4.1.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 2: RF Output Power at the Antenna Port – Test Results

Test Conditions: Conducted Measurement, Normal Temperature			
Antenna Type: PCB		**Power Setting:** Fixed	
Antenna Peak Gain: + 1.8 dBi (2400-2483.5 MHz); +3.0 dBi (5000-6000 MHz)			
Signal State: Modulated at 100%.			
Ambient Temp.: 23° C		**Relative Humidity:**38%	
Operating Channel (MHz)	**RMS Power [dBm]**	**Limit [dBm]**	**Margin [dB]**
IEEE 802.11b			
2437.00	19.18	30.00	-10.82
IEEE 802.11a			
5220.00	11.23	30.00	-18.77
5785.00	11.81	30.00	-18.19
Note: The highest peak output power was observed, Mid channel, 1 Data Stream.			

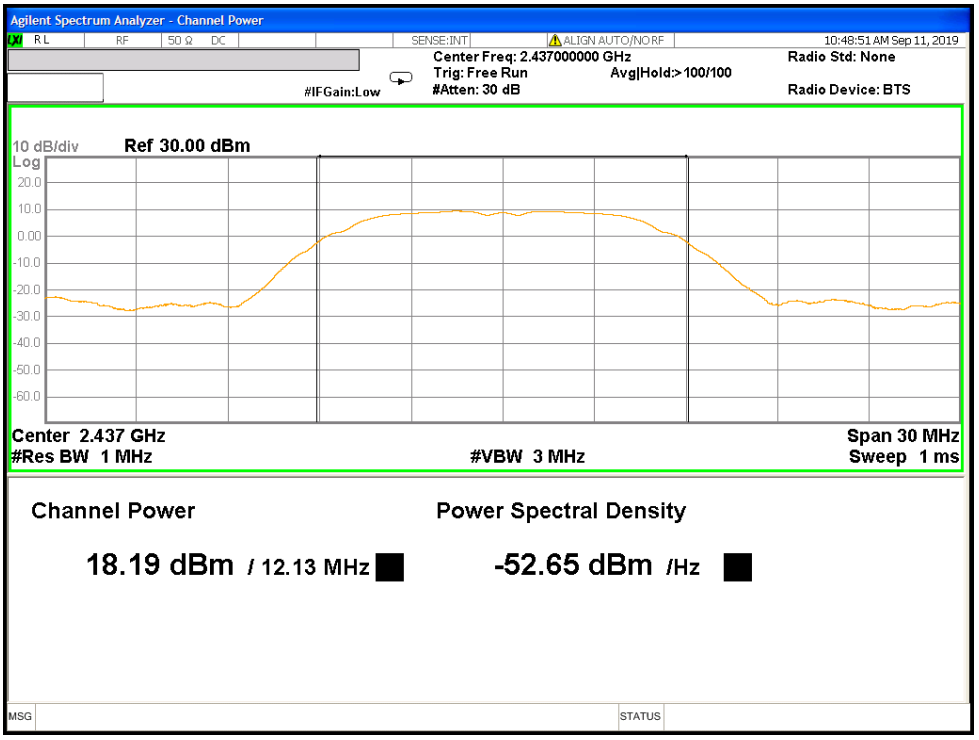


Figure 4: 2437MHz_802.11b_RMS Conducted Power

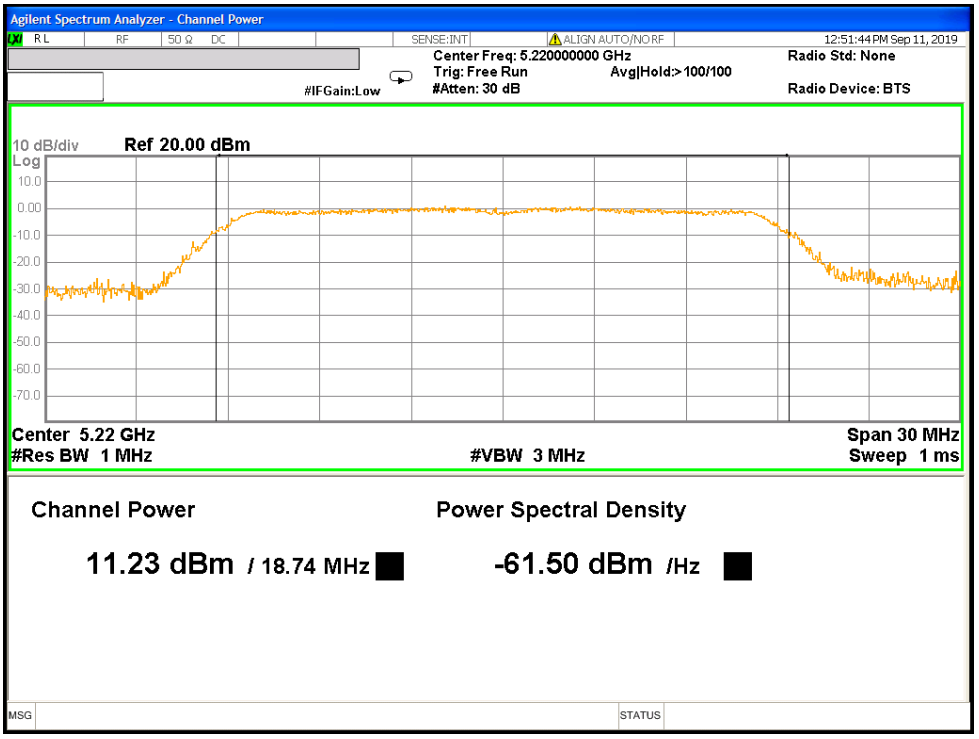


Figure 5: 5220MHz_802.11a_RMS Conducted Power

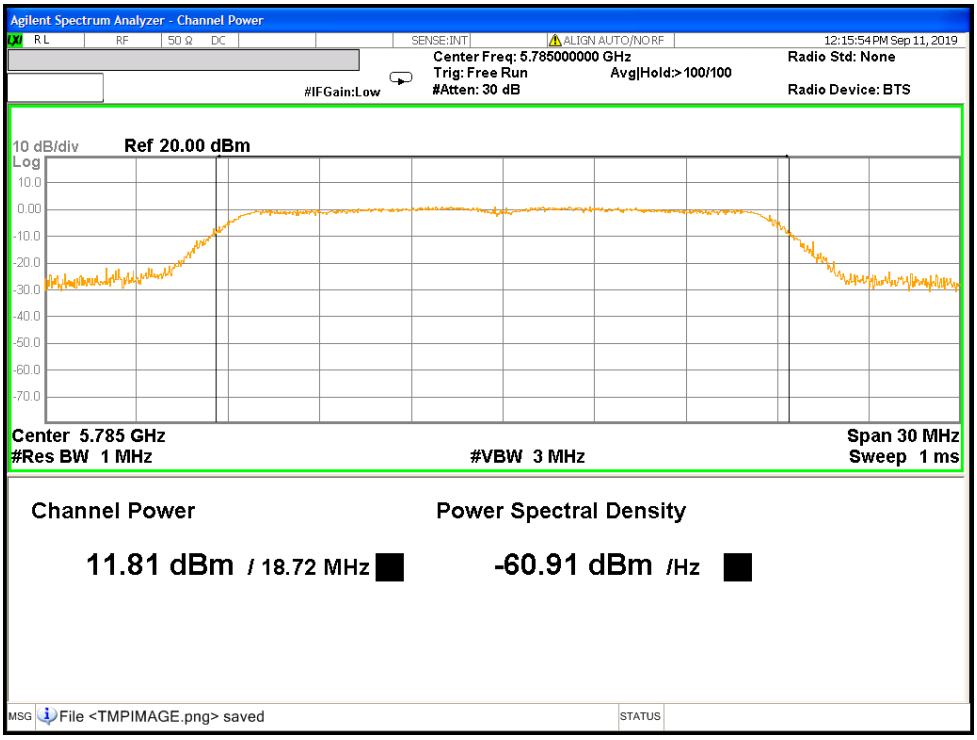


Figure 6: 5785MHz_802.11a_RMS Conducted Power

4.2 Transmitter Spurious Emissions

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmit mode; per requirement of CFR47 15.205, 15.209, 15.247(d), RSS 247 Sect. 5.5, RSS GEN Sect. 8.9 and 8.10.

4.2.1 Test Methodology

4.2.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 120 kHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m with 1m increment up to 4m height. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

Pre-scan were performed to determine the worst position of the EUT (X axis, Y axis and Z axis).

4.2.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

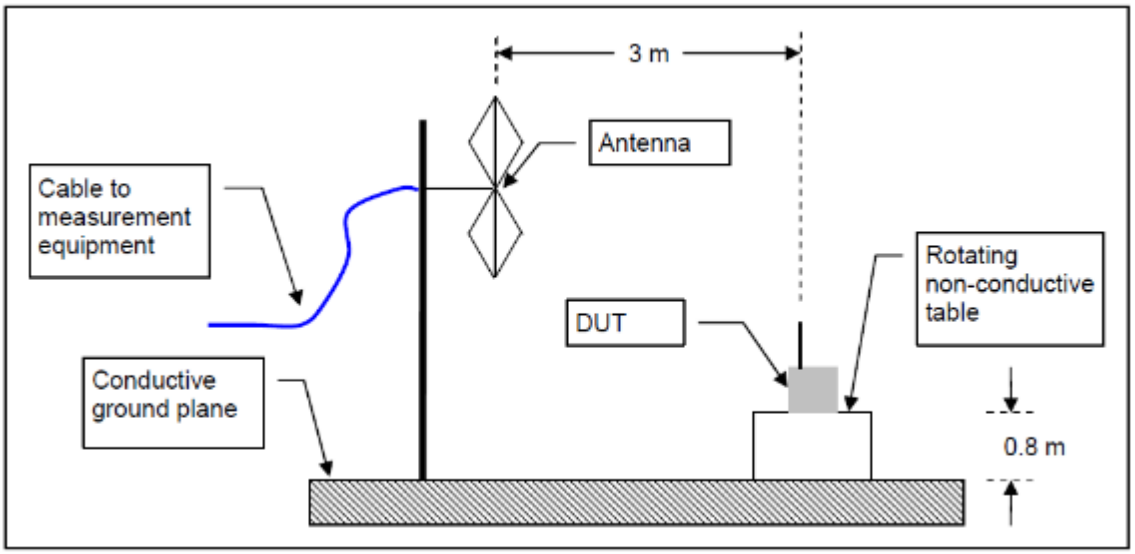
Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

Final result is EUT positioned at Y axis (Upright).

4.2.1.3 Deviations

None.

Test Setup:



Note: > 1 GHz, the EUT table height is set to 1.5 m.

4.2.2 Transmitter Spurious Emission Limit

The spurious emissions of the transmitter shall not exceed the values in CFR47 Part 15.205, 15.209 and RSS 247 Sect. 5.5, RSS GEN Sect. 8.9 and 8.10.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490.....	2400/F(kHz)	300
0.490-1.705.....	24000/F(kHz)	30
1.705-30.0.....	30	30
30-88.....	100 **	3
88-216.....	150 **	3
216-960.....	200 **	3
Above 960.....	500	3

4.2.3 Test Results

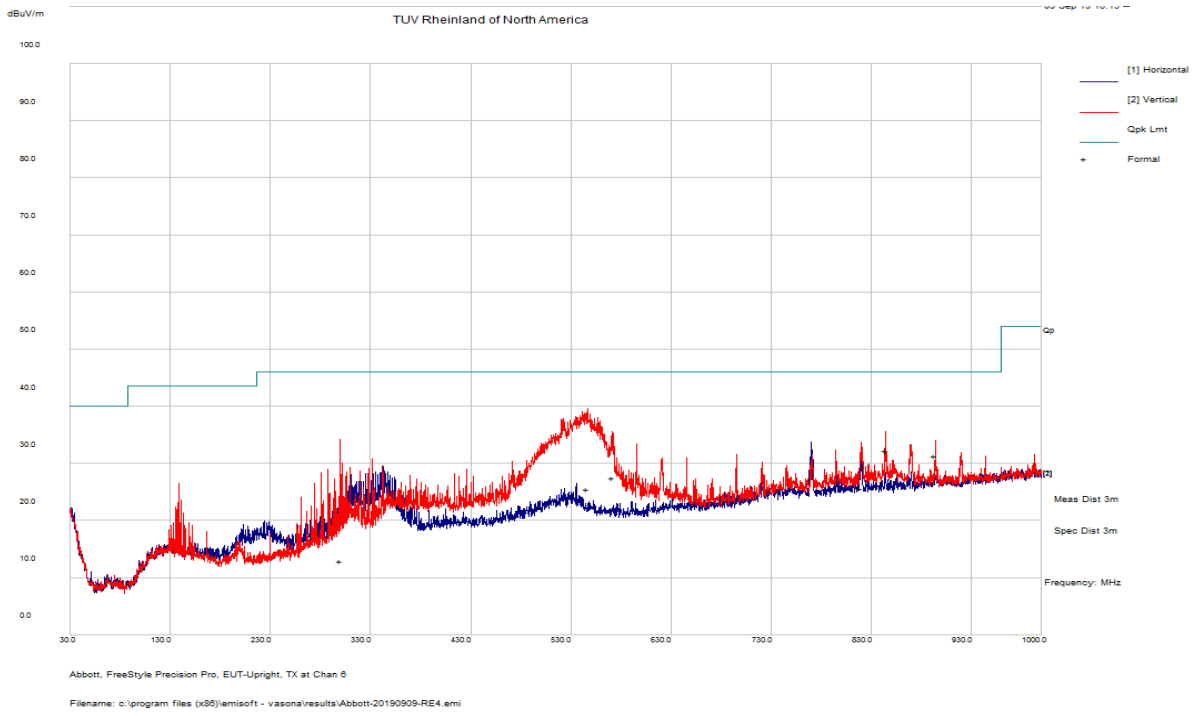
The final measurement data was taken under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and test plan.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

SOP 1 Radiated Emissions		Tracking # 31964313.001 Page 1 of 11	
EUT Name	FreeStyle Precision Pro	**Date**	September 09, 2019
EUT Model	FreeStyle Precision Pro	**Temp / Hum in**	23° C / 40%rh
EUT Serial	KFAY246-A0113	**Temp / Hum out**	N/A
EUT Config.	802.11b	**Line AC / Freq**	3VDC Battery
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	120 kHz/ 300 kHz
Dist/Ant Used	3m / JB3	**Performed by**	Colton Aliff

30 – 1000 MHz Transmit at 2437 MHz (Mid Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
299.78	25.42	1.60	-14.09	12.92	QP	V	194	76	46.00	-33.08
546.39	32.71	2.24	-9.40	25.55	QP	V	163	360	46.00	-20.45
571.84	34.03	2.30	-8.80	27.54	QP	V	107	212	46.00	-18.47
819.24	28.37	2.81	-5.46	25.71	QP	V	166	344	46.00	-20.29
844.26	34.65	2.86	-5.27	32.24	QP	V	130	288	46.00	-13.77
893.97	33.01	2.96	-4.55	31.42	QP	V	187	18	46.00	-14.58



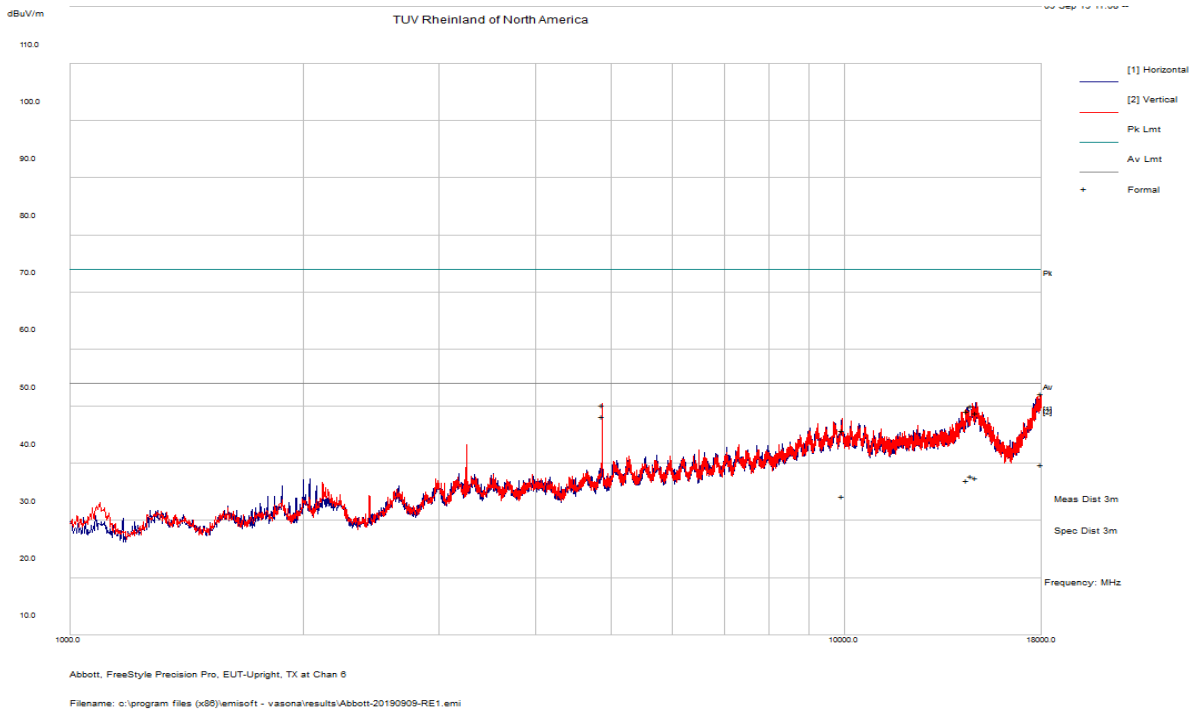
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on Mid channel of 802.11b with EUT positioned Y axis (Upright).

SOP 1 Radiated Emissions		Tracking # 31964313.001 Page 2 of 11	
EUT Name	FreeStyle Precision Pro	**Date**	September 09, 2019
EUT Model	FreeStyle Precision Pro	**Temp / Hum in**	23° C / 40%rh
EUT Serial	KFAY246-A0113	**Temp / Hum out**	N/A
EUT Config.	802.11b	**Line AC / Freq**	3VDC Battery
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Colton Aliff

1 – 18 GHz Transmit at 2437 MHz (Mid Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
4874.01	69.99	3.50	-23.18	50.31	Peak	V	211	176	74.00	-23.69
4874.01	67.89	3.50	-23.18	48.21	Average	V	211	176	54.00	-5.79
14624.67	56.91	6.15	-12.93	50.13	Peak	V	212	74	74.00	-23.87
14624.67	44.64	6.15	-12.93	37.86	Average	V	212	74	54.00	-16.14
17969.26	52.99	6.96	-7.71	52.24	Peak	V	199	274	74.00	-21.76
17969.26	40.51	6.96	-7.71	39.76	Average	V	199	274	54.00	-14.24



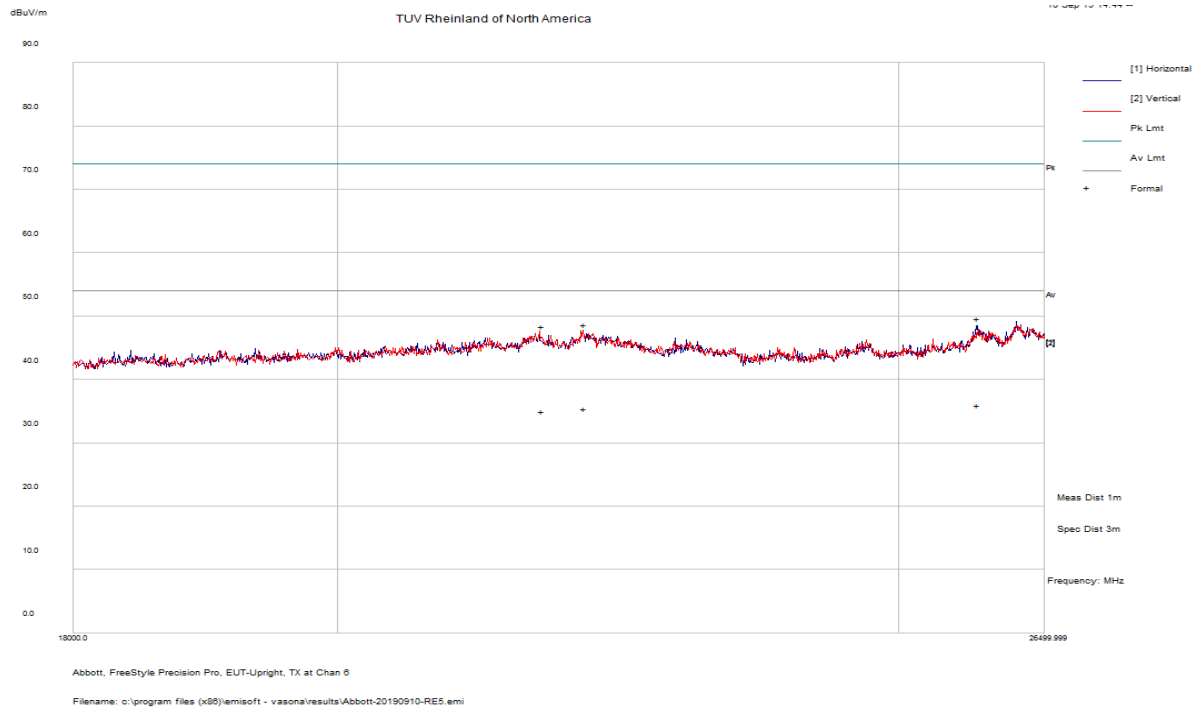
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed with EUT positioned Y axis (Upright).

SOP 1 Radiated Emissions		Tracking # 31964313.001 Page 3 of 11	
EUT Name	FreeStyle Precision Pro	**Date**	September 09, 2019
EUT Model	FreeStyle Precision Pro	**Temp / Hum in**	23° C / 40%rh
EUT Serial	KFAY246-A0113	**Temp / Hum out**	N/A
EUT Config.	802.11b	**Line AC / Freq**	3VDC Battery
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Colton Aliff

18 – 25 GHz Transmit at 2437 MHz (Mid Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
22062.09	43.22	7.64	-2.22	48.65	Peak	H	167	162	74.00	-25.35
22062.09	29.93	7.64	-2.22	35.35	Average	H	167	162	54.00	-18.65
25800.64	44.10	8.10	-2.57	49.62	Peak	H	110	220	74.00	-24.38
25800.64	30.45	8.10	-2.57	35.98	Average	H	110	220	54.00	-18.02



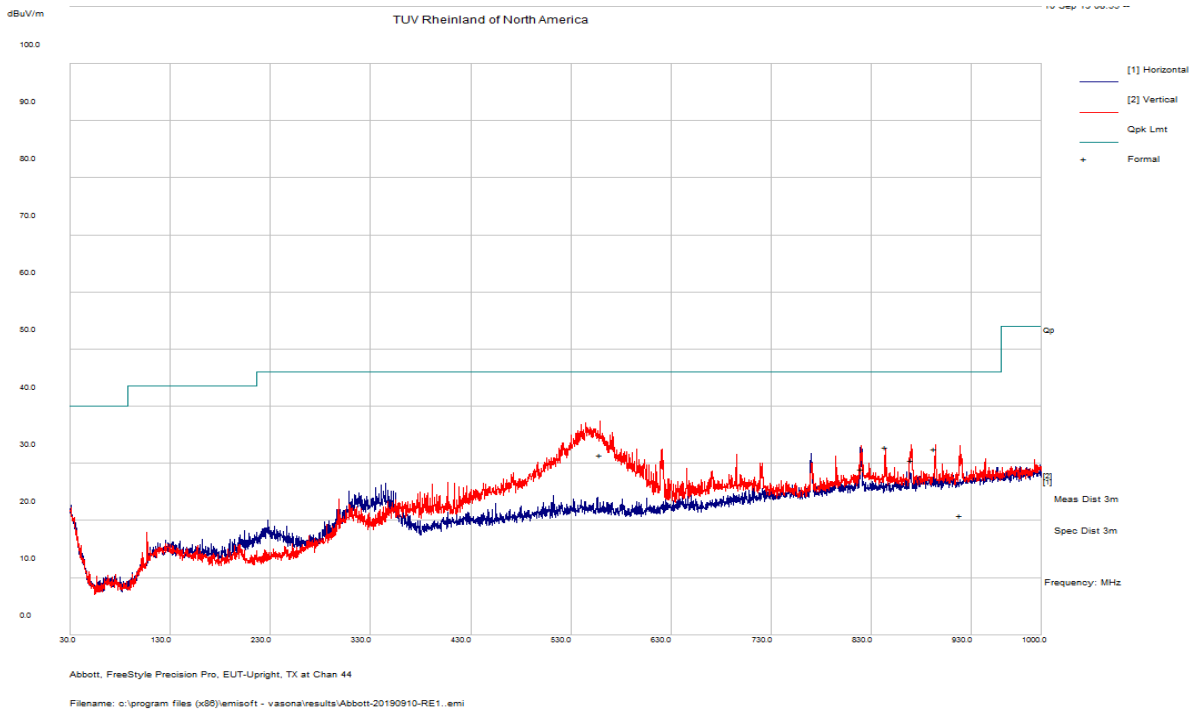
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: 1. Worst case was observed with EUT positioned Y axis (Upright).
2. No significant emission found. Detected spectrum noise floor.

SOP 1 Radiated Emissions		Tracking # 31964313.001 Page 4 of 11	
EUT Name	FreeStyle Precision Pro	**Date**	September 09, 2019
EUT Model	FreeStyle Precision Pro	**Temp / Hum in**	23° C / 40%rh
EUT Serial	KFAY246-A0108	**Temp / Hum out**	N/A
EUT Config.	802.11a	**Line AC / Freq**	3VDC Battery
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	120 kHz/ 300 kHz
Dist/Ant Used	3m / JB3	**Performed by**	Colton Aliff

30 – 1000 MHz Transmit at 5220 MHz (Mid Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
559.38	38.51	2.25	-9.20	31.56	QP	V	103	282	46.00	-14.44
820.10	31.73	2.81	-5.46	29.08	QP	V	114	300	46.00	-16.92
844.35	35.26	2.86	-5.28	32.84	QP	V	126	162	46.00	-13.16
870.10	32.52	2.90	-4.90	30.52	QP	V	121	152	46.00	-15.48
893.89	34.14	2.96	-4.55	32.54	QP	V	118	198	46.00	-13.46
918.80	22.27	2.99	-4.28	20.98	QP	V	334	233	46.00	-25.02



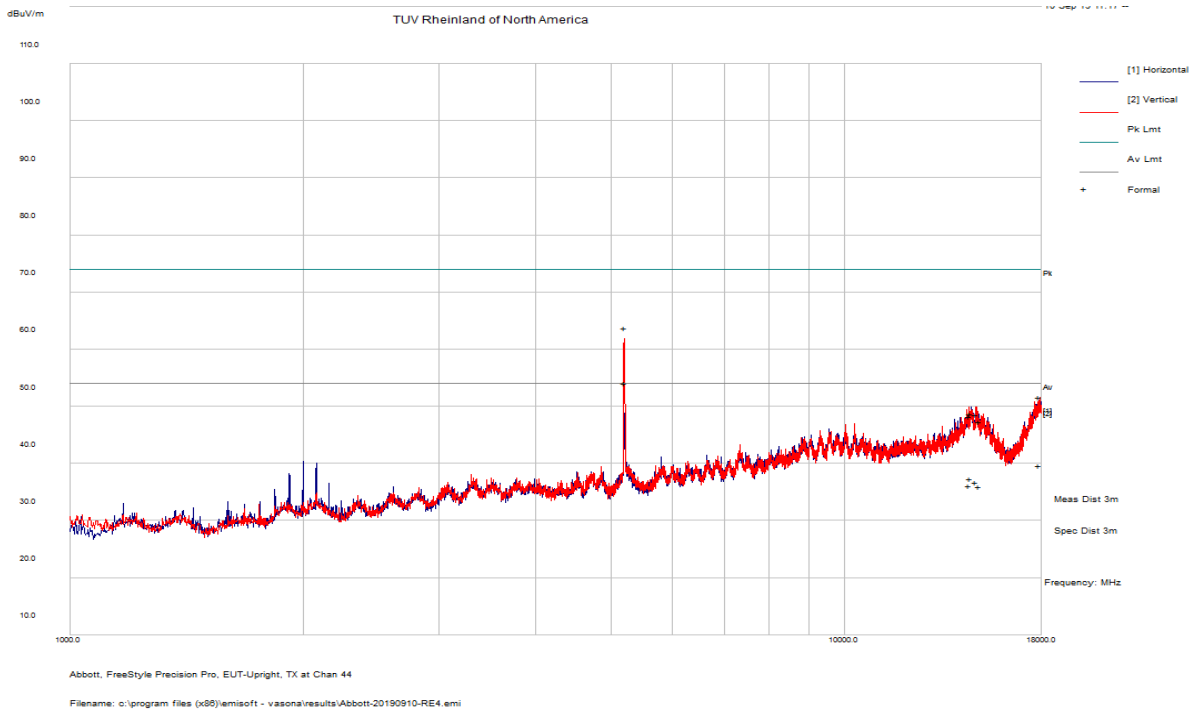
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on Mid channel of 802.11a with EUT positioned Y axis (Upright).

SOP 1 Radiated Emissions		Tracking # 31964313.001 Page 5 of 11	
EUT Name	FreeStyle Precision Pro	**Date**	September 09, 2019
EUT Model	FreeStyle Precision Pro	**Temp / Hum in**	23° C / 40%rh
EUT Serial	KFAY246-A0108	**Temp / Hum out**	N/A
EUT Config.	802.11a	**Line AC / Freq**	3VDC Battery
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Colton Aliff

1 – 18 GHz Transmit at 5220 MHz (Mid Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
5202.56	82.33	3.70	-22.29	63.74	Peak	V	173	262	74.00	-10.26
5202.58	67.35	3.70	-22.29	48.76	Average	V	173	262	54.00	-5.24
14575.20	55.63	6.20	-13.12	48.71	Peak	H	250	322	74.00	-25.30
14575.20	44.24	6.20	-13.12	37.32	Average	H	250	322	54.00	-16.68
17905.41	52.66	6.82	-7.91	51.57	Peak	V	154	264	74.00	-22.43
17905.41	40.71	6.82	-7.91	39.62	Average	V	154	264	54.00	-14.38



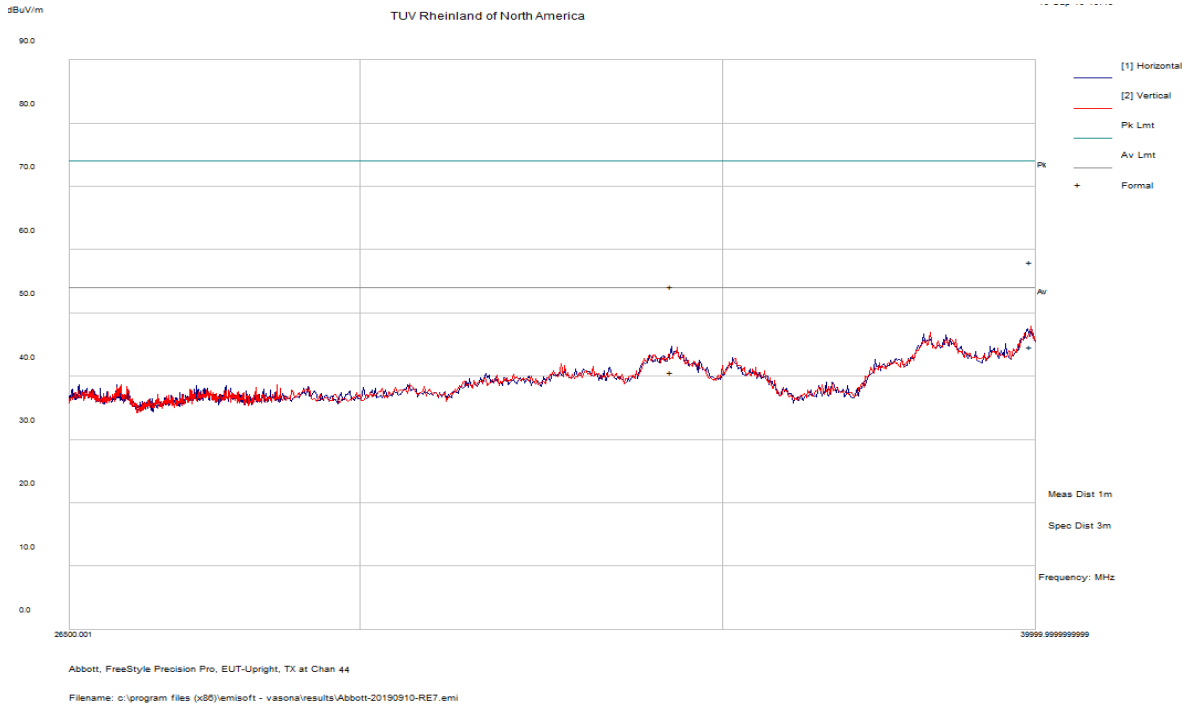
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed with EUT positioned Y axis (Upright).

SOP 1 Radiated Emissions		Tracking # 31964313.001 Page 6 of 11	
EUT Name	FreeStyle Precision Pro	**Date**	September 09, 2019
EUT Model	FreeStyle Precision Pro	**Temp / Hum in**	23° C / 40%rh
EUT Serial	KFAY246-A0108	**Temp / Hum out**	N/A
EUT Config.	802.11a	**Line AC / Freq**	3VDC Battery
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Colton Aliff

18 – 26.5 GHz Transmit at 5220 MHz (Mid Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
20626.89	40.43	7.50	-8.91	39.01	Peak	H	227	204	74.00	-34.99
20626.89	28.01	7.50	-8.91	26.60	Average	H	227	204	54.00	-27.40



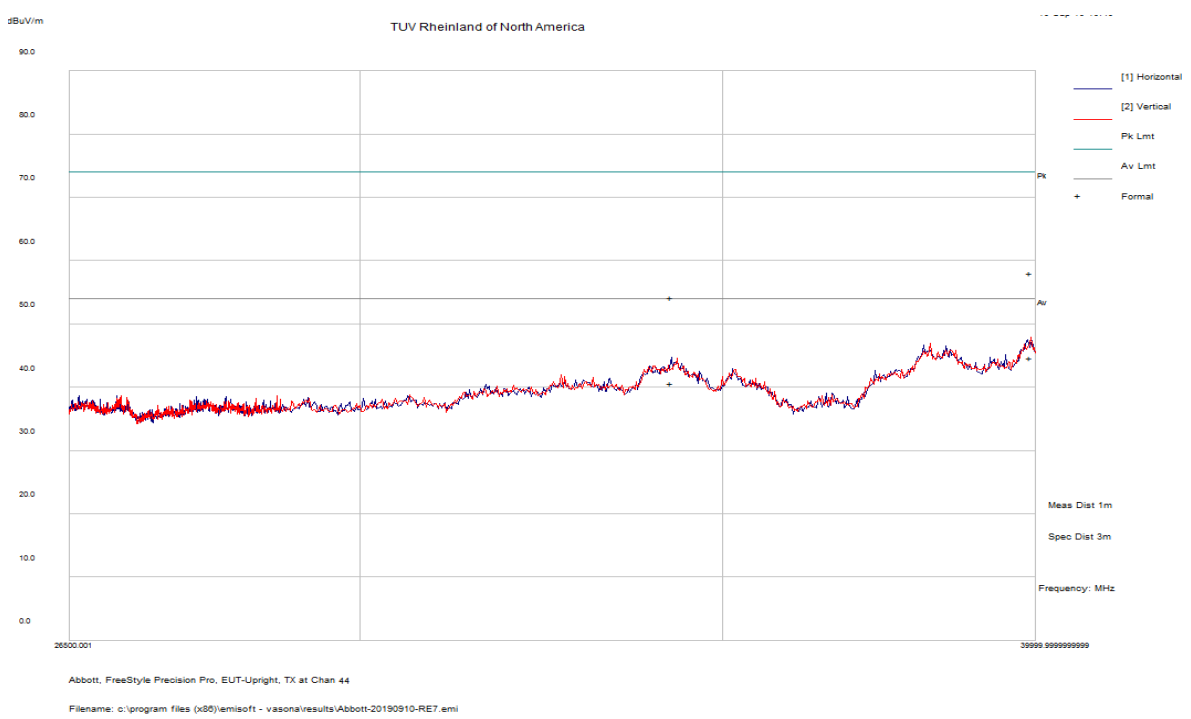
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: 1. Worst case was observed with EUT positioned Y axis (Upright).
2. No significant emission found. Detected spectrum noise floor.

SOP 1 Radiated Emissions		Tracking # 31964313.001 Page 7 of 11	
EUT Name	FreeStyle Precision Pro	**Date**	September 09, 2019
EUT Model	FreeStyle Precision Pro	**Temp / Hum in**	23° C / 40%rh
EUT Serial	KFAY246-A0108	**Temp / Hum out**	N/A
EUT Config.	802.11a	**Line AC / Freq**	3VDC Battery
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Colton Aliff

26.5 – 40 GHz Transmit at 5220 MHz (Mid Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
39912.05	60.72	10.91	-13.52	58.10	Peak	V	228	102	74.00	-15.90
39912.05	47.25	10.91	-13.52	44.64	Average	V	228	102	54.00	-9.36



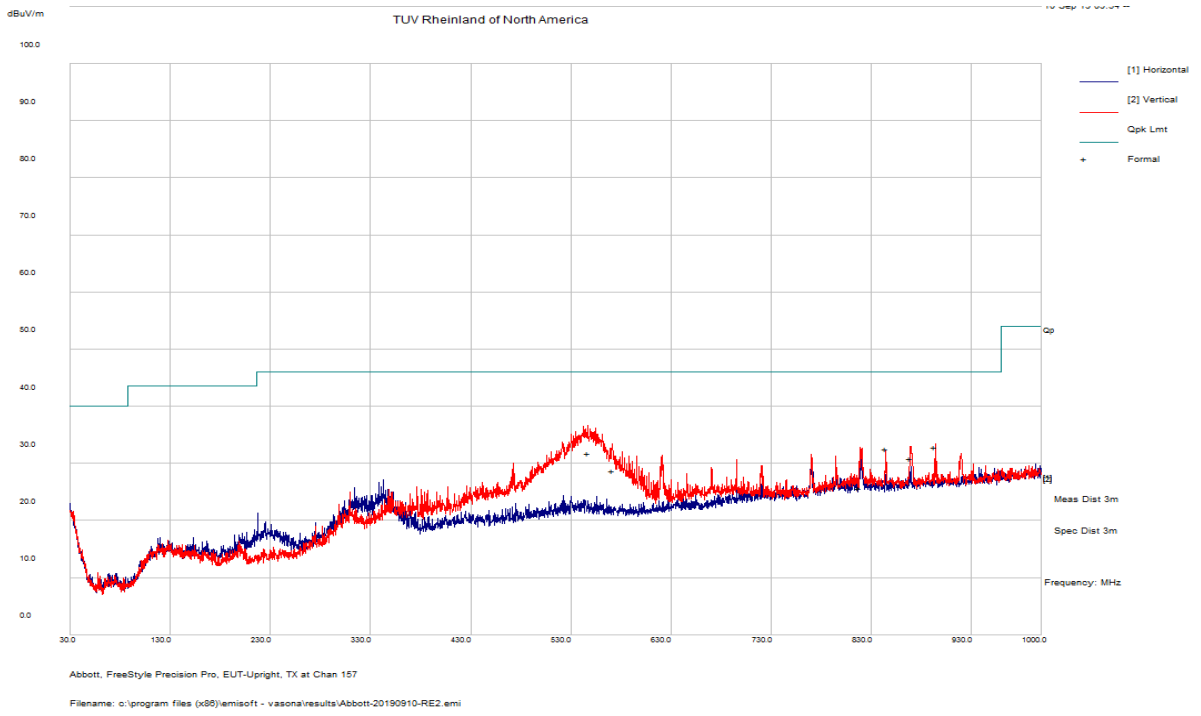
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: 1. Worst case was observed with EUT positioned Y axis (Upright).
2. No significant emission found. Detected spectrum noise floor.

SOP 1 Radiated Emissions		Tracking # 31964313.001 Page 8 of 11	
EUT Name	FreeStyle Precision Pro	**Date**	September 09, 2019
EUT Model	FreeStyle Precision Pro	**Temp / Hum in**	23° C / 40%rh
EUT Serial	KFAY246-A0108	**Temp / Hum out**	N/A
EUT Config.	802.11a	**Line AC / Freq**	3VDC Battery
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	120 kHz/ 300 kHz
Dist/Ant Used	3m / JB3	**Performed by**	Colton Aliff

30 – 1000 MHz Transmit at 5785 MHz (Mid Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
547.13	39.02	2.24	-9.40	31.86	QP	V	110	56	46.00	-14.14
571.21	35.27	2.30	-8.80	28.77	QP	V	100	64	46.00	-17.23
818.52	28.32	2.80	-5.47	25.66	QP	V	172	308	46.00	-20.34
844.34	34.99	2.86	-5.28	32.57	QP	V	126	216	46.00	-13.43
869.11	32.85	2.90	-4.91	30.85	QP	V	117	160	46.00	-15.16
893.92	34.50	2.96	-4.55	32.91	QP	V	124	180	46.00	-13.09



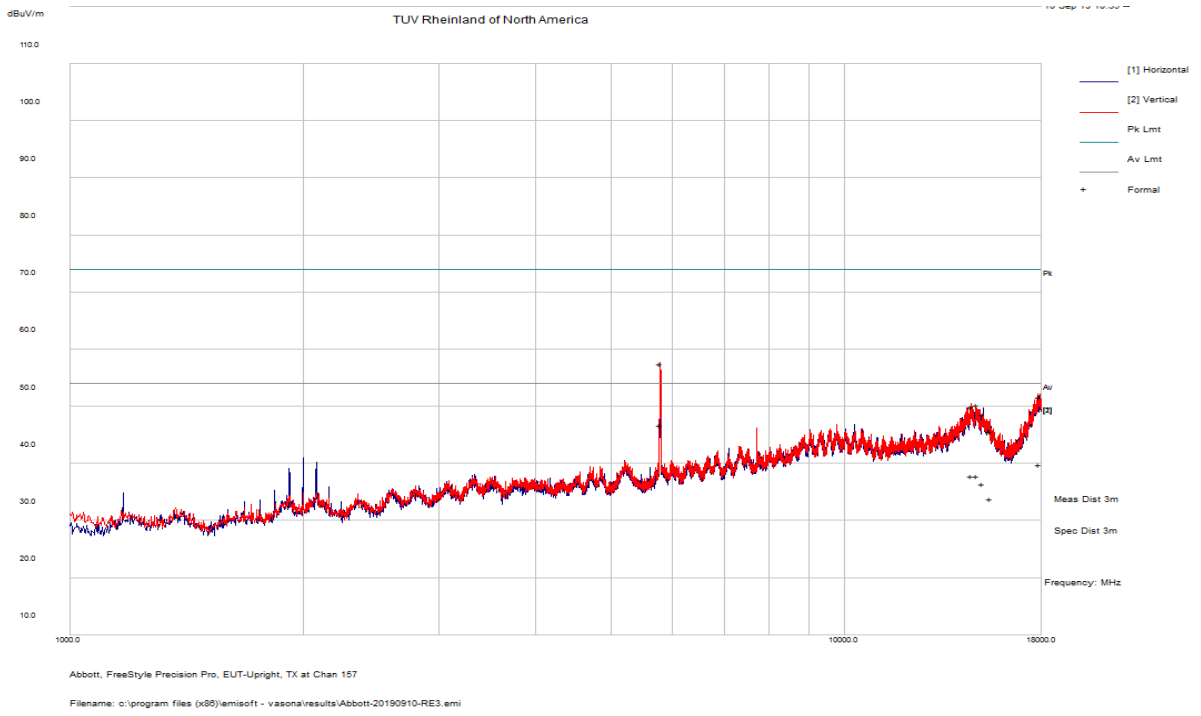
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed on Mid channel of 802.11a with EUT positioned Y axis (Upright).

SOP 1 Radiated Emissions		Tracking # 31964313.001 Page 9 of 11	
EUT Name	FreeStyle Precision Pro	**Date**	September 09, 2019
EUT Model	FreeStyle Precision Pro	**Temp / Hum in**	23° C / 40%rh
EUT Serial	KFAY246-A0108	**Temp / Hum out**	N/A
EUT Config.	802.11a	**Line AC / Freq**	3VDC Battery
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Colton Aliff

1 – 18 GHz Transmit at 5785 MHz (Mid Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
5784.67	75.70	3.80	-22.11	57.38	Peak	V	207	300	74.00	-16.62
5784.67	64.96	3.80	-22.11	46.65	Average	V	207	300	54.00	-7.35
14837.40	56.36	6.40	-12.56	50.20	Peak	V	123	316	74.00	-23.80
14837.40	43.99	6.40	-12.56	37.82	Average	V	123	316	54.00	-16.18
17906.51	52.76	6.83	-7.91	51.67	Peak	V	221	6	74.00	-22.33
17906.51	40.93	6.83	-7.91	39.84	Average	V	221	6	54.00	-14.16



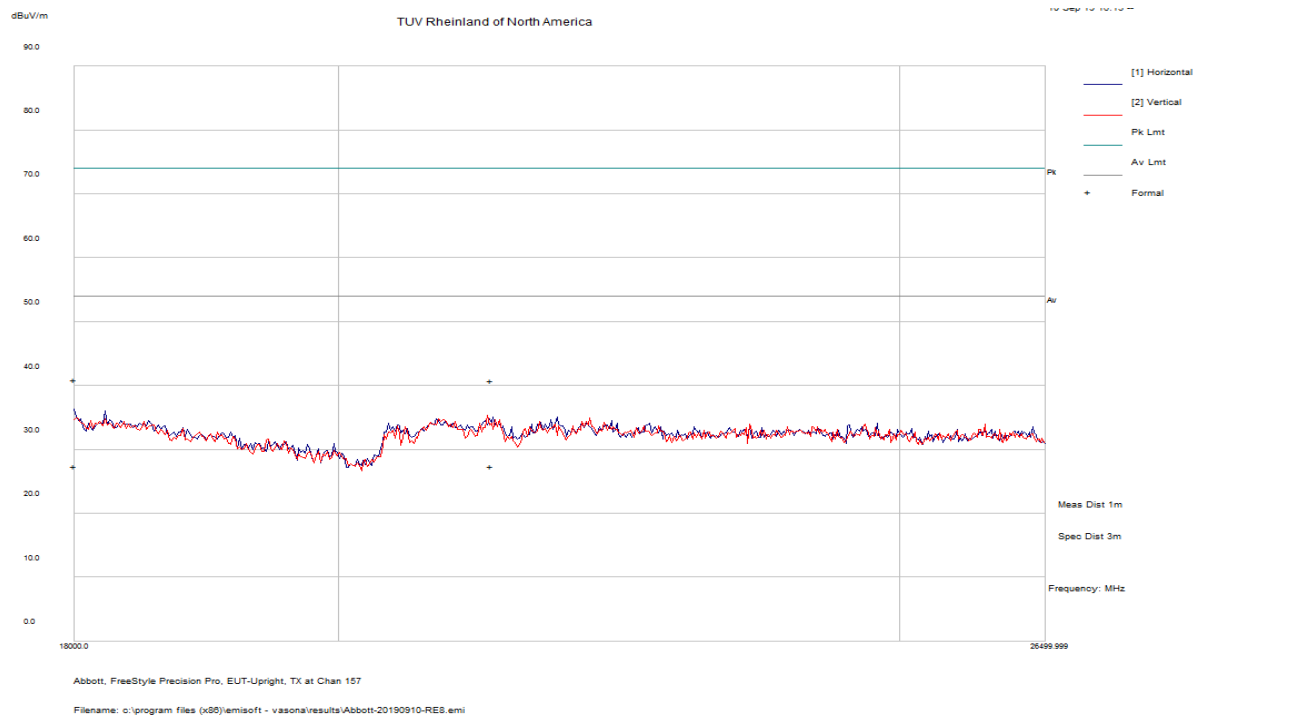
Spec Margin = E-Field QP - Limit, E-Field QP = FIM QP+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: Worst case was observed with EUT positioned Y axis (Upright).

SOP 1 Radiated Emissions		Tracking # 31964313.001 Page 10 of 11	
EUT Name	FreeStyle Precision Pro	**Date**	September 09, 2019
EUT Model	FreeStyle Precision Pro	**Temp / Hum in**	23° C / 40%rh
EUT Serial	KFAY246-A0108	**Temp / Hum out**	N/A
EUT Config.	802.11a	**Line AC / Freq**	3VDC Battery
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Colton Aliff

18 – 26.5 GHz Transmit at 5785 MHz (Mid Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
21252.14	42.55	7.60	-9.40	40.76	Peak	H	317	203	74.00	-33.24
21252.14	29.23	7.60	-9.40	27.43	Average	H	317	203	54.00	-26.57



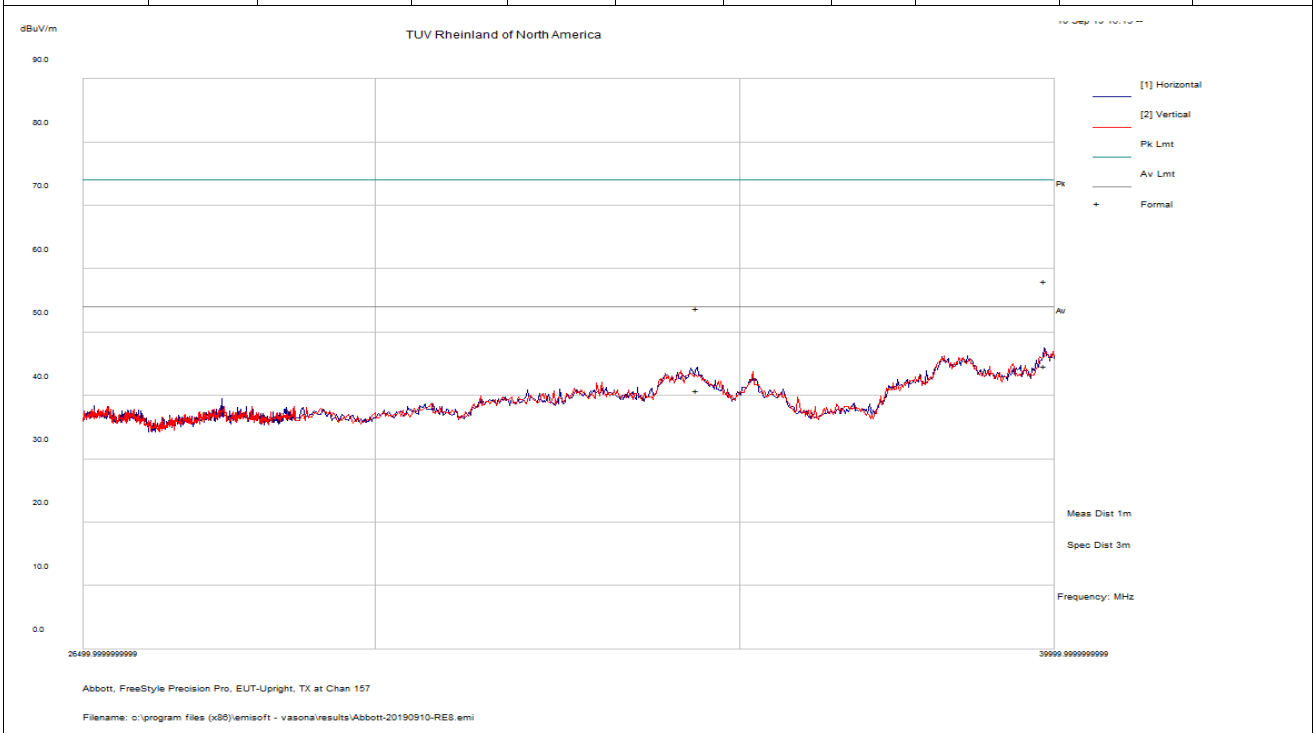
Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: 1. Worst case was observed with EUT positioned Y axis (Upright).
2. No significant emission found. Detected spectrum noise floor.

SOP 1 Radiated Emissions		Tracking # 31964313.001 Page 11 of 11	
EUT Name	FreeStyle Precision Pro	**Date**	September 09, 2019
EUT Model	FreeStyle Precision Pro	**Temp / Hum in**	23° C / 40%rh
EUT Serial	KFAY246-A0108	**Temp / Hum out**	N/A
EUT Config.	802.11a	**Line AC / Freq**	3VDC Battery
Standard	CFR47 Part 15 Subpart C, RSS-247, RSS-GEN	**RBW / VBW**	1 MHz / 3 MHz
Dist/Ant Used	3m – EMCO3115 / 1m – AHA-840	**Performed by**	Colton Aliff

26.5 – 40 GHz Transmit at 5785 MHz (Mid Channel)

Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
39824.89	60.75	10.85	-13.54	58.06	Peak	H	110	8	74.00	-15.94
39824.89	47.29	10.85	-13.54	44.61	Average	H	110	8	54.00	-9.39



Spec Margin = E-Field AVG - Limit, E-Field AVG = FIM AVG+ Total CF ± Uncertainty
Total CF= AF+ Cable Loss AF= Antenna factor + Preamp

Note: 1. Worst case was observed with EUT positioned Y axis (Upright).
2. No significant emission found. Detected spectrum noise floor.

4.3 Maximum Permissible Exposure

4.3.1 Test Methodology

In this document, we try to prove the safety of radiation harmfulness to the human body for our product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. The Gain of the antenna used in this calculation is declared by the manufacturer, and the maximum total power input to the antenna is measured. Through the Friis transmission formula and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis transmission formula is a far field assumption, the calculated result of that is an over-prediction for near field power density. We will take that as the worst case to specify the safety range.

4.3.2 RF Exposure Limit

According to FCC 1.1310 table 1: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
(A)Limits For Occupational / Control Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	…	…	1.0	6
300 - 1500	…	…	f/300	6
1500 - 100,000	…	…	5	6
(B)Limits For General Population / Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/ f^2$)	30
30–300	27.5	0.037	0.2	30
300 - 1500	…	…	f/1500	30
1500 - 100,000	…	…	1.0	30

F = Frequency in MHz
* = Plane-wave equivalent power density

4.3.3 EUT Operating Condition

The software provided by Manufacturer enabled the EUT to transmit data at lowest, middle and highest channel individually.

4.3.4 Classification

The antenna of the product, under normal use condition, is within 20cm away from the body of the user. This device is classified as an **Ultra Mobile Portable Computer**.

4.3.5 Test Results

Refer to SAR Test Report number 31854839.001.

5 Test Equipment List

5.1 Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yyyy	Next Cal mm/dd/yyyy
Bilog Antenna	Sunol Sciences	JB3	A102606	08/01/2018	08/01/2020
Horn Antenna	EMCO	3115	9602-4616	05/03/2019	05/03/2021
Antenna / Amplifier (18-26GHz)	Rohde Schwarz	TS-PR26	100011	03/04/2019	03/04/2021
Magnetic Loop	EMCO	6511	9110-2683	07/20/2017	10/20/2019
EMI Receiver	Agilent	N9038A	MY52260210	01/16/2019	01/16/2020
Spectrum Analyzer	Agilent	N9030A	US51350291	01/15/2019	01/15/2020
EMI Receiver	Rohde Schwarz	ESI40	832427/002	02/28/2019	02/28/2020
Amplifier	Sonoma Instruments	310	185516	01/15/2019	01/15/2020
Amplifier	Miteq	TTA1800-30-4G	1842452	01/15/2019	01/15/2020
Power Meter	Agilent	E4418A	MY45103902	01/17/2019	01/17/2020
Power Sensor	Hewlett Packard	8482A	US37292296	01/16/2019	01/16/2020
Notch Filter	Micro-Tronics	BRM50716-02	003	See Note	
EMI Receiver	Rohde & Schwarz	FSV40	1321.3008K40	11/21/2018	11/21/2019

Note: Equipment characterized before use.

6 EMC Test Plan

6.1 Introduction

This section provides a description of the Equipment Under Test (EUT), configurations, operating conditions, and performance acceptance criteria. It is an overview of information provided by the manufacturer so that the test laboratory may perform the requested testing.

6.2 Customer

Table 3: Customer Information

Company Name	Abbott Diabetes Care, Inc
Address	1360 South Loop Road
City, State, Zip	Alameda, CA 94502
Country	USA
Phone	+1 (888) 522-5226

Table 4: Technical Contact Information

Name	William Matievich
E-mail	william.matievich@abbott.com
Phone	+1 (888) 522-5226

6.3 Equipment Under Test (EUT)

Table 5: EUT Specifications

EUT Specifications	
Dimensions	W: 74.77 mm x D: 199.4 mm x H: 48.6 mm
DC Input	3 VDC via 2xAA batteries
Environment	Indoor
Operating Temperature Range:	15 to +40 degrees C
Multiple Feeds:	☐ Yes and how many ☒ No
Hardware Version	PRT19550-230
RF Software Version	1.7.2 (Redpine module Firmware)
802.11-radio modules	
Operating Mode	802.11b, 802.11g, 802.11a, 802.11n
Transmitter Frequency Band	2.412 GHz – 2.462 GHz; 5.150 GHz – 5.350 GHz, 5.470 GHz – 5.725 GHz, 5.725 GHz – 5850 GHz
Modulation Type	☐ AM ☐ FM ☒ DSSS ☒ OFDM ☐ Other describe: GFSK
TX/RX Chain (s)	1
Directional Gain Type	☒ Uncorrelated ☒ No Beam-Forming ☐ Other describe:
Type of Equipment	☐ Table Top ☐ Wall-mount ☐ Floor standing cabinet ☒ Other: Hand held
Note: None.	

Table 6: Interface Specifications

Interface Type	Cabled with what type of cable?	Is the cable shielded?	Maximum potential length of the cable?	Metallic (M), Coax (C), Fiber (F), or Not Applicable?
N/A		☐ No	☐ Metric:	☐ N/A

Table 7: Supported Equipment

Equipment	Manufacturer	Model	Serial	Used for
Laptop	Dell	Latitude E6430	N/A	Setup EUT operating channel
Note: None.				

Table 8: Description of Sample used for Testing

Device	Serial	RF Connection	CFR47 Part 15.247 and Part 15.407
EUT	KFAY246-A0113	SMA Connector & Antenna	TX Radiated & Conducted Emission for Part 15.247
EUT	KFAY246-A0108	SMA Connector & Antenna	TX Radiated & Conducted Emission for Part 15.407

Table 9: Description of Test Configuration used for Radiated Measurement.

Device	Antenna	Mode	Setup Photo (X-Axis)	Setup Photo (Y-Axis)	Setup Photo (Z-Axis)
EUT	Integrated PCB	Transmit	EUT laid flat	EUT stood upright	EUT onside
Note: Pre-scans were performed in 2 supporting axis, and Y-axis was worst.					

6.4 Test Specifications

Testing requirements

Table 10: Test Specifications

Emissions and Immunity	
Regulation Rules / Standard	**Requirement**
CFR 47 Part 15.247: 2018 CFR 47 Part 15.407: 2018	All
RSS 247 Issue 2, 2017	All

END OF REPORT