Emissions
Test Report

EUT Name: Flash

Model No.: FLASHV1

FCC Part 22, 24, 27

Prepared for:

KPZ, Inc
918 S Horton St, Unit 912
Seattle, WA 98134

Prepared by:

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Project Number:	0000149258

Statement of Compliance

Manufacturer:	KPZ, Inc 918 S Horton St, Unit 912 Seattle, WA 98134
Name of Equipment:	Flash
Model No.	FLASHV1
Type of Equipment:	Intentional Radiator
Test Dates:	June 1, 2017 to June 6, 2017

Test Specifications:

CFR 47 Part 22, 24, 27

Test Methods:

FCC KDB 971168, v02r02
TIA 603-D: 2010
ANSI C63.26

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 contains data that are not covered by A2LA accreditation. This report shall not be reproduced except in full, without the written authorization of TUV Rheinland of North America.

Josie Sabado	July 5, 2017	Arndt Stoecker	July 5, 2017
Test Engineer	Date	Operations Manager	Date

Testing Cert #3331.02 **US1131**

Table of Contents

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC based on the results of testing performed on June 1, 2017 through June 6, 2017 the Flash Model FLASHV1 manufactured by KPZ, 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.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	FCC Rule	Test Method	Result[1]
Conducted RF Output Power	§2.1046	KDB 971168, section 5 ANSI C63.26, section 5.2	**Not Tested**
Equivalent (Isotropic) Radiated Power	§22.913 §24.232 §27.50	KDB 971168, section 5 ANSI C63.26, section 5.2	**Not Tested**
Peak-to-average ratio	§24.232 §27.50	KDB 971168, section 5.7 ANSI C63.26, section 5.2	**Not Tested**
Occupied Bandwidth	§2.1049	KDB 971168, section 4 ANSI C63.26, section 5.4	**Not Tested**
Spurious Emissions at antenna terminals	§2.1051 §22.917 §24.238 §27.53	KDB 971168, section 6 ANSI C63.26, section 5.7	**Not Tested**
Band Edge	§2.1051 §22.917 §24.238 §27.53	KDB 971168, section 6 ANSI C63.26, section 5.7	**Not Tested**
Transmitter Unwanted Emissions	§2.1053 §22.917 §24.238 §27.53	KDB 971168, section 7 TIA 603-D, section 2.2.12 ANSI C63.26, section 5.5	**Complied**
Frequency Stability	§2.1055 §22.355 §24.235 §27.54	KDB 971168, section 9 ANSI C63.26, section 5.6	**Not Tested**

Notes:
1. EUT integrates a precertified module. For test cases not tested, refer to the module's test report for results.

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 Lane, Ste. A., Pleasanton, CA 94566, is accredited 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. 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 17025:1999 and ISO 9002 (Lab Code US5254). 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). This reference number is the indication to the Industry Canada Certification Officers that the site meets the requirements of RSS 212, Issue 1 (Provisional). 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-0031
VCCI Registration No. for Santa Clara: A-0032

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

Testing was done at 1279 Quarry Lane, Ste. A, Pleasanton, California 94566, USA.

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 C63.4-2009, at a test distance of 3 and 5 meters. The site is listed with the FCC and accredited by A2LA (Lab Code US5254). A report detailing this site can be obtained from TUV Rheinland of North America.

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.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

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 Uncertainties

Table 2: Summary of Uncertainties

	U_{lab}	U_{cispr}
Radiated Disturbance		
30 MHz – 25,000 MHz	3.2 dB	5.2 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	2.4 dB	3.6 dB
Disturbance Power		
30 MHz – 300 MHz	3.92 dB	4.5 dB

Note: U_{lab} is the calculated Combined Standard Uncertainty
U_{cispr} is the measurement uncertainty requirement per CISPR 16.

Measurement Uncertainty – Radio Testing

The estimated combined standard uncertainty for frequency error measurements is ± 3.88 Hz
The estimated combined standard uncertainty for carrier power measurements is ± 1.59 dB.
The estimated combined standard uncertainty for adjacent channel power measurements is ± 1.47 dB.
The estimated combined standard uncertainty for modulation frequency response measurements is ± 0.46 dB.
The estimated combined standard uncertainty for transmitter conducted emission measurements is ± 4.01 dB

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 Guide 17025:2005.

3 Product Information

3.1 Introduction

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

3.2 Customer

Table 3: Customer Information

Company Name	KPZ, Inc
Address	918 S Horton St, Unit 912
City, State, Zip	Seattle, WA 98134
Country	USA

3.3 Product Description

The Flash is a smart electric bike consisting of a cellular radio and Bluetooth LE radio. The cellular radio supports WCDMA and LTE technologies.

3.4 Equipment Under Test (EUT)

Table 4: EUT Specifications

EUT Specification	
Power Input	120 VAC
Number of Antenna Feeds:	Transmit: 1 Receive: 1
Hardware Version	1.0
RF Software Version	1.0
Cellular Transmit Frequency Band	WCDMA Band 2: 1852.4 – 1907.6 MHz WCDMA Band 5: 826.4 – 846.6 MHz LTE Band 2: 1850.7 – 1909.3 MHz LTE Band 4: 1710.7 – 1754.3 MHz LTE Band 5: 824.7 – 848.3 MHz LTE Band 12: 699.7 – 715.3 MHz
Cellular Max. Rated Power Output	WCDMA: 24 dBm LTE: 24 dBm
Cellular Power Setting @ Operating Channel	WCDMA: Transmit power control bits all 1 LTE: Active transmit power control setup max power
Cellular Antenna Type	PCB Trace Antenna
Cellular Modulation Type	WCDMA: QPSK LTE: QPSK, 16QAM
Type of Equipment	☐ Table Top ☐ Wall-mount ☐ Floor standing cabinet ☒ Other: Bicycle

Table 5: Description of Sample used for Testing

Device	Serial Number	Configuration	Used For
Link Bike	FCC #1	Radiated Sample	Radiated Emissions

3.5 Test Equipment Configuration

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 the declared 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 a 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.

During testing, the Bluetooth LE radio was active and transmitting on advertising channels. The Bluetooth LE radio is used to send AT commands to the cellular radio.

3.6 Operating Mode

In the case of a 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.

Table 6: Final Test Mode

Test	Operating Mode
Transmitter Unwanted Emissions	WCDMA: 12.2 kbps RMC, TPC Bits all 1 LTE: 1 RB centered in channel, Max power

4 Emissions

Testing was performed in accordance with FCC rules. 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 TIA-603-D and ANSI C63.26 were used.

4.1 Transmitter Unwanted Emissions

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmitting mode; per requirement of CFR47 15.205, 15.209, 15.247(d), RSS-Gen Sect. 8.9

4.1.1 Test Methodology

4.1.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emissions test procedure. The frequency range of interest was divided into sub-ranges. For each sub-range peak emission data was recorded and plotted while the turntable was rotated 360° in 90° steps and the measurement antenna was rotated in horizontal and vertical antenna polarization.

Preliminary emission profile testing was performed inside a semi-anechoic chamber. The EUT was placed on a non-conductive table 80 cm above the floor for emissions less than 1 GHz and 150cm above the floor for emissions greater than 1 GHz. The EUT was positioned as shown in the setup photographs. The measurement antenna was placed at a distance of 3m.

4.1.1.2 Final Test

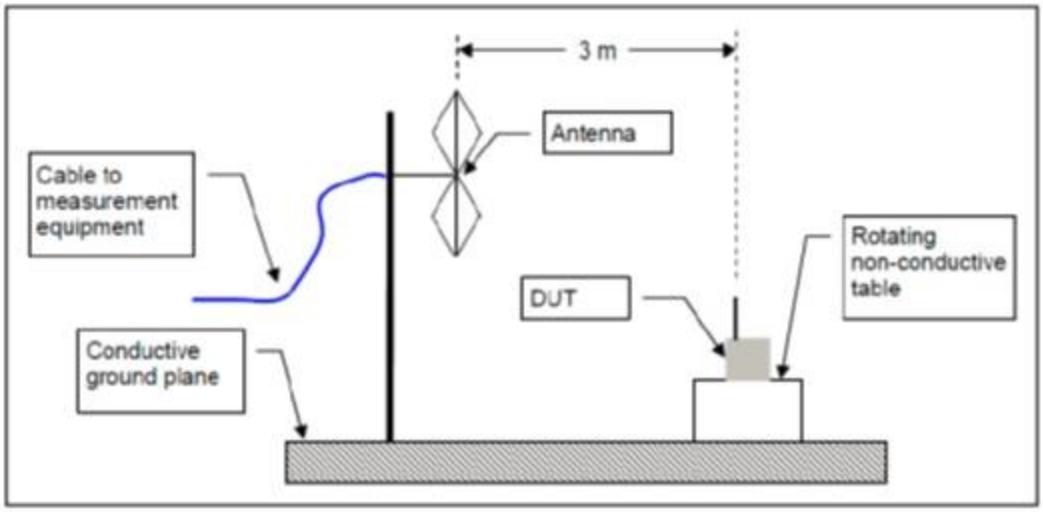
Final testing was performed on an NSA compliant test site.

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. Emissions within 20 dB of the limit were measured.

Substitution measurements are done for emissions within 10 dB of the limit.

The final scans were performed on the worst EUT axis for three operating channels in the operating mode with the highest power.

4.1.1.3 Test Setup



4.1.1.4 Deviations

None.

4.1.2 Transmitter Spurious Emission Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB where P is in watts. The limit is -13 dBm for any power.

4.1.3 Test Results

The final measurement data was taken under the worst case operating modes, configurations, and cable positions. It also reflects the results including any modifications and/or special accessories listed in section 1

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

Radiated Emissions – WCDMA Band 2

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 24.238		
Distance Used	3m	**Performed by**	J. Sabado

Freq.	Level	Detector	RBW	Ant Pol.	Ant Height	Azimuth	Limit	Margin	Result
MHz	dBm		kHz	H/V	cm	deg	dBm	dB	
Transmit Channel 9262 (1852.4 MHz)									
202.75	-55.06	Peak	120	V	100	180	-13	-42.06	Complies
Transmit Channel 9400 (1880.0 MHz)									
202.75	-54.80	Peak	120	V	100	170	-13	-41.80	Complies
Transmit Channel 9538 (1907.6 MHz)									
202.75	-55.19	Peak	120	V	100	180	-13	-42.19	Complies

Spec Margin = Level - Limit

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Radiated Emissions – WCDMA Band 5

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 22.917		
Distance Used	3m	**Performed by**	J. Sabado

Freq.	Level	Detector	RBW	Ant Pol.	Ant Height	Azimuth	Limit	Margin	Result
MHz	dBm		kHz	H/V	cm	deg	dBm	dB	
Transmit Channel 4132 (826.4 MHz)									
202.75	-55.56	Peak	120	V	100	180	-13	-43.56	Complies
Transmit Channel 4183 (836.6 MHz)									
202.70	-55.30	Peak	120	V	100	180	-13	-42.3	Complies
712.95	-42.25	Peak	120	H	100	180	-13	-29.25	Complies
1675.2	-39.54	Peak	1000	V	150	90	-13	-26.54	Complies
Transmit Channel 4233 (846.6 MHz)									
202.7	-55.30	Peak	120	V	100	180	-13	-42.3	Complies
1687.2	-40.74	Peak	1000	V	150	0	-13	-27.74	Complies

Spec Margin = Level - Limit

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Radiated Emissions – LTE Band 2

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 24.238		
Distance Used	3m	**Performed by**	J. Sabado

Freq.	Level	Detector	RBW	Ant Pol.	Ant Height	Azimuth	Limit	Margin	Result
MHz	dBm		kHz	H/V	cm	deg	dBm	dB	
Transmit Channel 18700 (1860 MHz)									
202.7	-55.65	Peak	120	V	100	180	-13	-41.65	Complies
Transmit Channel 18900 (1880 MHz)									
202.7	-55.17	Peak	120	V	100	180	-13	-42.170	Complies
Transmit Channel 19100 (1900 MHz)									
202.7	-56.11	Peak	120	V	100	0	-13	-43.11	Complies

Spec Margin = Level - Limit

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Radiated Emissions – LTE Band 4

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 27.53		
Distance Used	3m	**Performed by**	J. Sabado

Freq.	Level	Detector	RBW	Ant Pol.	Ant Height	Azimuth	Limit	Margin	Result
MHz	dBm		kHz	H/V	cm	deg	dBm	dB	
Transmit Channel 20050 (1720 MHz)									
202.7	-58.8	Peak	120	H	100	180	-13	-45.8	Complies
Transmit Channel 20175 (1732.5 MHz)									
202.7	-59.19	Peak	120	H	100	180	-13	-46.19	Complies
Transmit Channel 20300 (1745 MHz)									
202.7	-58.8	Peak	120	H	100	180	-13	-45.8	Complies

Spec Margin = Level - Limit

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Radiated Emissions – LTE Band 5

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 22.917		
Distance Used	3m	**Performed by**	J. Sabado

Freq.	Level	Detector	RBW	Ant Pol.	Ant Height	Azimuth	Limit	Margin	Result
MHz	dBm		kHz	H/V	cm	deg	dBm	dB	
Transmit Channel 20450 (829 MHz)									
202.7	-54.78	Peak	120	V	100	180	-13	-41.78	Complies
704.65	-40.04	Peak	120	H	100	90	-13	-27.04	Complies
1658	-37.01	Peak	1000	V	150	90	-13	-24.01	Complies
Transmit Channel 20525 (836.5 MHz)									
1672.8	-35.05	Peak	1000	V	150	90	-13	-22.05	Complies
Transmit Channel 20600 (844 MHz)									
1688	-35.55	Peak	1000	V	150	90	-13	-22.55	Complies

Spec Margin = Level - Limit

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Radiated Emissions – LTE Band 12

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 27.53		
Distance Used	3m	**Performed by**	J. Sabado

Freq.	Level	Detector	RBW	Ant Pol.	Ant Height	Azimuth	Limit	Margin	Result
MHz	dBm		kHz	H/V	cm	deg	dBm	dB	
Transmit Channel 23060 (704 MHz)									
202.75	-55.72	Peak	120	V	100	180	-13	-42.72	Complies
Transmit Channel 23095 (707.5 MHz)									
202.7	-55.04	Peak	120	V	100	180	-13	-42.04	Complies
Transmit Channel 23130 (711 MHz)									
202.75	-55.45	Peak	120	V	100	180	-13	-42.45	Complies

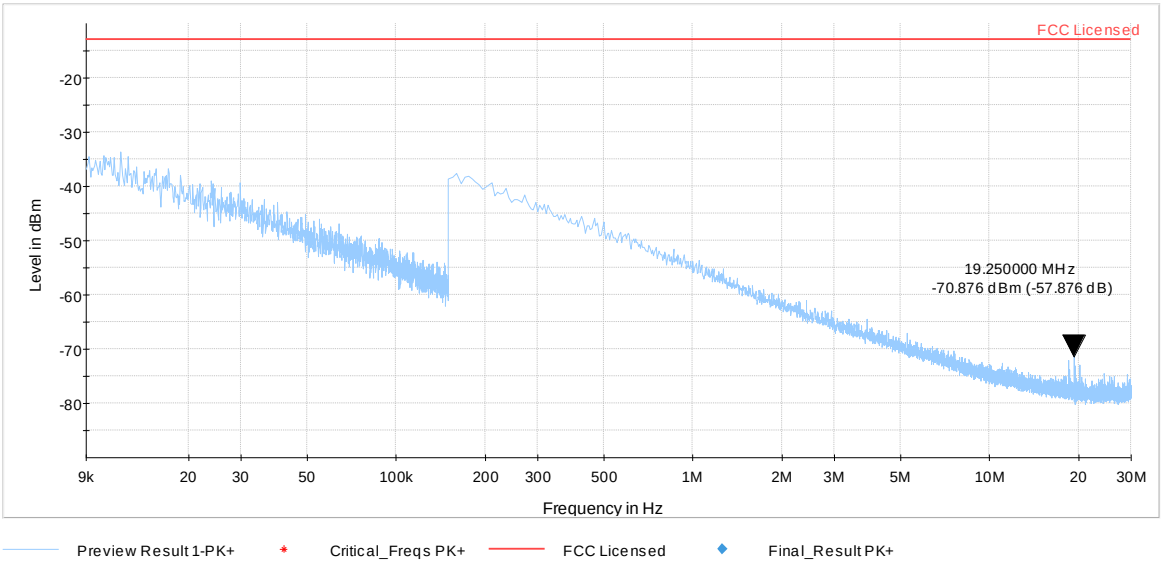
Spec Margin = Level - Limit

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

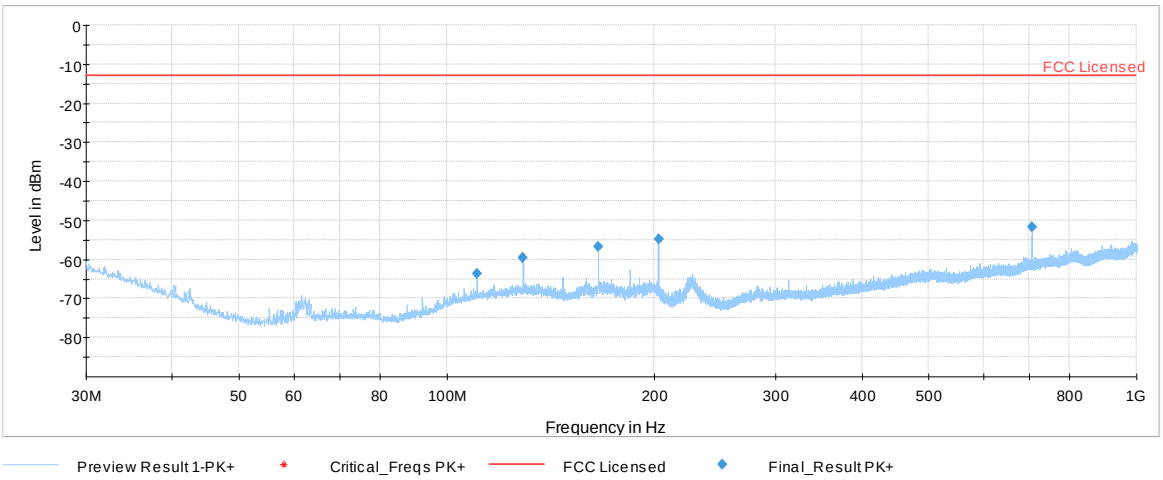
Radiated Emissions – WCDMA Band 2 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 24.238		
Dist/Ant Used	3m	**Date**	J. Sabado

9 KHz – 30 MHz for Channel 9400



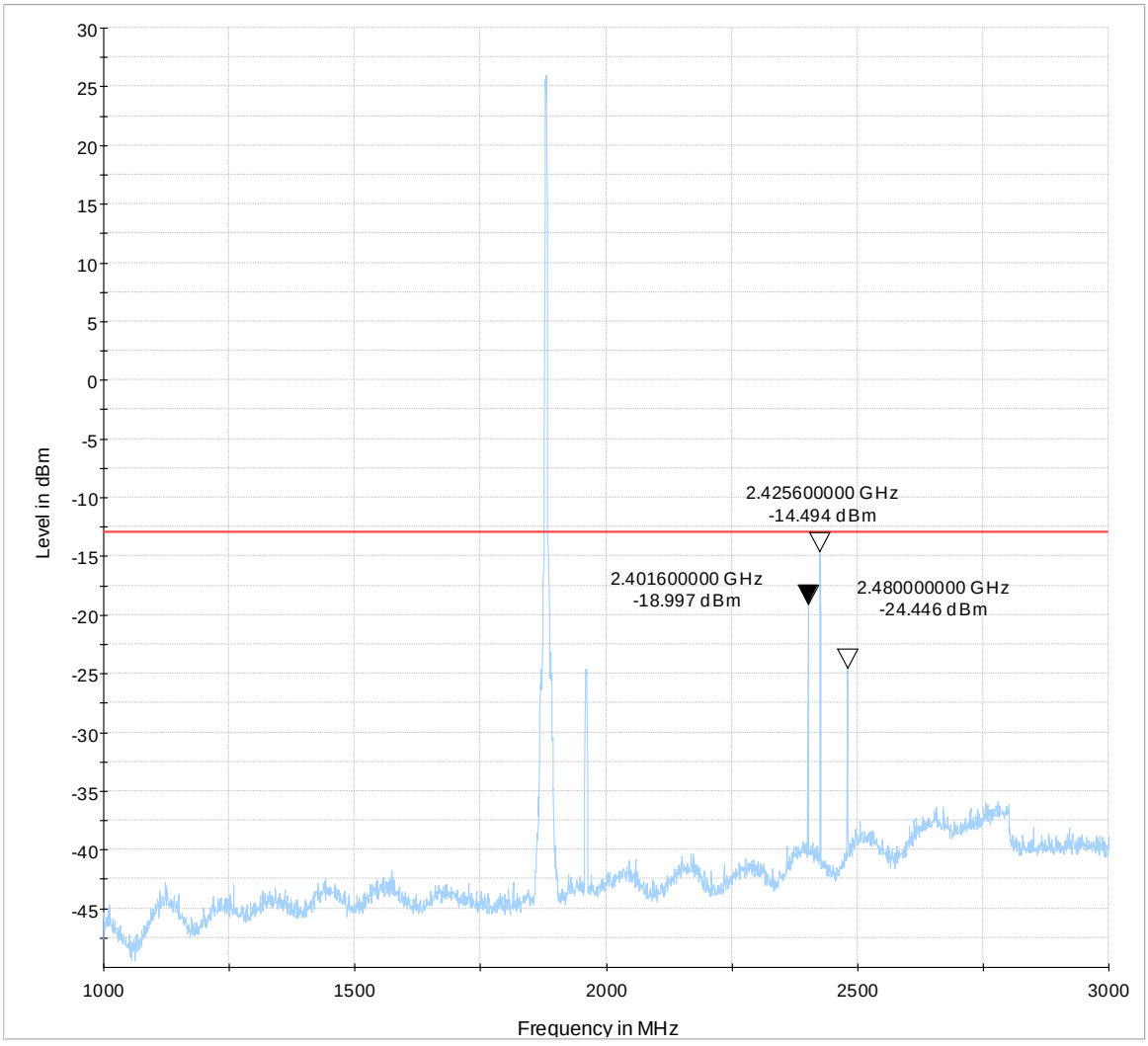
30 MHz – 1 GHz for Channel 9400



Radiated Emissions – WCDMA Band 2 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 24.238		
Dist/Ant Used	3m	**Date**	J. Sabado

1 GHz – 3 GHz for Channel 9400

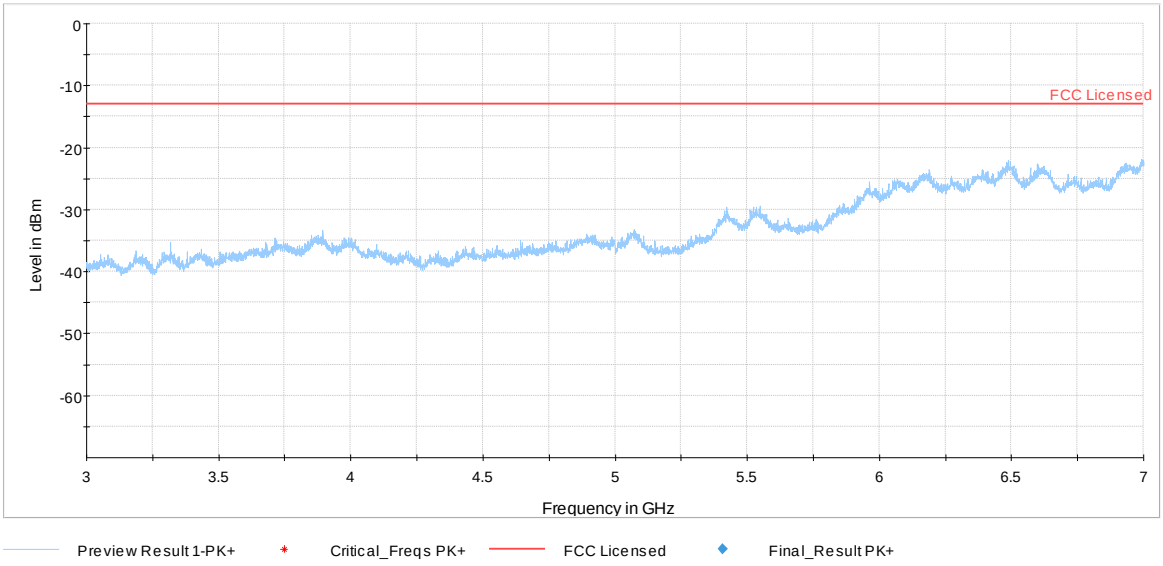


Peak above the limit is the uplink carrier frequency

Radiated Emissions – WCDMA Band 2 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 24.238		
Dist/Ant Used	3m	**Date**	J. Sabado

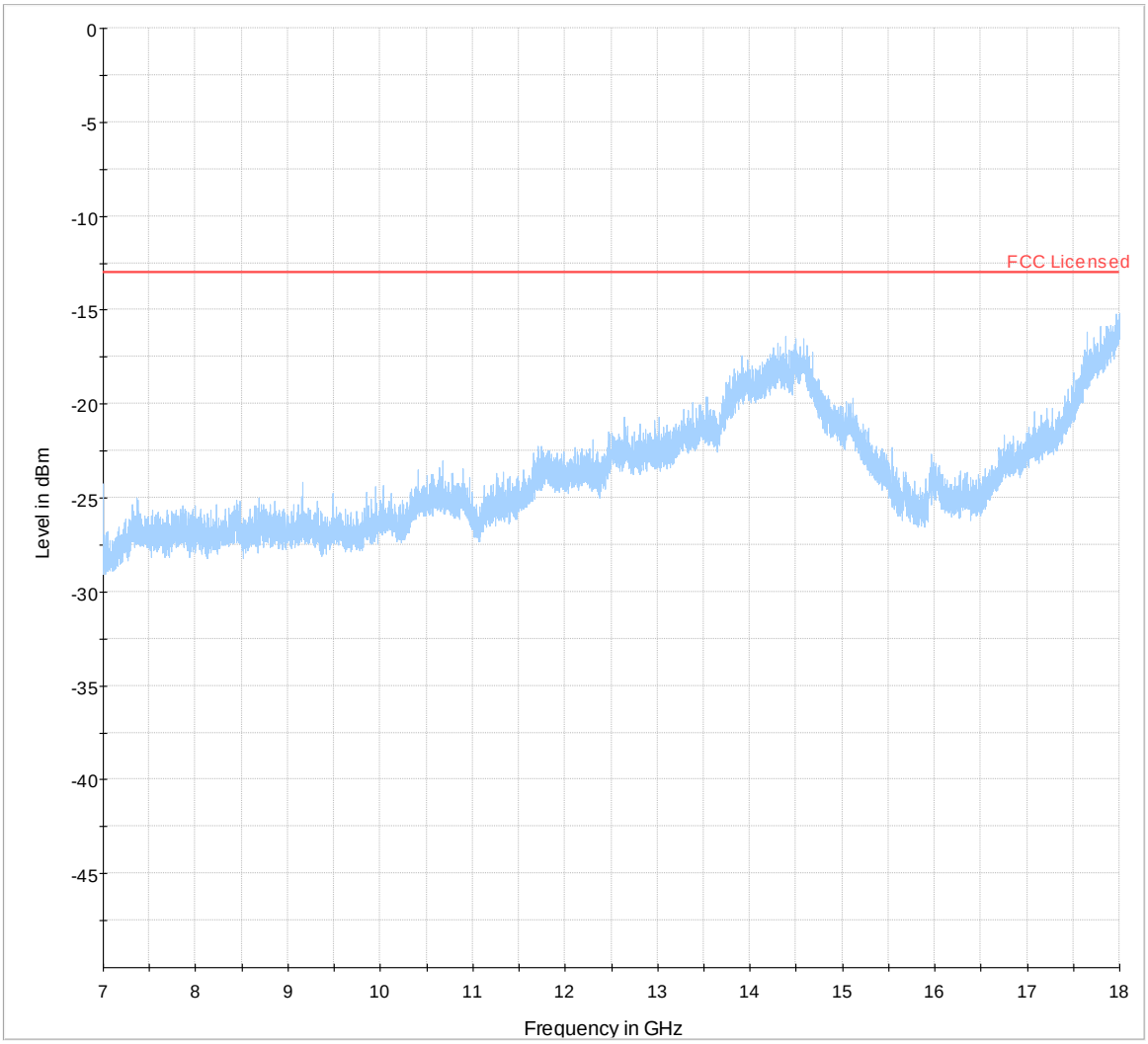
3 GHz – 7 GHz for Channel 9400



Radiated Emissions – WCDMA Band 2 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 24.238		
Dist/Ant Used	3m	**Date**	J. Sabado

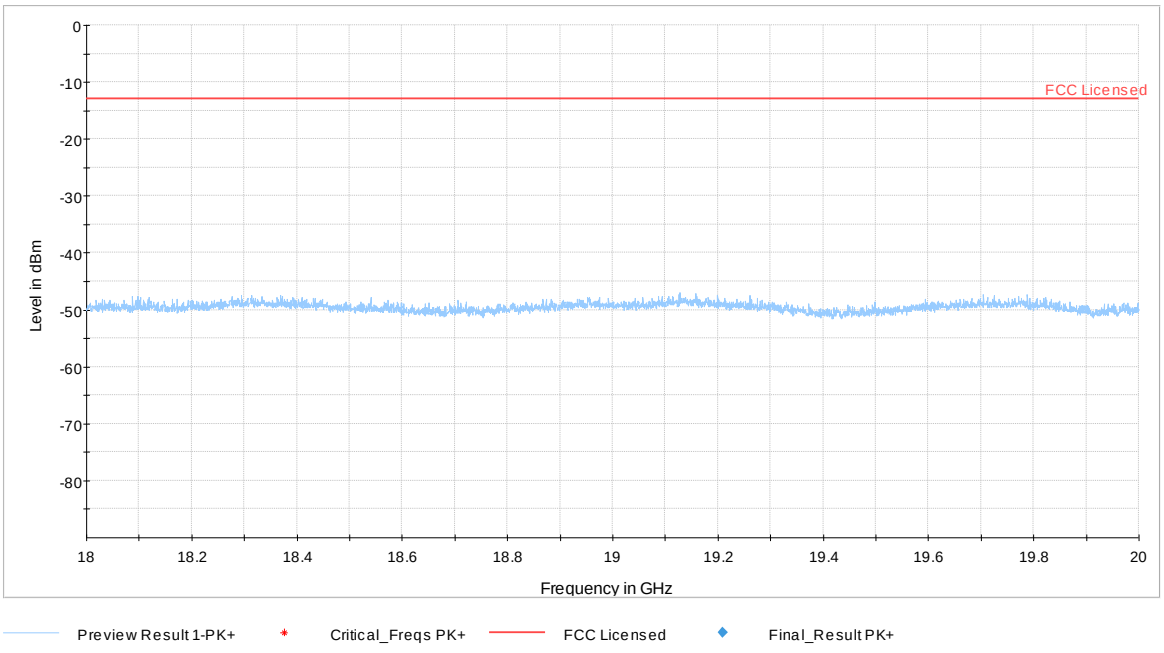
7 GHz – 18 GHz for Channel 9400



Radiated Emissions – WCDMA Band 2 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 24.238		
Dist/Ant Used	3m	**Date**	J. Sabado

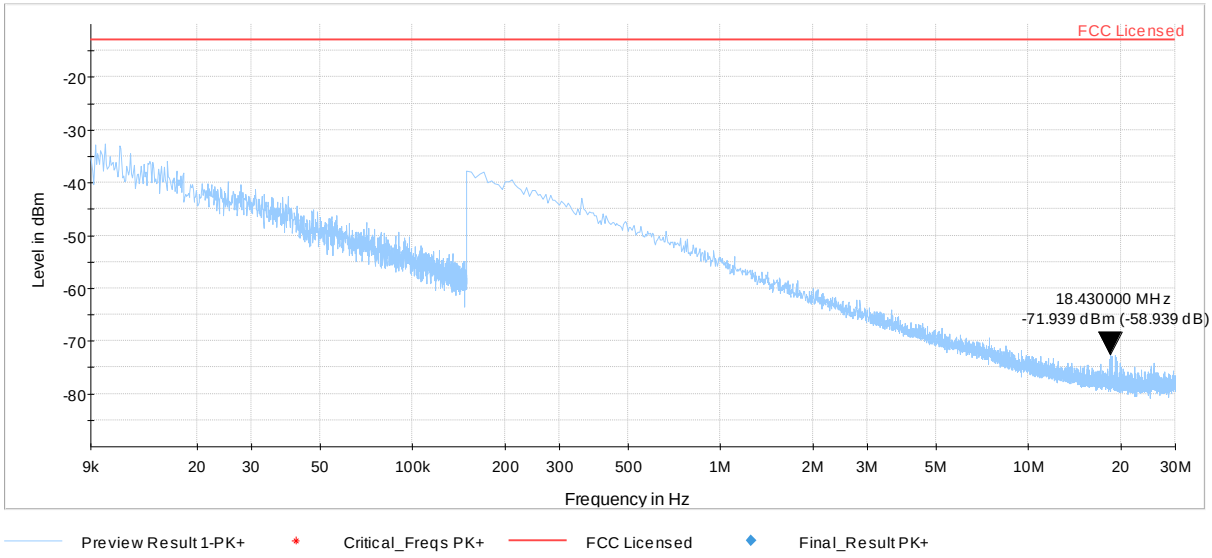
18 GHz – 20 GHz for Channel 9400



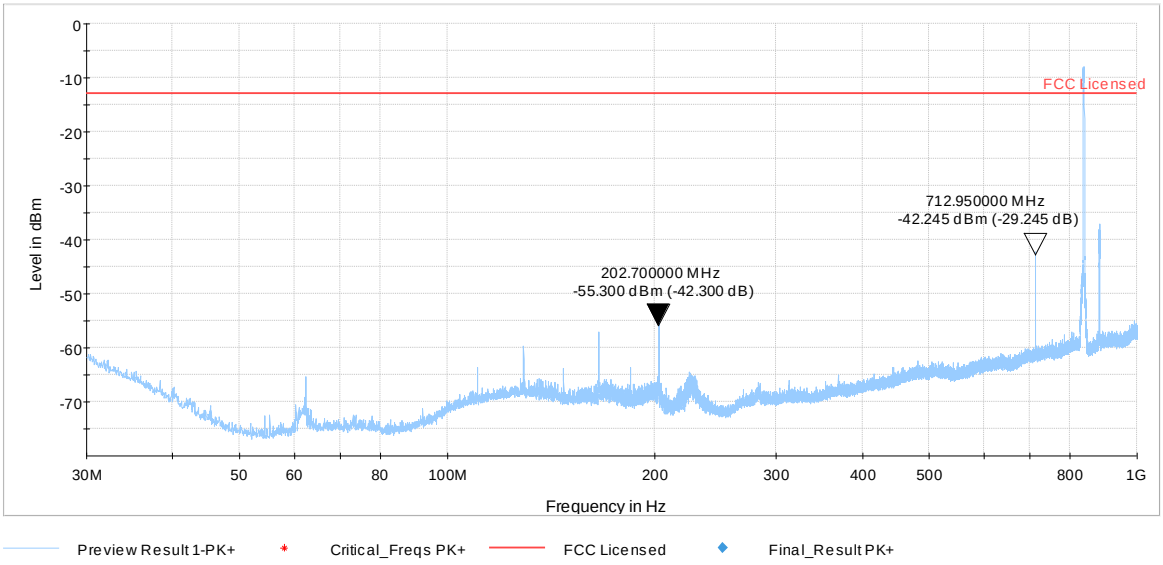
Radiated Emissions – WCDMA Band 5 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 22.917		
Dist/Ant Used	3m	**Date**	J. Sabado

9 KHz – 30 MHz for Channel 4183



30 MHz – 1 GHz for Channel 4183

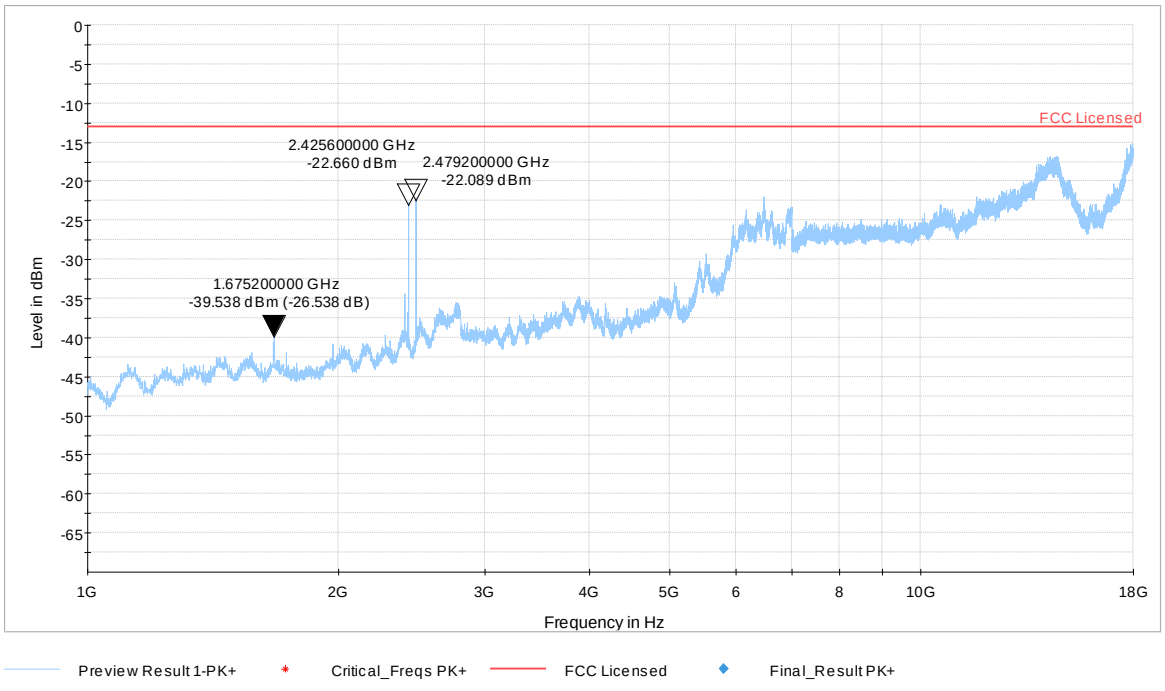


Peak above the limit is the uplink carrier frequency.

Radiated Emissions – WCDMA Band 5 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 22.917		
Dist/Ant Used	3m	**Date**	J. Sabado

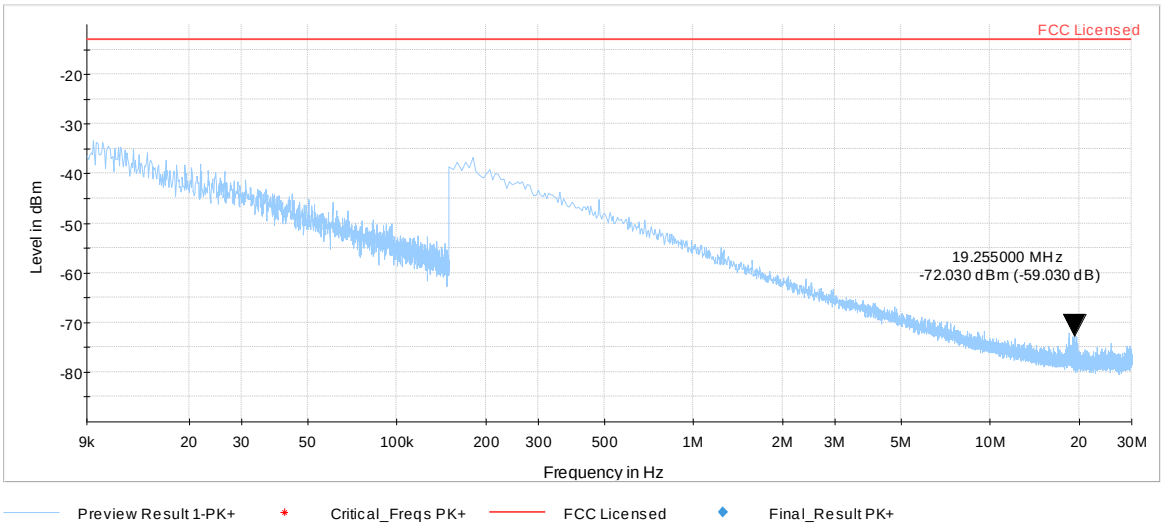
1 GHz – 9 GHz for Channel 4183



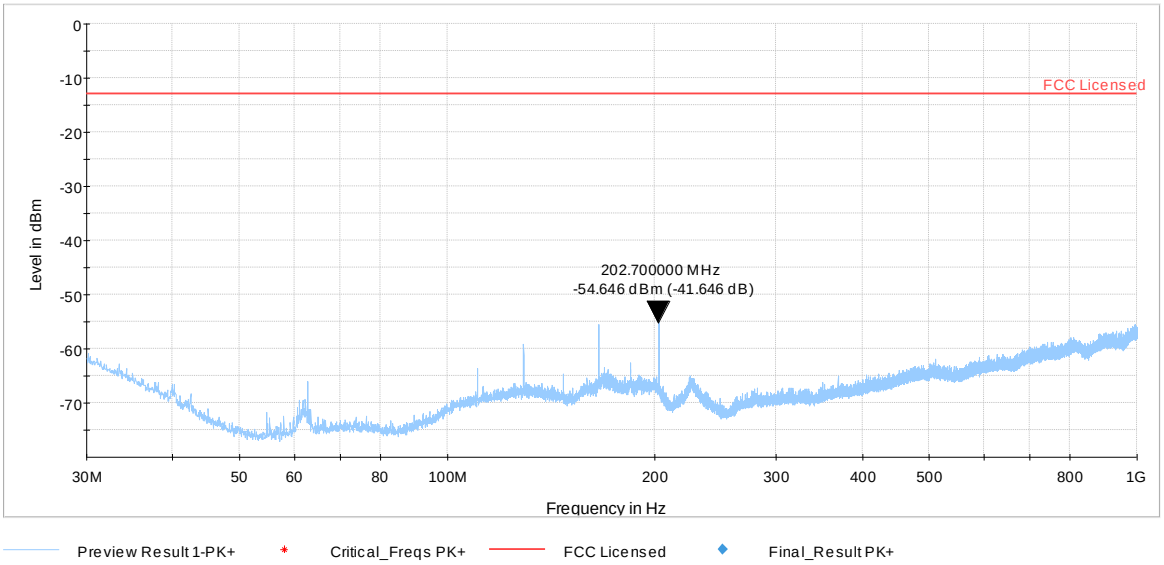
Radiated Emissions – LTE Band 2 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 24.238		
Dist/Ant Used	3m	**Date**	J. Sabado

9 KHz – 30 MHz for Channel 18900



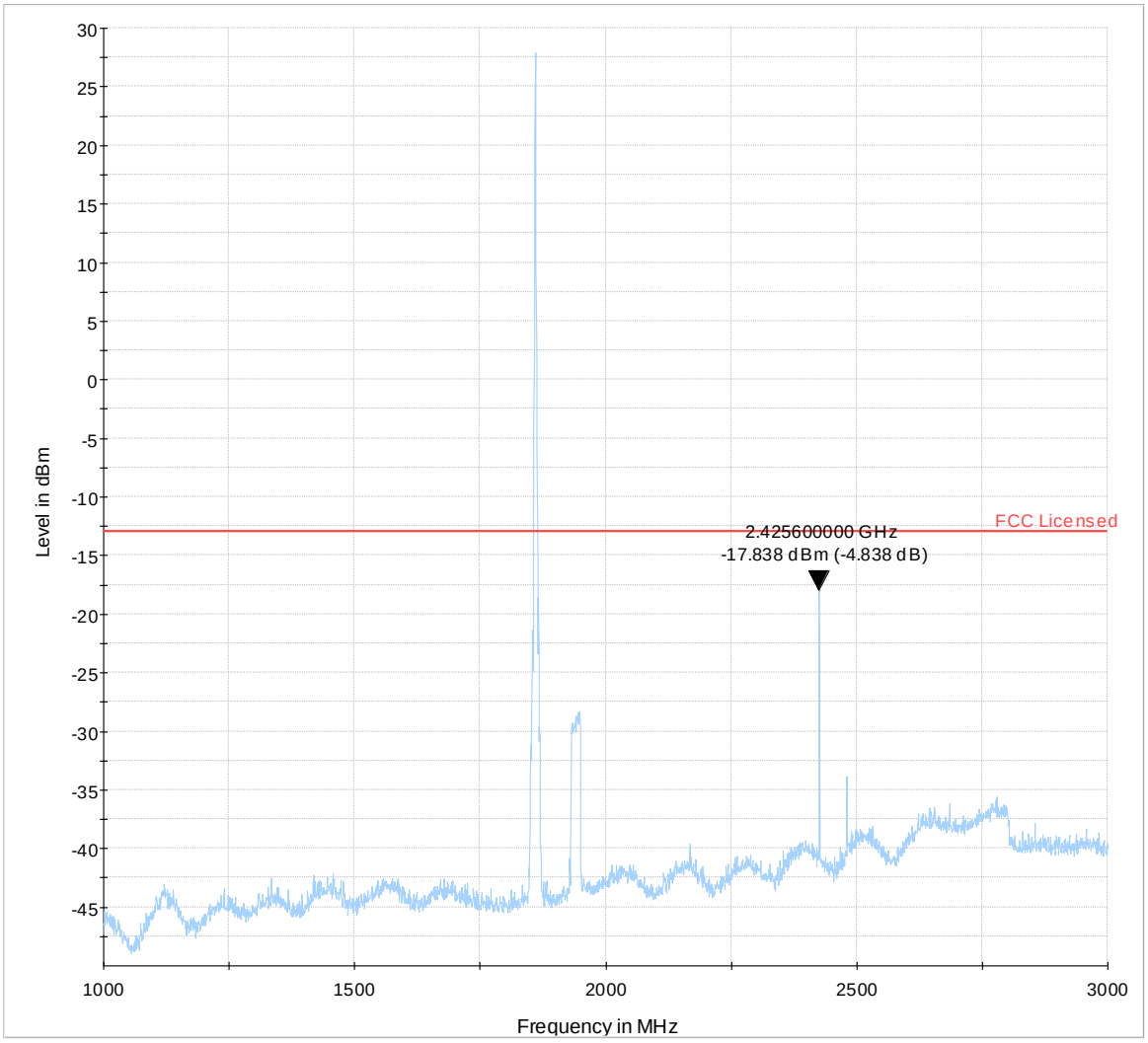
30 MHz – 1 GHz for Channel 18700



Radiated Emissions – LTE Band 2 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 24.238		
Dist/Ant Used	3m	**Date**	J. Sabado

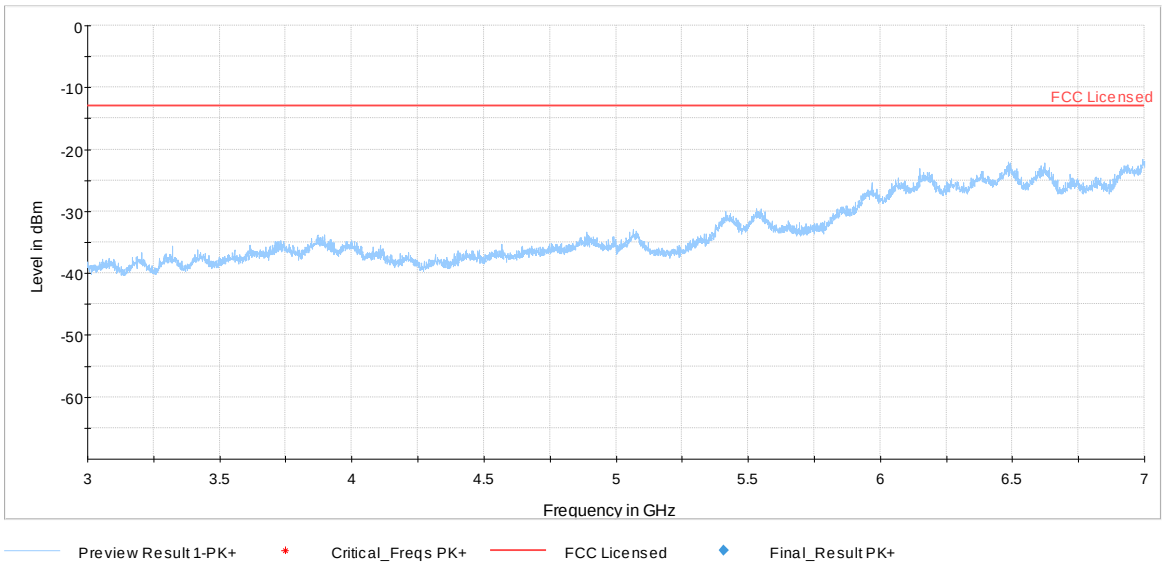
1 GHz – 3 GHz for Channel 18700



Radiated Emissions – LTE Band 2 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 24.238		
Dist/Ant Used	3m	**Date**	J. Sabado

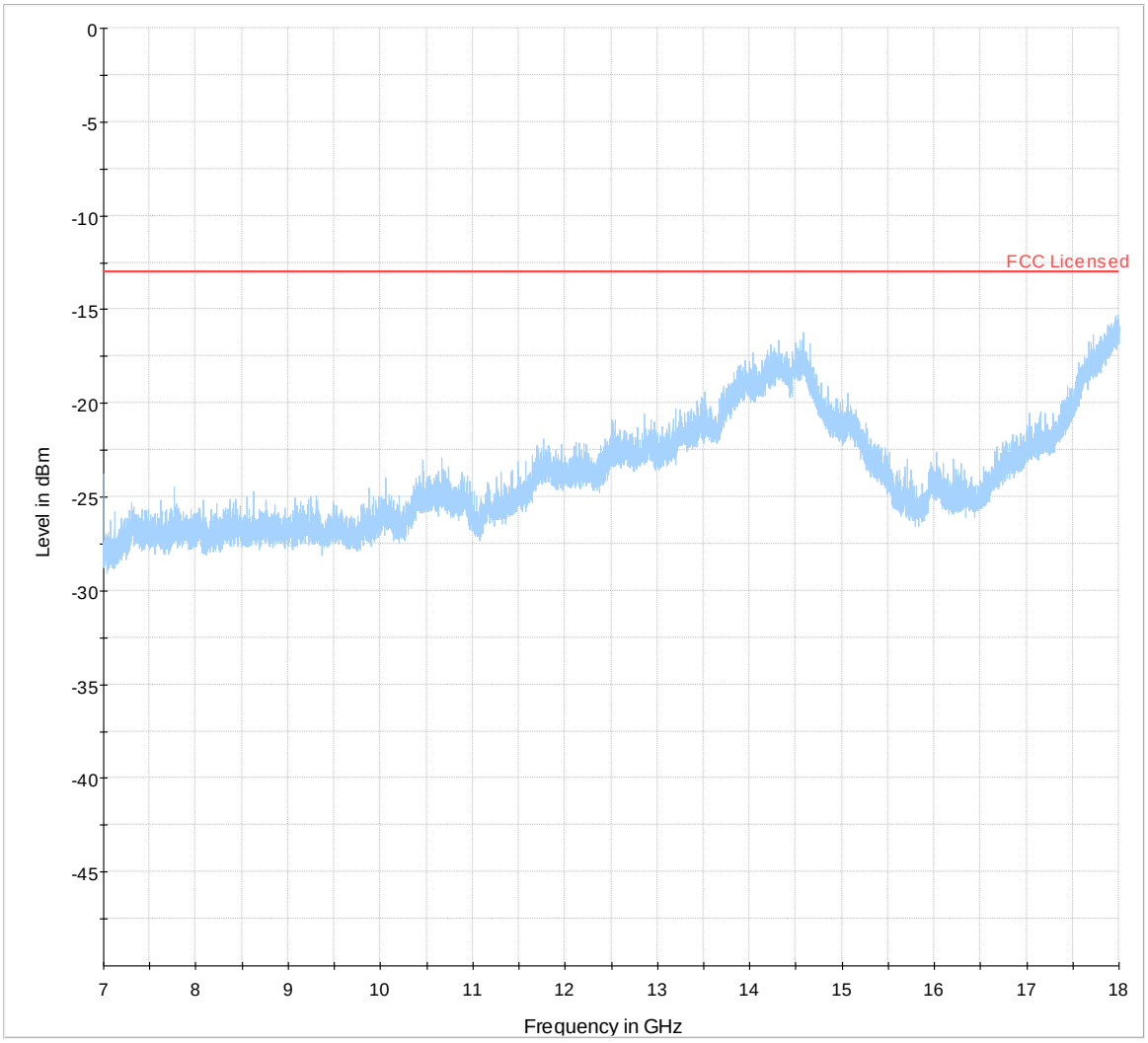
3 GHz – 7 GHz for Channel 18900



Radiated Emissions – LTE Band 2 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 24.238		
Dist/Ant Used	3m	**Date**	J. Sabado

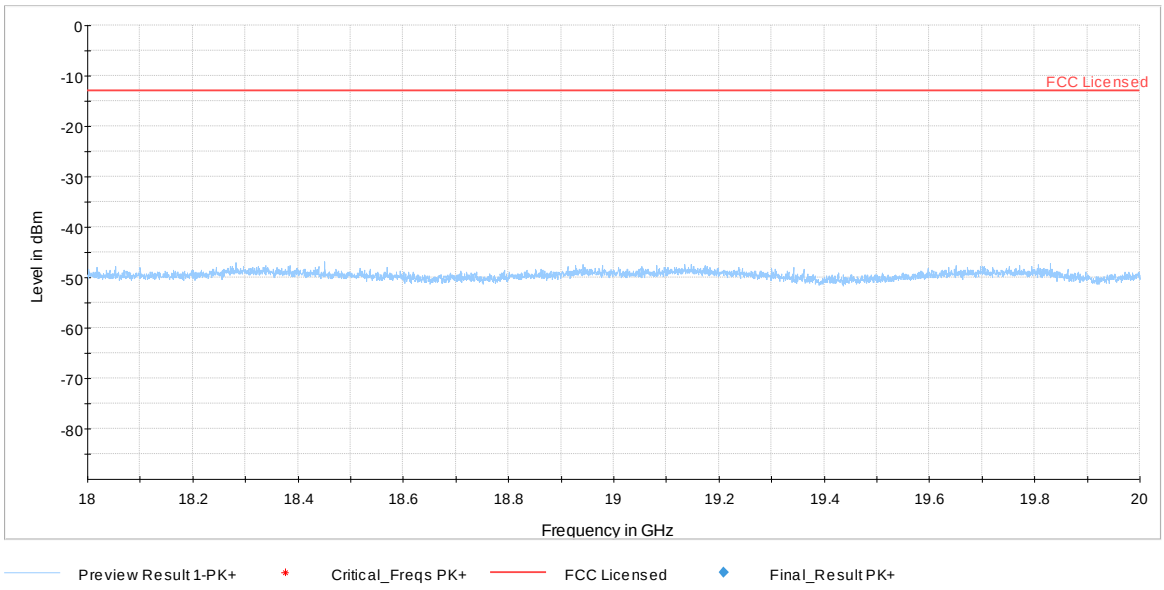
7 GHz – 18 GHz for Channel 18900



Radiated Emissions – LTE Band 2 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 24.238		
Dist/Ant Used	3m	**Date**	J. Sabado

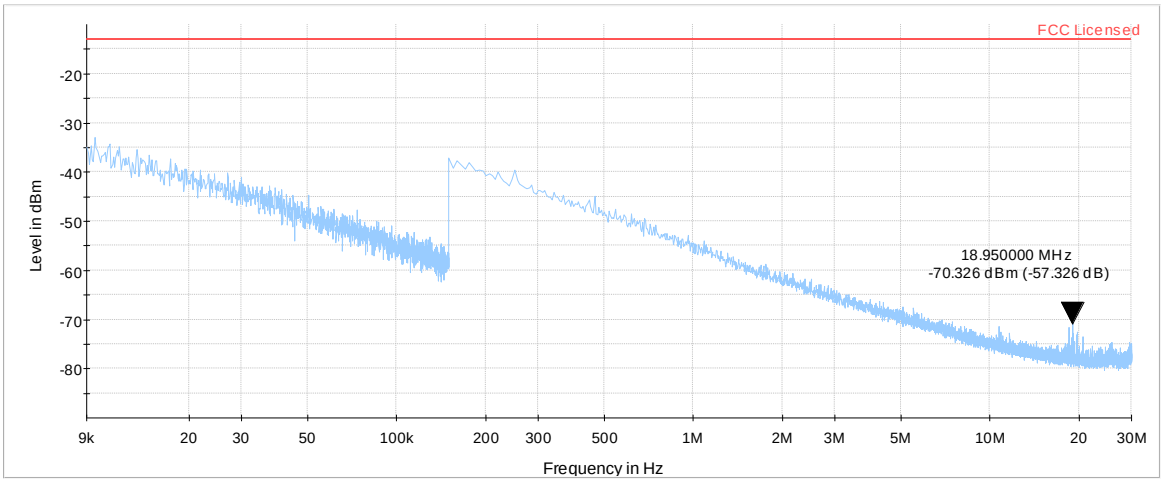
18 GHz – 20 GHz for Channel 18900



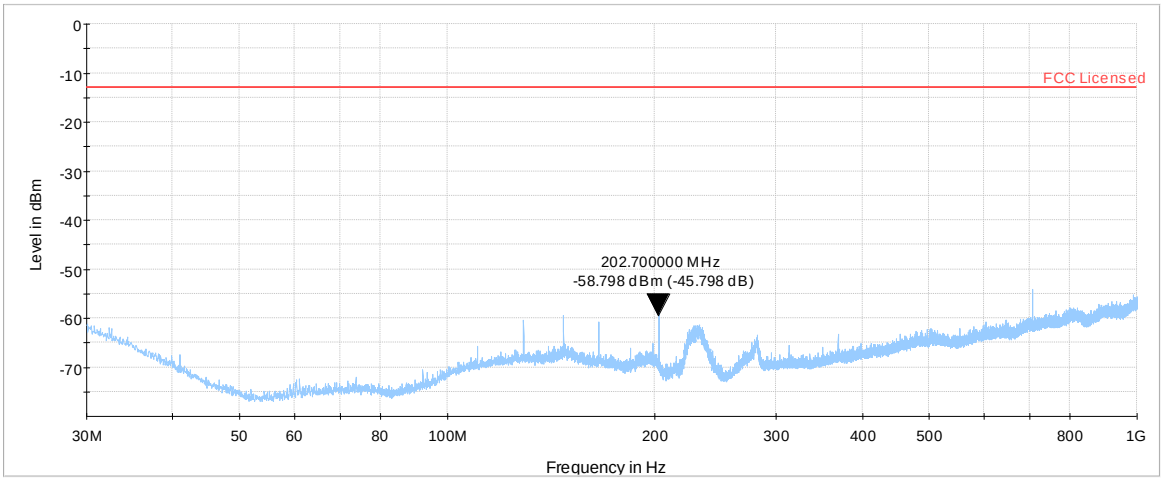
Radiated Emissions – LTE Band 4 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 27.53		
Dist/Ant Used	3m	**Date**	J. Sabado

9 KHz – 30 MHz for Channel 20175



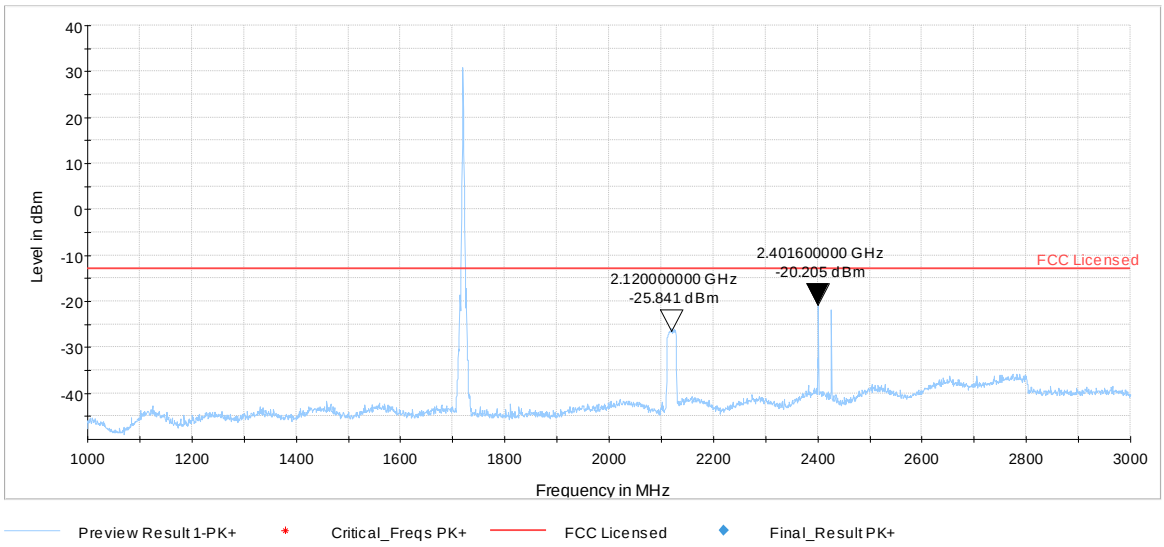
30 MHz – 1 GHz for Channel 20050



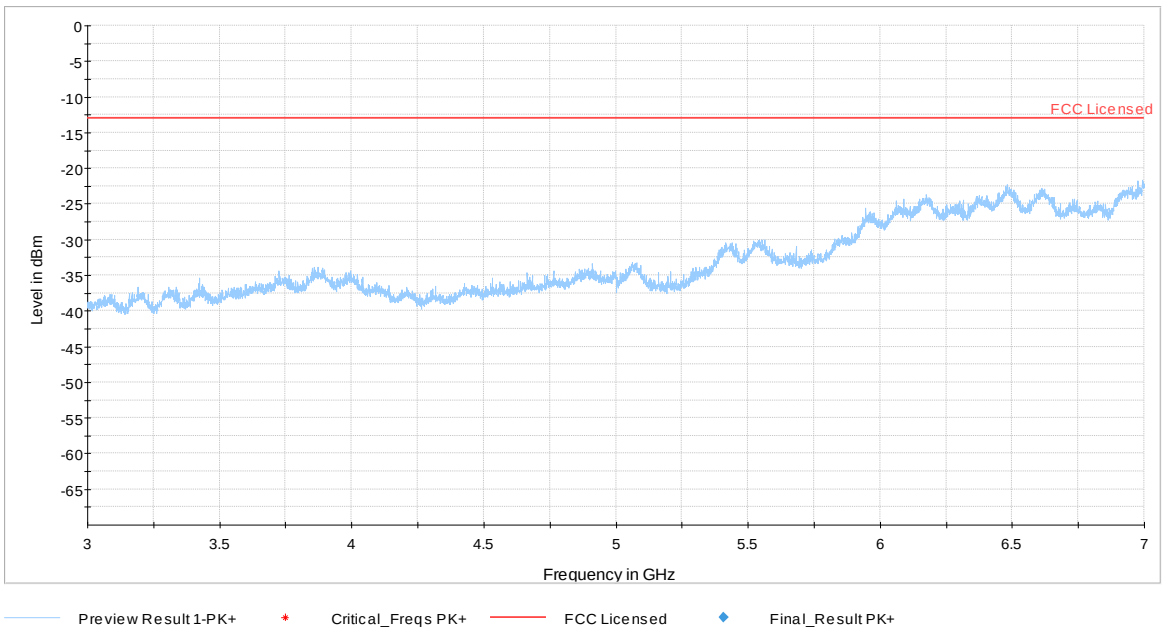
Radiated Emissions – LTE Band 4 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 27.53		
Dist/Ant Used	3m	**Date**	J. Sabado

1 GHz – 3 GHz for Channel 20050



3 GHz – 7 GHz for Channel 20175

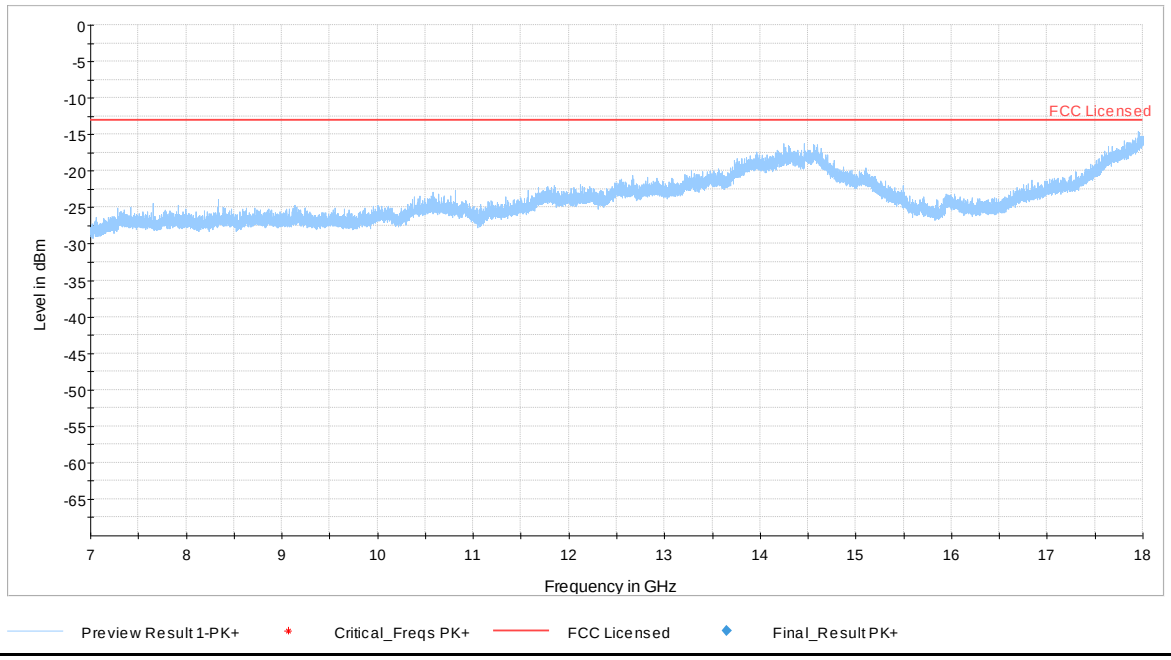


Peak above the limit is the uplink carrier frequency.

Radiated Emissions – LTE Band 4 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 27.53		
Dist/Ant Used	3m	**Date**	J. Sabado

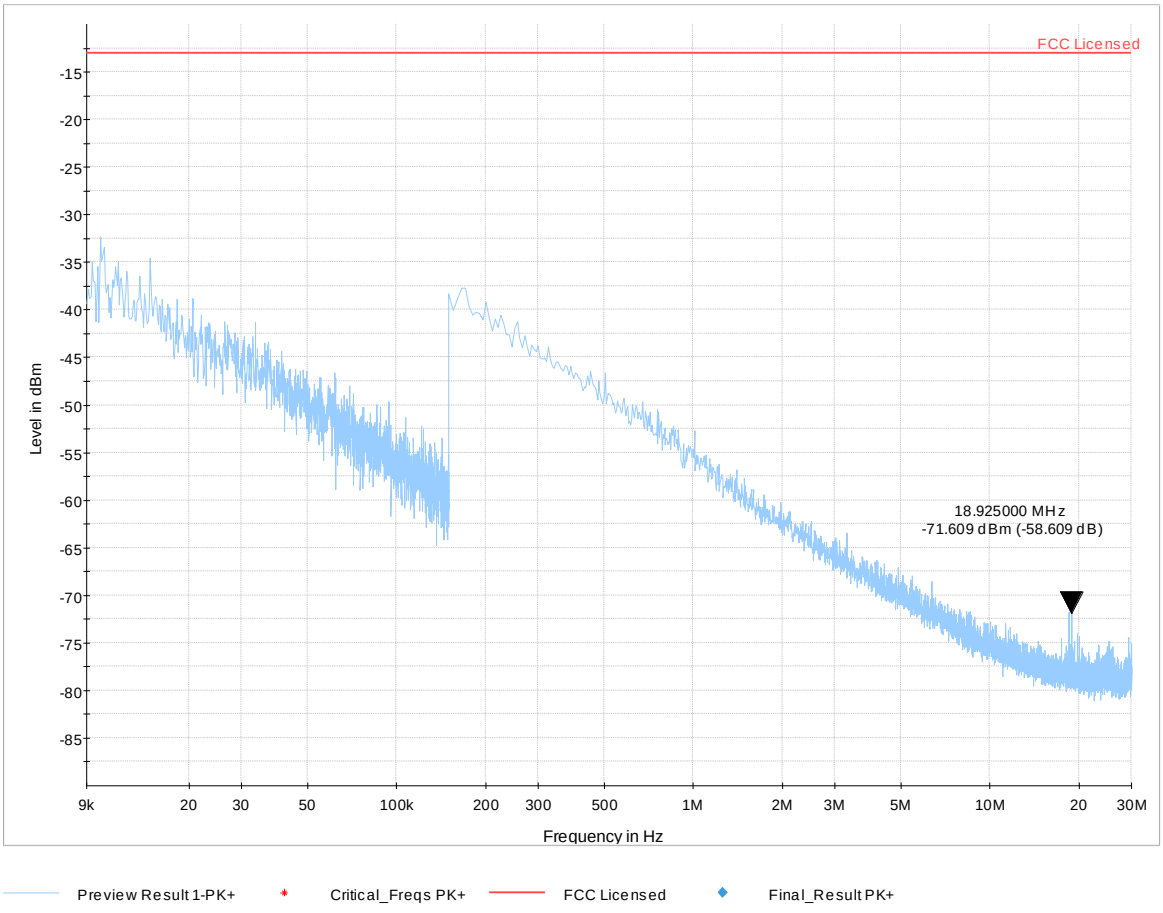
7 GHz – 18 GHz for Channel 20050



Radiated Emissions – LTE Band 5 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 22.917		
Dist/Ant Used	3m	**Date**	J. Sabado

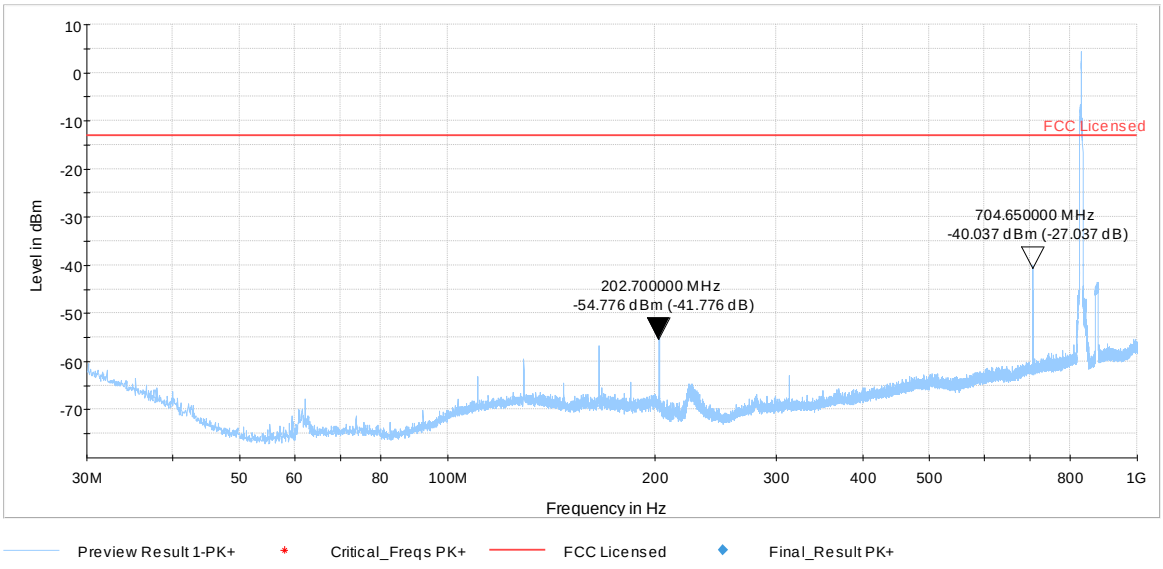
9 KHz – 30 MHz for Channel 20525



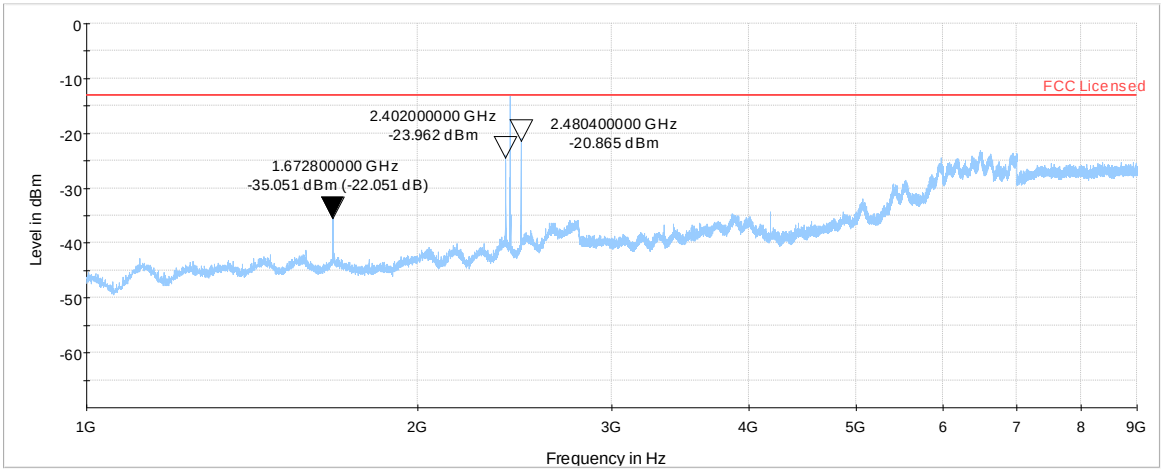
Radiated Emissions – LTE Band 5 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 22.917		
Dist/Ant Used	3m	**Date**	J. Sabado

30 MHz – 1 GHz for Channel 20450



1 GHz – 9 GHz for Channel 20525

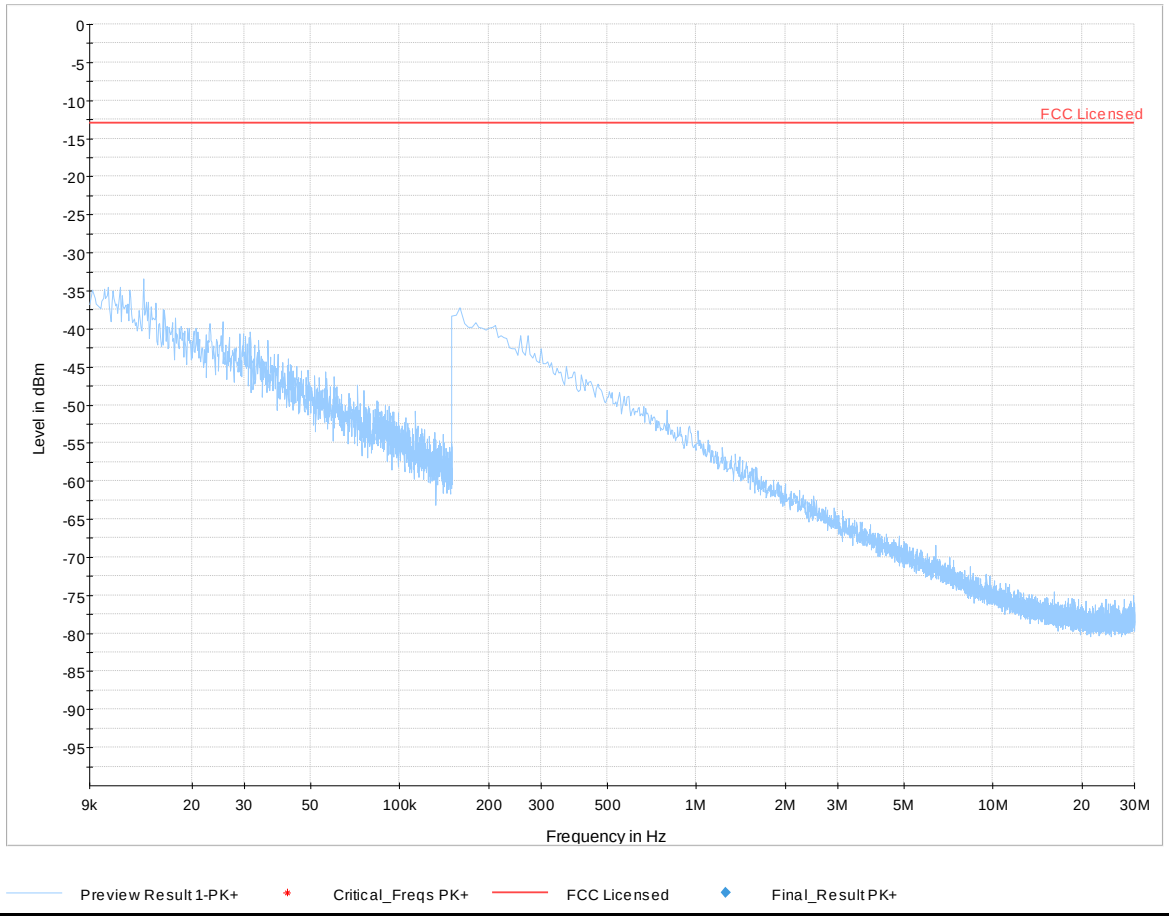


Peak above the limit is the uplink carrier frequency.

Radiated Emissions – LTE Band 12 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 27.53		
Dist/Ant Used	3m	**Date**	J. Sabado

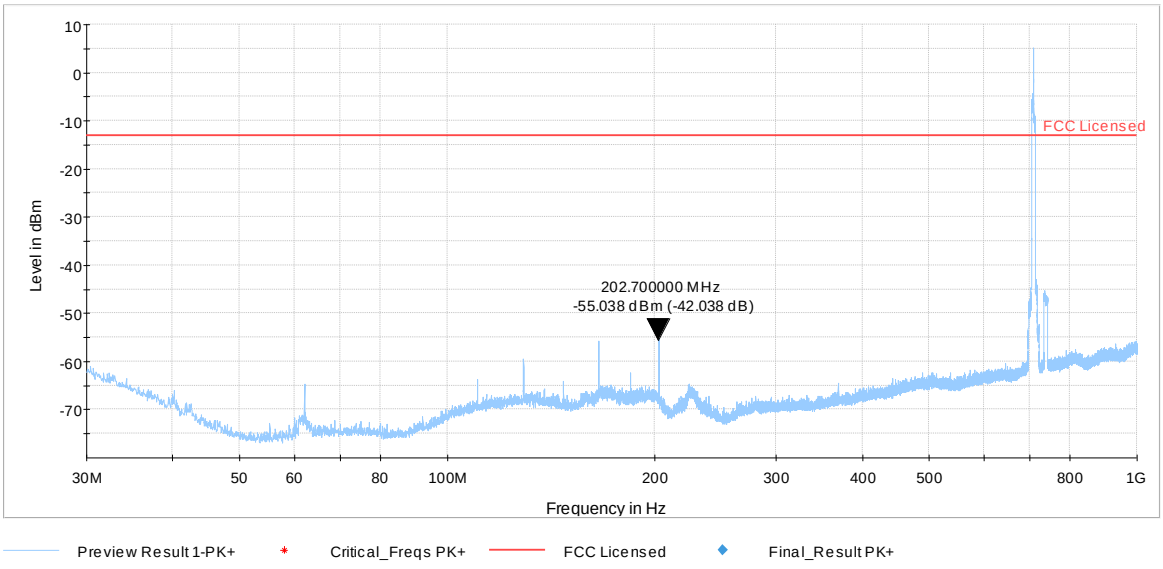
9 KHz – 30 MHz for Channel 23095



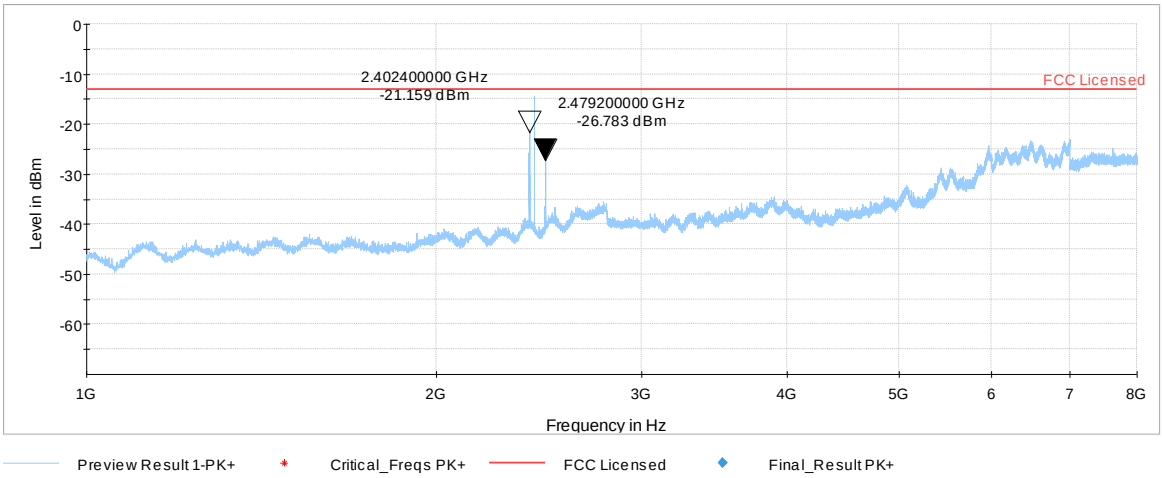
Radiated Emissions – LTE Band 12 Worst Case Plots

EUT Name	Flash	**Date**	June 1-6, 2017
EUT Model	FLASHV1	**Temp / Hum in**	23°C / 38%rh
EUT Serial	FCC #1	**Temp / Hum out**	N/A
EUT Config.	Vertical	**Line AC / Freq**	120 VAC
Standard	CFR 47 Part 27.53		
Dist/Ant Used	3m	**Date**	J. Sabado

30 MHz – 1 GHz for Channel 23095



1 GHz – 8 GHz for Channel 23095



Peak above the limit is the uplink carrier frequency.

5 Test Equipment List

5.1 Equipment List

Table 7: Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yyyy	Next Cal mm/dd/yyyy
Test Software	Rohde & Schwarz	EMC32 v.10.20.01	N/A	N/A	N/A
3.5 GHz High Pass Filter	Hewlett Packard	84300-80038	820004	N/A	N/A
Amplifier	Miteq	TTA1800-30-HG	1842452	01/13/2017	01/13/2018
Bilog Antenna	Sunol Sciences	JB3	A061907	08/04/2016	08/04/2018
Horn Antenna (1-18GHz)	EMCO	3115	9710-5301	10/08/2015	10/08/2017
Horn Antenna (18-26GHz)	Rohde & Schwarz	TS-PR26	100011	08/04/2016	08/04/2018
Receiver	Rohde & Schwarz	ESI40	832427/002	01/16/2017	01/16/2018
Base station simulator	Rohde & Schwarz	CMW500	147637	10/06/2016	10/07/2017
Thermometer	VWR	61161-378	160702310	08/15/2015	08/15/2018