



FCC/IC Test Report

FOR:

Rosemount Aerospace Inc.

Model Name:

8730L1-5

Product Description:

Aircraft Interface Device

FCC ID: 2AEAK8730L1-5

IC ID: 12766A-8730L15

Per:

47 CFR: Part 22, Part 24, Part 27, part 90

RSS-130; RSS-132 Issue 3, RSS-133 Issue 6, RSS-139 Issue 3, RSS-195 Issue 2, RSS199 Issue 2

Report #: EMC-UTCAE-018-16501_FCC_22_24_27_90

Date: October 20, 2016



CETECOM Inc.

411 Dixon Landing Road • Milpitas, CA 95035 • U.S.A.

Phone: + 1 (408) 586 6200 • Fax: + 1 (408) 586 6299 • E-mail: info@cetecom.com • <http://www.cetecom.com>

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| | | |
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1. Assessment

The following device as further described in section 3 of this report was evaluated against the applicable criteria specified in the Code of Federal Regulations Title 47 parts 22, 24, 27 and 90 and relevant ISED standards RSS-132 Issue 3, RSS-133 Issue 6 and RSS-139 Issue 3, RSS-130, RSS199 Issue 2, RSS-195 Issue 2.

No deviations from the limits were ascertained.

| Company Name | Product Description | Model # |
|--------------------------|---------------------------|----------|
| Rosemount Aerospace Inc. | Aircraft Interface Device | 8730L1-5 |

Review:

| | | |
|------------------|------------|--------------------------------|
| October 20, 2016 | Compliance | Kris Lazarov (EMC Engineer) |
| | | |

Responsible for evaluation and report:

| | | |
|------------------|------------|---------------------------------------|
| October 20, 2016 | Compliance | James Donnellan (Sr. EMC Engineer) |
| | | |

The test results of this test report relate exclusively to the test item specified in Section 3. CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2. Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

| | |
|----------------------------|------------------------|
| Company Name: | CETECOM Inc. |
| Department: | Compliance |
| Street Address: | 411 Dixon Landing Road |
| City/Zip Code | Milpitas, CA 95035 |
| Country | USA |
| Telephone: | +1 (408) 586 6200 |
| Fax: | +1 (408) 586 6299 |
| Compliance Manager: | Franz Engert |
| Project Engineer: | Issa Ghanma |

2.2 Identification of the Client

| | |
|--------------------------|--------------------------|
| Applicant's Name: | Rosemount Aerospace Inc. |
| Street Address: | 14300 Judicial Road |
| City/Zip Code | Burnsville, MN 55306 |
| Country | USA |

2.3 Identification of the Manufacturer

| | |
|-------------------------------|----------------|
| Manufacturer's Name: | Same as client |
| Manufacturers Address: | Same as client |
| City/Zip Code | Same as client |
| Country | Same as client |

3. Equipment Under Test (EUT)

3.1 EUT Specifications

| | |
|--|--|
| Model #: | 8730L1-5 |
| HW Version: | 08730-0427-0005/K |
| SW Version: | 08730-0459-0002 |
| FCC-ID: | 2AEAK8730L1-5 |
| IC-ID: | 12766A-8730L15 |
| HVIN: | 8730L1-5 |
| PMN: | Aircraft Interface Device |
| Product Description | Aircraft Interface Device |
| Module Information: | Sierra Wireless MC7455, FCC ID: 2AEAK8730L1-5, IC ID: 12766A-8730L15 SW SWI9X30C_02.08.02.00 HW 1.0 |
| Transceiver Technology / Type(s) of Modulation | WCDMA/UMTS: QPSK LTE: QPSK |
| TX Operating Frequency Ranges (MHz): | WCDMA/UMTS FDD BAND II : 1852.4MHz – 1907.6MHz WCDMA/UMTS FDD BAND IV : 1712.4MHz – 1752.6MHz WCDMA/UMTS FDD BAND V : 826.4MHz – 846.6MHz LTE BAND 25/2 : 1852.5MHz – 1912.3MHz LTE BAND 4 : 1710.7MHz – 1754.3MHz LTE BAND 26/5 : 814.5MHz – 846.5MHz LTE BAND 7 : 2502.5MHz – 2567.5MHz LTE BAND 12 : 699.7MHz – 715.3MHz LTE BAND 13 : 779.5MHz – 784.5MHz LTE BAND 30 : 2307.5MHz – 2312.5MHz LTE BAND 41 : 2498.5 – 2687.5MHz |
| Maximum AVG Conducted Output Power from module grant: | UMTS II 0.225W = 23.52 dBm UMTS IV 0.221W = 23.44dBm UMTS V 0.224W = 23.50dBm LTE 2/25 0.251W = 24.0dBm LTE 4 0.249W = 23.96dBm LTE 5/26 0.249W = 23.96dBm LTE 7 0.196W = 22.92dBm LTE 12 0.251W = 24.00dBm LTE 13 0.247W = 23.93dBm LTE 30 0.197W = 22.94dBm LTE 41 0.142W = 21.52dBm |
| Antenna info: | Dipole Blade Omnidirectional Antenna (DBA6927C1-FSMAF) with peak gain of 0.5dBi (698-960 MHz) and 2.2dBi (1710-2700) MHz |
| Rated Operating Voltage Range: | DC 18V to 32.2V |
| Operating Temperature Range: | Tlow: -40° C/ Tnom: 25° C/ Tmax: 55° C |
| Other Radios included in the device | N/A |
| Sample Revision | <input type="checkbox"/> Prototype <input checked="" type="checkbox"/> Production <input type="checkbox"/> Pre-Production |

3.2 EUT Sample details

| EUT # | Radio Serial Number | HW Version | SW Version | Antenna cable | Antenna |
|-------|---------------------|-------------------|-----------------|----------------------------------|--------------------------------------|
| 1 | 8730L-2-2 | 08730-0427-0005/K | 08730-0459-0002 | Manufacture: BJG Model: Odtu2 | Dipole Blade Omnidirectional Antenna |

3.3 Accessory Equipment (AE) details

| AE # | Type | Model | Manufacturer | Serial Number |
|------|------|-------|--------------|---------------|
| NA | N/A | N/A | N/A | N/A |

3.4 Ancillary Equipment (AE) details

| AE # | Type | Model | Manufacturer | Serial Number |
|------|--------------|-------|--------------|---------------|
| 1 | Power supply | 3003B | Proteck | H012771 |

4. Test Sample Configuration

| Set-up # | EUT / AE used for set-up | Measurement | Comments |
|----------|--------------------------|-----------------------------|--|
| 1 | EUT #1 + AE #1 | Power Verification | Power meter connected to antenna connector through cable. |
| 2 | EUT #1 + AE #1 | Radiated Spurious Emissions | Antenna from 3.2 connected to EUT with provided 3 foot cables. |

5. Subject of Investigations

The objective of the measurements done by CETECOM Inc. was to evaluate the compliance of the device described under 3 against the relevant requirements specified in the Code of Federal Regulations Title 47 parts 22, 24, 27, 90 and relevant ISED standards RSS-132 Issue 3, RSS-133 Issue 6 and RSS-139 Issue 3, RSS-130, RSS199 Issue 2, RSS-195 Issue 2.

This evaluation is intended to support product certification under FCC-2AEAK870L1-5and IC ID: 12766A-8730L15.

A power-verification was performed on the host device described under 3 with worst case settings from the modular report and all powers were found to be lower than in the report and grant. This verification is deemed sufficient to conclude that conducted measurement results from the modular report are valid for the host device under investigation.

Radiated spurious emissions have been tested to evaluate the integration of the module into the host product.

6. Measurement

6.1 Dates of Testing:

August 18, 2016 – September 21, 2016

6.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=1.

Radiated measurement

| | |
|--------------------|---------------------------------|
| 9 kHz to 30MHz | ±2.5 dB (Magnetic Loop Antenna) |
| 30 MHz to 3000 MHz | ±2.0 dB (Biconilog Antenna) |
| 3 GHz to 40 GHz | ±2.3 dB (Horn Antenna) |

Conducted measurement

| | |
|-------------------|----------------|
| 150 kHz to 30 MHz | ±0.7 dB (LISN) |
|-------------------|----------------|

RF conducted measurement ±0.5 dB

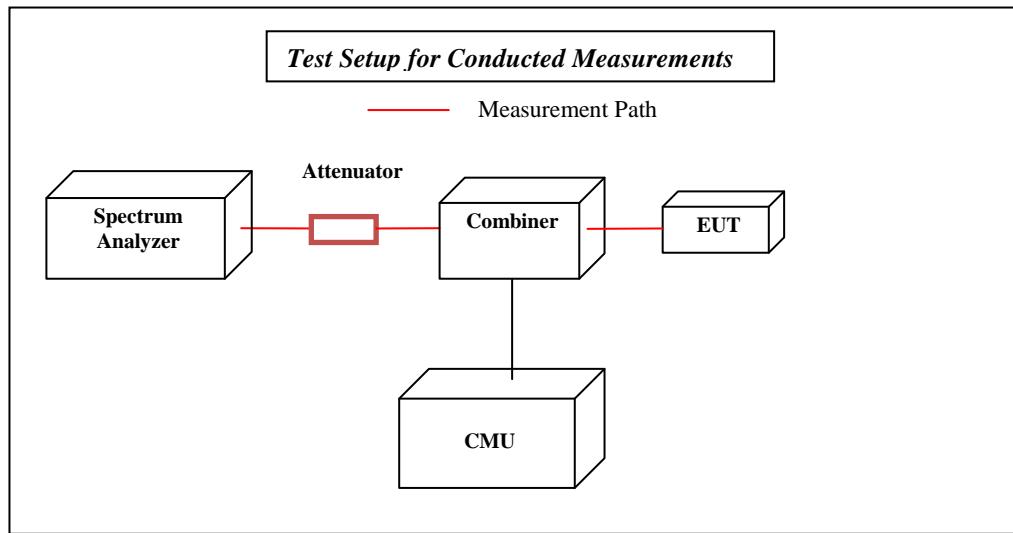
6.3 Environmental Conditions during Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25°C
- Relative humidity: 40-60%

6.4 Conducted measurement setup

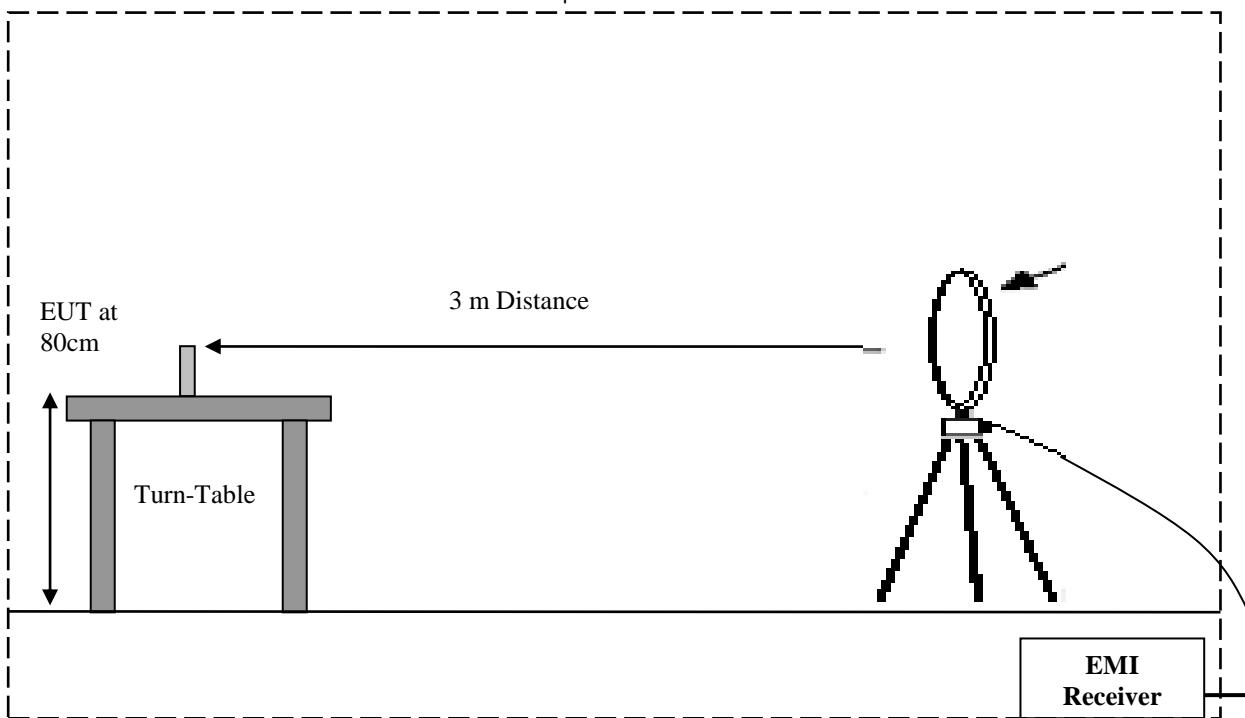
Testing is performed according to the guidelines provided in FCC publication (KDB) 971168 D01 v02r02 – “Measurement Guidance for Certification of Licensed Digital Transmitters” and according to relevant parts of TIA-603C 2004 as detailed below.



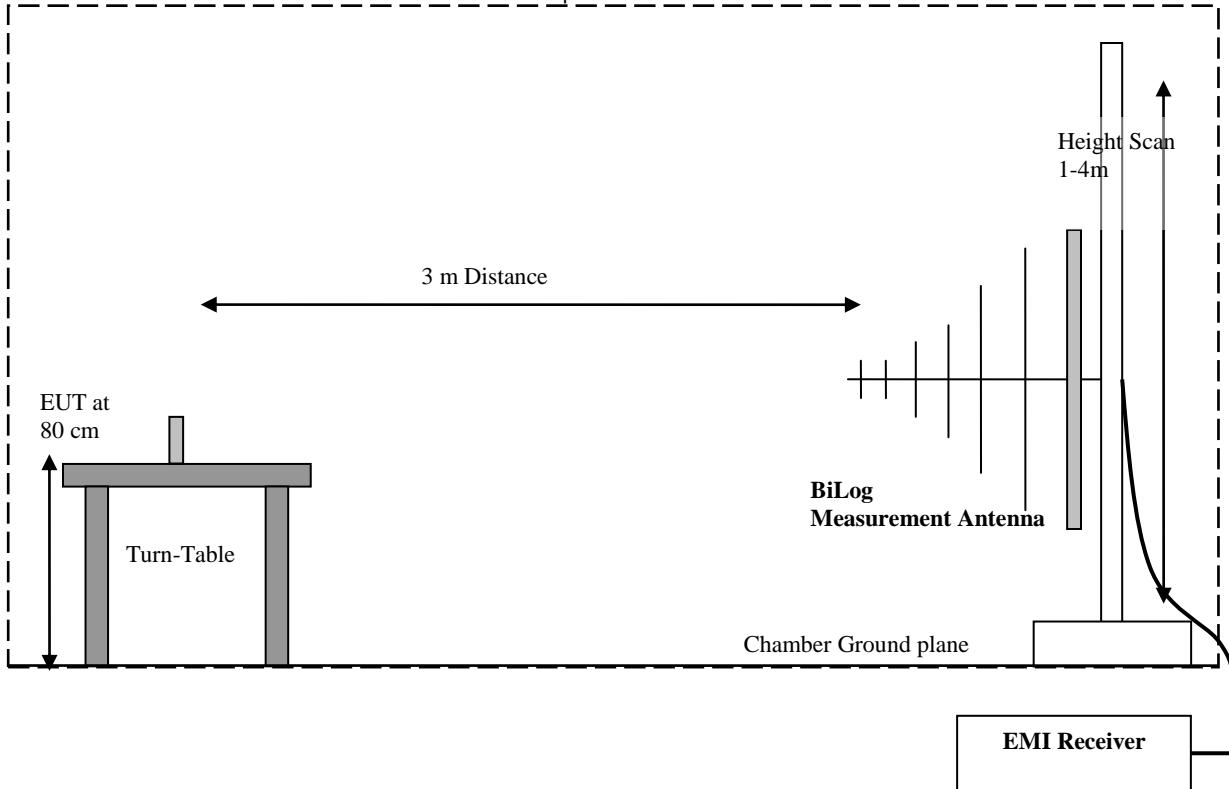
6.5 Radiated Measurement setup

- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 3 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.

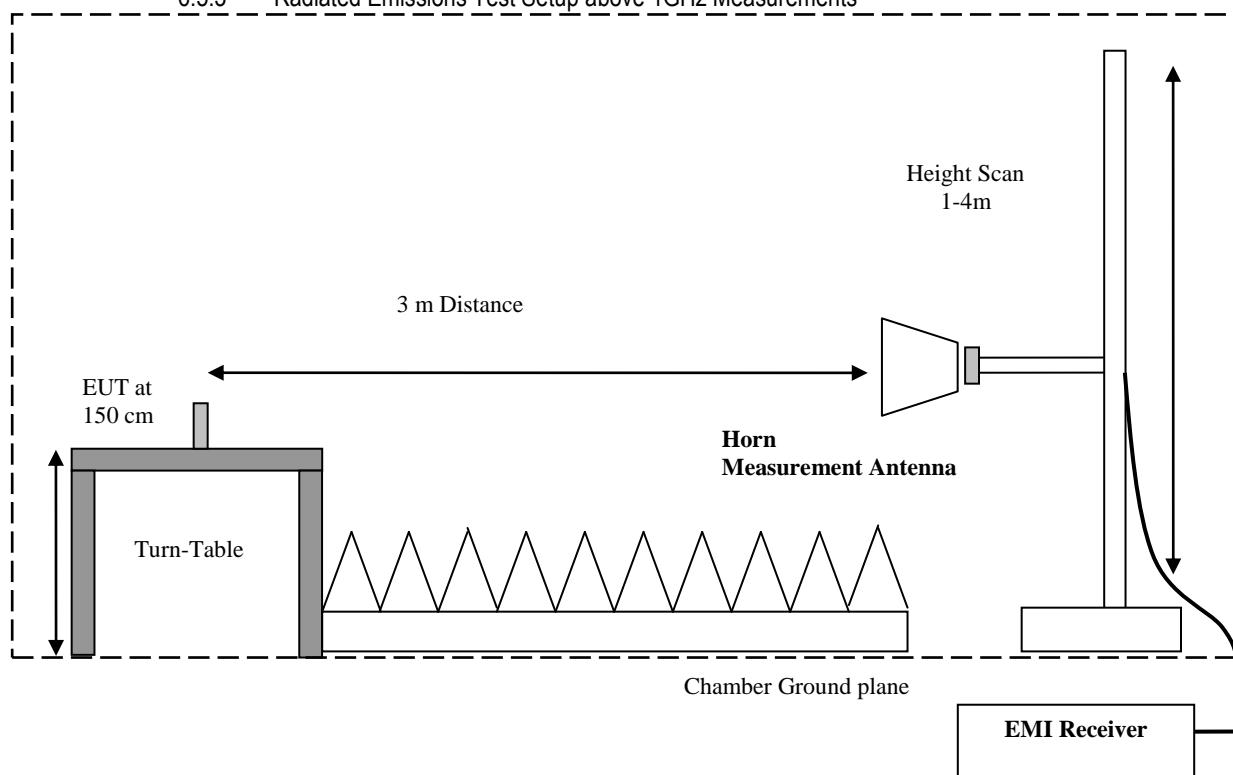
6.5.1 Radiated Emissions Test Setup below 30MHz Measurements



6.5.2 Radiated Emissions Test Setup 30MHz-1GHz Measurements



6.5.3 Radiated Emissions Test Setup above 1GHz Measurements



7 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

- Measured reading in dB μ V.
- Cable Loss between the receiving antenna and SA in dB and
- Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

$$FS \text{ (dB}\mu\text{V/m)} = \text{Measured Value on SA (dB}\mu\text{V)} - \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$$

Example:

| Frequency (MHz) | Measured SA (dB μ V) | Cable Loss (dB) | Antenna Factor Correction (dB) | Field Strength Result (dB μ V/m) |
|-----------------|--------------------------|-----------------|--------------------------------|--------------------------------------|
| 1000 | 80.5 | 3.5 | 14 | 98.0 |

8 Measurement Results Summary

8.1 FCC 22,24,27,90:

| Test Specification | Test Case | Temperature and Voltage Conditions | Mode | Pass | Fail | NA | NP | Result |
|--|------------------------------|------------------------------------|-----------------------------|------|------|----|----|-------------------|
| §2.1046; §22.913 (a); §24.232 (a); §27.50 (a); §27.50 (b); §27.50 (c); §27.50 (d); §27.50 (h); §90.635(b); | RF Output Power | Nominal | LTE QPSK, WCDMA RMC12.2kbps | ■ | □ | □ | □ | Complies (Note 2) |
| | Frequency Stability | Nominal | LTE QPSK, WCDMA RMC12.2kbps | □ | □ | □ | ■ | Note 2 |
| | Occupied Bandwidth | Nominal | LTE QPSK, WCDMA RMC12.2kbps | □ | □ | □ | ■ | Note 2 |
| | Band Edge Compliance | Nominal | LTE QPSK, WCDMA RMC12.2kbps | □ | □ | □ | ■ | Note 2 |
| | Conducted Spurious Emissions | Nominal | LTE QPSK, WCDMA RMC12.2kbps | □ | □ | □ | ■ | Note 2 |
| §2.1053; §22.917(a); §24.238 (a); §27.53 (a); §27.53 (h); §27.53 (m); §27.53(g); §27.53(c); §90.210; | Radiated Spurious Emissions | Nominal | LTE QPSK, WCDMA RMC12.2kbps | ■ | □ | □ | □ | Complies |

Note 1: NA= Not Applicable; NP= Not Performed.

Note 2: Leveraged from the certification of the module after a power verification was performed on the worst case settings of the modular report (Report No.: B15W50446-FCC-RF).

8.2 Canada RSS132, RSS133, RSS

| Test Specification | Test Case | Temperature and Voltage Conditions | Mode | Pass | Fail | NA | NP | Result |
|--|------------------------------|------------------------------------|-----------------------------|------|------|----|----|-------------------|
| RSS-130 4.4 RSS-132 Issue 3-5.4 RSS-133 Issue 6-6.4 RSS-139 Issue 3-6.4 RSS-195 Issue 2-5.5 RSS-199 Issue 2-4.4 | RF Output Power | Nominal | LTE QPSK, WCDMA RMC12.2kbps | ■ | □ | □ | □ | Complies (Note 2) |
| | Frequency Stability | Nominal | LTE QPSK, WCDMA RMC12.2kbps | □ | □ | □ | ■ | Note 2 |
| | Occupied Bandwidth | Nominal | LTE QPSK, WCDMA RMC12.2kbps | □ | □ | □ | ■ | Note 2 |
| | Band Edge Compliance | Nominal | LTE QPSK, WCDMA RMC12.2kbps | □ | □ | □ | ■ | Note 2 |
| | Conducted Spurious Emissions | Nominal | LTE QPSK, WCDMA RMC12.2kbps | □ | □ | □ | ■ | Note 2 |
| RSS-130-4.6 RSS-132 Issue 3-5.5 RSS-133 Issue 6-6.5 RSS-139 Issue 3-6.5 RSS-195 Issue 2-5.6 RSS-199 Issue 2-4.6 | Radiated Spurious Emissions | Nominal | LTE QPSK, WCDMA RMC12.2kbps | ■ | □ | □ | □ | Complies |

Note 1: NA= Not Applicable; NP= Not Performed.

Note 2: Leveraged from the certification of the module after a power verification was performed on the worst case settings of the modular report (Report No.: B15W50446-FCC-RF).

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9 RF Output Power

9.1 Reference

Measurement according to KDB 971168 D01 Power Meas License Digital Systems v02r02, and according to TIA-603C 2004- 2.2.12

9.2 Limits:

9.2.1 GSM850, UMTS V, LTE 5 (824-849MHz)

FCC Part 22.913

The effective radiated power (ERP) of mobile transmitters must not exceed 7 Watts (38.45dBm).

EIRP Limit 40.6dBm

RSS-132 Issue 3

The transmitter output power shall be measured in terms of average power. The equivalent isotropically radiated power (e.i.r.p.) for mobile equipment shall not exceed 11.5 watts. Refer to SRSP-503 for base station e.i.r.p. limits.

In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

EIRP Limit 40.6dBm

9.2.2 GSM1900, UMTS II, LTE2 (1850-1910MHz)

FCC Part 24.232 (c), (d), (e)

(c) Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

(d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph

(e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

(e) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

EIRP Limit 33dBm

RSS-133 Issue 6

The equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510. Moreover, base station transmitters operating in the band 1930-1995 MHz shall not have output power exceeding 100 watts.

In addition, the transmitter's peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

SRSP 510 - 5.1.2 Mobile Stations

Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p. The equipment shall employ means to limit the power to the minimum necessary for successful communication.

EIRP Limit 33dBm

9.2.3 UMTS IV, LTE 4 (1710-1785MHz)

FCC Part 27C.50 (d)

(4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

EIRP Limit 30dBm

RSS-139 Issue 3

The equivalent isotropically radiated power (e.i.r.p.) for mobile and portable transmitters shall not exceed one watt. The e.i.r.p. for fixed and base stations in the band 1710-1780 MHz shall not exceed one watt.

Consult SRSP-513 for e.i.r.p. limits on fixed and base stations operating in the band 2110-2180 MHz.

In addition, the peak to average power ratio (PAPR) of the equipment shall not exceed 13 dB for more than 0.1% of the time, using a signal that corresponds to the highest PAPR during periods of continuous transmission.

EIRP Limit 30dBm

9.2.4 LTE 12 (699-716MHz)

FCC Part 27C.50 (c)

(10) Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

EIRP Limit 37dBm

RSS-130

The transmitter output power shall be measured in terms of average power.

For base and fixed equipment, refer to SRSP-518 for power limits.

The e.i.r.p. shall not exceed 50 watts for mobile equipment or for outdoor fixed subscriber equipment, nor shall it exceed 5 watts for portable equipment or for indoor fixed subscriber equipment.

In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

EIRP Limit 47dBm (mobile equipment or for outdoor fixed subscriber equipment)

EIRP Limit 37dBm (for portable equipment or for indoor fixed subscriber equipment)

9.2.5 LTE 13 (777-787MHz)

FCC Part 27C.50 (b)

(b) The following power and antenna height limits apply to transmitters operating in the 746-758 MHz, 775-788 MHz and 805-806 MHz bands:

(9) Control stations and mobile stations transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands and fixed stations transmitting in the 787-788 MHz and 805-806 MHz bands are limited to 30 watts ERP.

EIRP Limit 47dBm

(10) Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

EIRP Limit 37dBm

RSS-130

The transmitter output power shall be measured in terms of average power.

For base and fixed equipment, refer to SRSP-518 for power limits.

The e.i.r.p. shall not exceed 50 watts for mobile equipment or for outdoor fixed subscriber equipment, nor shall it exceed 5 watts for portable equipment or for indoor fixed subscriber equipment.

In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

EIRP Limit 47dBm (mobile equipment or for outdoor fixed subscriber equipment)

EIRP Limit 37dBm (for portable equipment or for indoor fixed subscriber equipment)

9.2.6 LTE 7 (2500-2570MHz)

FCC Part 27C.50 (h)

(2) Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

EIRP Limit 33dBm

RSS-199 Issue 2

The transmitter output power shall be measured using a peak detector.

For base station equipment, refer to [SRSP-517](#) for the e.i.r.p.

For mobile subscriber equipment, the e.i.r.p. shall not exceed 2 watts. For fixed subscriber equipment, the transmitter output power shall not exceed 2 watts and the e.i.r.p. shall be limited to 40 watts.

EIRP Limit 33dBm with peak detector

9.2.7 LTE26 (814-849MHz)

FCC Part 90.635 (b)

The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).

EIRP Limit 50dBm

Not licensed in Canada

9.2.8 LTE 30 (2305-2315MHz)

FCC Part 27.50 (a)

(3) Mobile and portable stations. (i) For mobile and portable stations transmitting in the 2305-2315 MHz band or the 2350-2360 MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, except that for mobile and portable stations compliant with 3GPP LTE standards or another advanced mobile broadband protocol that avoids concentrating energy at the edge of the operating band the average EIRP must not exceed 250 milliwatts within any 5 megahertz of authorized bandwidth but may exceed 50 milliwatts within any 1 megahertz of authorized bandwidth. For mobile and portable stations using time division duplexing (TDD) technology, the duty cycle must not exceed 38 percent in the 2305-2315 MHz and 2350-2360 MHz bands. Mobile and portable stations using FDD technology are restricted to transmitting in the 2305-2315 MHz band. Power averaging shall not include intervals in which the transmitter is off.

EIRP Limit 24dBm

RSS-195 Issue 2

The e.i.r.p. of mobile or portable equipment transmitting in the band 2305-2315 MHz or the band 2350-2360 MHz, employing 3GPP LTE (Third Generation Partnership Project Long Term Evolution) standards, shall not exceed 250 mW within any 5 MHz bandwidth. For other technologies, the e.i.r.p. shall not exceed 50 mW within any 1 MHz bandwidth.

EIRP Limit 24dBm

9.2.9 LTE 41 (2496-2690MHz)

FCC Part 27C.50 (h)

(2) Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

EIRP Limit 33dBm

RSS-199 Issue 2

The transmitter output power shall be measured using a peak detector.

For base station equipment, refer to [SRSP-517](#) for the e.i.r.p.

For mobile subscriber equipment, the e.i.r.p. shall not exceed 2 watts. For fixed subscriber equipment, the transmitter output power shall not exceed 2 watts and the e.i.r.p. shall be limited to 40 watts.

EIRP Limit 33dBm with peak detector

9.3 Summary Measurement Result:

| Band | Frequency (MHz) | Channel | Measured conducted RMS power [dBm] uncorrected | Cable Loss Correction [dB] | Measured conducted RMS power [dBm] corrected | Maximum RMS conducted power from grant [dBm] | Margin to grant (dB) | Antenna Gain | EIRP RMS [dBm] with worst case gain | Limit [dBm] |
|-------------|-----------------|---------|--|----------------------------|--|--|----------------------|--------------|-------------------------------------|-------------|
| LTE 2 & 25 | 1900 | Mid | 14 | 7.7 | 21.7 | 24 | 2.3 | 2.2 | 23.9 | 33 |
| LTE 4 | 1700 | Mid | 14.5 | 7.4 | 21.9 | 23.96 | 2.06 | 2.2 | 24.1 | 30 |
| LTE 5 | 850 | Mid | 17 | 6 | 23 | 23.96 | 0.96 | 0.5 | 23.5 | 38.45 |
| LTE 26 | 850 | Mid | 17 | 6 | 23 | 23.96 | 0.96 | 0.5 | 23.5 | 50 |
| LTE 7 | 2530 | Low | 11 | 8.3 | 19.3 | 22.92 | 3.62 | 2.2 | 21.5 | 33 |
| LTE 12 | 700 | Low | 17.5 | 5.9 | 23.4 | 24.0 | 0.6 | 0.5 | 23.9 | 37 |
| LTE 13 | 780 | Mid | 17.5 | 6 | 23.5 | 23.93 | 0.43 | 0.5 | 24 | 47 |
| LTE 30 | 2300 | Mid | 13.25 | 8.2 | 21.45 | 22.94 | 1.49 | 2.2 | 23.65 | 24 |
| LTE 41 | 2600 | High | 11.5 | 8.5 | 20 | 21.52 | 1.52 | 2.2 | 22.2 | 33 |
| UMTS FDD II | 1900 | Low | 14.63 | 7.7 | 22.33 | 23.52 | 1.19 | 2.2 | 24.53 | 33 |
| UMTS FDD IV | 1900 | Low | 15.18 | 7.4 | 22.58 | 23.44 | 0.86 | 2.2 | 24.78 | 30 |
| UMTS FDD V | 850 | High | 17.18 | 6 | 23.18 | 23.50 | 0.32 | 0.5 | 23.68 | 38.45 |

10 Radiated Spurious Emissions

10.1 Reference

Measurement according to KDB 971168 D01 Power Meas License Digital Systems v02r02, and according to TIA-603C 2004- 2.2.12

Spectrum Analyzer Settings

| Frequency Range | 9kHz – 150kHz | 150kHz – 30MHz | 30MHz – 1 GHz | 1 – 40 GHz |
|----------------------|---------------|----------------|---------------|------------|
| Resolution Bandwidth | 200Hz | 9kHz | 100 kHz | 1 MHz |
| Video Bandwidth | 1kHz | 30kHz | 100 kHz | 1 MHz |
| Detector | Peak | Peak | Peak | Peak |
| Trace Mode | Max Hold | Max Hold | Max Hold | Max Hold |
| Sweep Time | Auto | Auto | Auto | Auto |

10.2 Limits:

10.2.1 UMTS II, LTE 2

FCC Part 24.238 (a)

Out of band emissions. 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.

RSS133- 6.5.1

Equipment shall comply with the limits in (i) and (ii) below.

In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10}(watts)$.

After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10}(watts)$. If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

EIRP Limit -13dBm

10.2.2 UMTS IV, LTE 4

FCC Part 27.53 (h)

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 = (-13dBm)

RSS-136-6.5

Equipment shall comply with the limits in (i) and (ii) below.

In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10}(watts)$.

After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10}(watts)$. If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

EIRP Limit -13dBm

10.2.3 UMTS V, LTE 5

FCC Part 22.917 (a)

Out of band emissions. 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.

RSS-132 - 5.5

Mobile and base station equipment shall comply with the limits in (i) and (ii) below.

In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10}(watts)$.

After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} p$ (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

EIRP Limit -13dBm

10.2.4 LTE 7 (2500-2570MHz)

FCC Part 27.53 (m)

(4) For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log(P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log(P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log(P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log(P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log(P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

EIRP Limit -10dBm closer than 5MHz from band edges

EIRP Limit -13dBm from 5MHz to nominal bandwidth of signal or 6MHz whichever is greater

EIRP Limit -25dBm further away than nominal bandwidth from band edges or 6MHz whichever is greater

RSS-199 Issue 2-4.6

In the 1 MHz band immediately outside and adjacent to the channel edge, the unwanted emission power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth for base station and fixed subscriber equipment and 2% for mobile subscriber equipment. Beyond the 1 MHz band, a resolution bandwidth of 1 MHz shall be used. A narrower resolution bandwidth is allowed to be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz or 1%/2% of the occupied bandwidth, as applicable.

Equipment shall comply with the following unwanted emissions limits:

For base station and fixed subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$

For mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least:

$40 + 10 \log_{10} p$ from the channel edges to 5 MHz away,

$43 + 10 \log_{10} p$ between 5 MHz and X MHz from the channel edges, and

$55 + 10 \log_{10} p$ at X MHz and beyond from the channel edges.

in addition, the attenuation shall be not be less than $43 + 10 \log_{10} p$ on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log_{10} p$ at or below 2490.5 MHz.

where p in (a) and (b) is the transmitter power measured in watts and X is 6 MHz or the equipment occupied bandwidth, whichever is greater.

EIRP Limit -10dBm closer than 5MHz from band edges

EIRP Limit -13dBm from 5MHz to nominal bandwidth of signal or 6MHz whichever is greater

EIRP Limit -25dBm further away than nominal bandwidth from band edges or 6MHz whichever is greater

10.2.5 LTE 12 (699-716MHz)

FCC Part 27.53(g)

For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log(P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

EIRP Limit -13dBm for mobile and portable

RSS-130-4.6

4.6.1 The power of any unwanted emissions in any 100 kHz bandwidth on any frequency outside the frequency range(s) within which the equipment is designed to operate shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$ (watts), dB. However, in the 100 kHz band immediately outside the equipment's operating frequency range, a resolution bandwidth of 30 kHz may be employed.

4.6.2 In addition to the limit outlined in Section 4.6.1 above, equipment operating in the frequency bands 746-756 MHz and 777-787 MHz shall also comply with the following restrictions:

(a) The power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:

(i) $76 + 10 \log_{10} p$ (watts), dB, for base and fixed equipment, and

(ii) $65 + 10 \log_{10} p$ (watts), dB, for mobile and portable equipment.

(b) The e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW/MHz for wideband signal and -80 dBW for discrete emission with bandwidth less than 700 Hz.

EIRP Limit -13dBm for mobile and portable

10.2.6 LTE13 (777-787MHz)

FCC Part 27.53(c)

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;

EIRP Limit -13dBm for mobile and portable

RSS-130-4.6

4.6.1 The power of any unwanted emissions in any 100 kHz bandwidth on any frequency outside the frequency range(s) within which the equipment is designed to operate shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$ (watts), dB. However, in the 100 kHz band immediately outside the equipment's operating frequency range, a resolution bandwidth of 30 kHz may be employed.

4.6.2 In addition to the limit outlined in Section 4.6.1 above, equipment operating in the frequency bands 746-756 MHz and 777-787 MHz shall also comply with the following restrictions:

(a) The power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:

(i) $76 + 10 \log_{10} p$ (watts), dB, for base and fixed equipment, and

(ii) $65 + 10 \log_{10} p$ (watts), dB, for mobile and portable equipment.

(b) The e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW/MHz for wideband signal and -80 dBW for discrete emission with bandwidth less than 700 Hz.

EIRP Limit -13dBm for mobile and portable

10.2.7 LTE 26 (814-849MHz)

FCC Part 90.210

- (g) Emission Mask G. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:
- (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but no more than 250 percent of the authorized bandwidth: At least $116 \log(f_d/6.1)$ dB, or $50 + 10 \log(P)$ dB, or 70 dB, whichever is the lesser attenuation;
 - (2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log(P)$ dB.

Not licensed in Canada

10.2.8 LTE 30 (2305-2315MHz)

FCC Part 27.53 (a)

- (i) By a factor of not less than $43 + 10 \log(P)$ dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, and not less than $75 + 10 \log(P)$ dB on all frequencies between 2320 and 2345 MHz;

EIRP Limit -13dBm except 2320 <f<2345

EIRP Limit -37dBm 2320 <f<2345

RSS-195 Issue 2-5.6

EIRP Limit -13dBm except 2200 <f<2395

EIRP Limit -37dBm 2200 <f<2395

Table 2 — Unwanted Emissions for Mobile, Portable and Low-Power Fixed Subscriber Equipment

| Frequency (MHz) | Attenuation (dB) |
|-----------------|---|
| <2200 | $43 + 10 \log_{10}(p)$ |
| 2200 - 2288 | $70 + 10 \log_{10}(p)$ |
| 2288 - 2292 | $67 + 10 \log_{10}(p)$ |
| 2292 - 2296 | $61 + 10 \log_{10}(p)$ |
| 2296 - 2300 | $55 + 10 \log_{10}(p)$ |
| 2300 - 2305 | $43 + 10 \log_{10}(p)$ |
| 2305 - 2320 | $43 + 10 \log_{10}(p)$ <small>Footnote Note</small> |
| 2320 - 2324 | $55 + 10 \log_{10}(p)$ |
| 2324 - 2328 | $61 + 10 \log_{10}(p)$ |
| 2328 - 2337 | $67 + 10 \log_{10}(p)$ |
| 2337 - 2341 | $61 + 10 \log_{10}(p)$ |
| 2341 - 2345 | $55 + 10 \log_{10}(p)$ |
| 2345 - 2360 | $43 + 10 \log_{10}(p)$ <small>Footnote Note</small> |
| 2360 - 2365 | $43 + 10 \log_{10}(p)$ |
| 2365 - 2395 | $70 + 10 \log_{10}(p)$ |
| >2395 | $43 + 10 \log_{10}(p)$ |

10.2.9 LTE 41 (2496-2690MHz)

FCC Part 27.53 (m)

(4) For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log(P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log(P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log(P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log(P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log(P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

EIRP Limit -10dBm closer than 5MHz from band edges**EIRP Limit -13dBm from 5MHz to nominal bandwidth of signal or 6MHz whichever is greater****EIRP Limit -25dBm further away than nominal bandwidth from band edges or 6MHz whichever is greater**

RSS-199 Issue 2-4.6

In the 1 MHz band immediately outside and adjacent to the channel edge, the unwanted emission power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth for base station and fixed subscriber equipment and 2% for mobile subscriber equipment. Beyond the 1 MHz band, a resolution bandwidth of 1 MHz shall be used. A narrower resolution bandwidth is allowed to be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz or 1%/2% of the occupied bandwidth, as applicable.

Equipment shall comply with the following unwanted emissions limits:

For base station and fixed subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$

For mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least:

$40 + 10 \log_{10} p$ from the channel edges to 5 MHz away,

$43 + 10 \log_{10} p$ between 5 MHz and X MHz from the channel edges, and

$55 + 10 \log_{10} p$ at X MHz and beyond from the channel edges.

in addition, the attenuation shall be not be less than $43 + 10 \log_{10} p$ on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log_{10} p$ at or below 2490.5 MHz.

where p in (a) and (b) is the transmitter power measured in watts and X is 6 MHz or the equipment occupied bandwidth, whichever is greater.

EIRP Limit -10dBm closer than 5MHz from band edges**EIRP Limit -13dBm from 5MHz to nominal bandwidth of signal or 6MHz whichever is greater****EIRP Limit -25dBm further away than nominal bandwidth from band edges or 6MHz whichever is greater**

10.3 Test plan

Radiated Emissions for UMTS measured at RMC12.2k because this setting delivers maximum power according to report on file for FCC-ID.

Radiated Emissions for LTE between 30MHz and 18GHz measured at 1RB Starting Low on Low channel, Mid on Mid channel, High on High channel as this corresponds to maximum channel power according to report on file for FCC-ID.

Frequencies below 30MHz and frequencies above 18GHz have only been investigated for mid channel. For the frequency range between 1GHz and 18GHz low mid and high channel have been investigated.

10.4 Summary Measurement result:

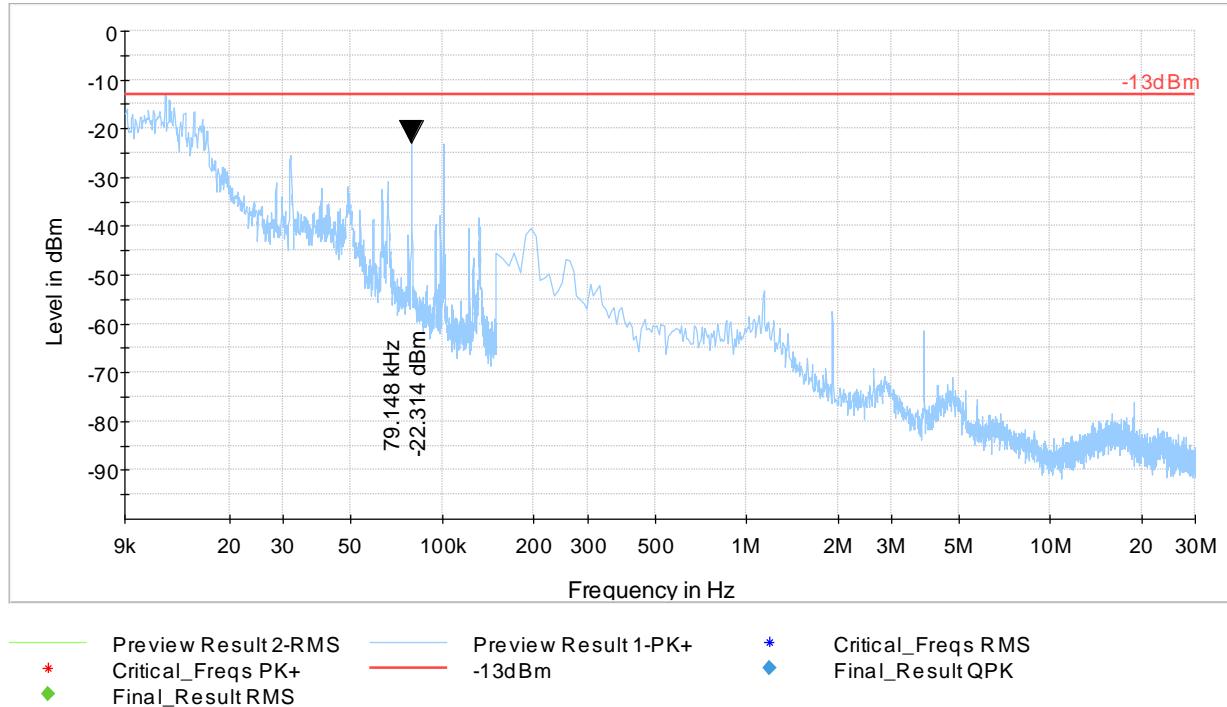
| Channel | EUT Operating Mode | Scan Frequency | Limit [dBm] converted to 3m | Result | Frequency of highest emission [MHz] | Highest Emission [dBm] |
|---------|--------------------|----------------|-----------------------------|--------|-------------------------------------|------------------------|
| Mid | WCDMA FDD II | 9kHz – 30MHz | -13 | Pass | 0.079 | -22 |
| Low | WCDMA FDD II | 30MHz – 1 GHz | -13 | Pass | 750.1 | -58.3 |
| Mid | WCDMA FDD II | 30MHz – 1 GHz | -13 | Pass | | |
| High | WCDMA FDD II | 30MHz – 1 GHz | -13 | Pass | 374.9 | -60.3 |
| Low | WCDMA FDD II | 1GHz – 3GHz | -13 | Pass | | |
| Mid | WCDMA FDD II | 1GHz – 3GHz | -13 | Pass | | |
| High | WCDMA FDD II | 1GHz – 3GHz | -13 | Pass | | |
| Low | WCDMA FDD II | 3GHz – 18GHz | -13 | Pass | | |
| Mid | WCDMA FDD II | 3GHz – 18GHz | -13 | Pass | | |
| High | WCDMA FDD II | 3GHz – 18GHz | -13 | Pass | | |
| Mid | WCDMA FDD II | 18GHz – 40GHz | -13 | Pass | | |
| | | | | | | |
| Mid | WCDMA FDD IV | 9kHz – 30MHz | -13 | Pass | 0.079 | -22 |
| Low | WCDMA FDD IV | 30MHz – 1 GHz | -13 | Pass | 374.9 | -58.9 |
| Mid | WCDMA FDD IV | 30MHz – 1 GHz | -13 | Pass | 749.9 | -58.6 |
| High | WCDMA FDD IV | 30MHz – 1 GHz | -13 | Pass | | |
| Low | WCDMA FDD IV | 1GHz – 3GHz | -13 | Pass | | |
| Mid | WCDMA FDD IV | 1GHz – 3GHz | -13 | Pass | | |
| High | WCDMA FDD IV | 1GHz – 3GHz | -13 | Pass | | |
| Low | WCDMA FDD IV | 3GHz – 18GHz | -13 | Pass | 15800 | -46.1 |
| Mid | WCDMA FDD IV | 3GHz – 18GHz | -13 | Pass | | |
| High | WCDMA FDD IV | 3GHz – 18GHz | -13 | Pass | | |
| Mid | WCDMA FDD IV | 18GHz – 40GHz | -13 | Pass | | |
| | | | | | | |
| Mid | WCDMA FDD V | 9kHz – 30MHz | -13 | Pass | 0.079 | -22 |
| Low | WCDMA FDD V | 30MHz – 1 GHz | -13 | Pass | | |
| Mid | WCDMA FDD V | 30MHz – 1 GHz | -13 | Pass | | |
| High | WCDMA FDD V | 30MHz – 1 GHz | -13 | Pass | | |
| Low | WCDMA FDD V | 1GHz – 3GHz | -13 | Pass | | |
| Mid | WCDMA FDD V | 1GHz – 3GHz | -13 | Pass | | |
| High | WCDMA FDD V | 1GHz – 3GHz | -13 | Pass | 2400 | -42.5 |
| Low | WCDMA FDD V | 3GHz – 18GHz | -13 | Pass | 15800 | -45.7 |
| Mid | WCDMA FDD V | 3GHz – 18GHz | -13 | Pass | | |
| High | WCDMA FDD V | 3GHz – 18GHz | -13 | Pass | | |
| | | | | | | |
| Mid | LTE 25/2 | 9kHz – 30MHz | -13 | Pass | .079 | -23 |
| Low | LTE 25/2 | 30MHz – 1 GHz | -13 | Pass | 374.9 | -61.4 |
| Mid | LTE 25/2 | 30MHz – 1 GHz | -13 | Pass | 749.9 | -57.7 |
| High | LTE 25/2 | 30MHz – 1 GHz | -13 | Pass | 749.9 | -59.5 |
| Low | LTE 25/2 | 1GHz – 3GHz | -13 | Pass | | |
| Mid | LTE 25/2 | 1GHz – 3GHz | -13 | Pass | | |

| | | | | | | |
|------|----------|---------------|-----|------|-------|-------|
| High | LTE 25/2 | 1GHz – 3GHz | -13 | Pass | | |
| Low | LTE 25/2 | 3GHz – 18GHz | -13 | Pass | | |
| Mid | LTE 25/2 | 3GHz – 18GHz | -13 | Pass | | |
| High | LTE 25/2 | 3GHz – 18GHz | -13 | Pass | | |
| Mid | LTE 25/2 | 18GHz – 40GHz | -13 | Pass | | |
| | | | | | | |
| Mid | LTE 4 | 9kHz – 30MHz | -13 | Pass | .1 | -19 |
| Low | LTE 4 | 30MHz – 1 GHz | -13 | Pass | 749.9 | -59.3 |
| Mid | LTE 4 | 30MHz – 1 GHz | -13 | Pass | 750.1 | -58.1 |
| High | LTE 4 | 30MHz – 1 GHz | -13 | Pass | 374.9 | -60.7 |
| Low | LTE 4 | 1GHz – 3GHz | -13 | Pass | | |
| Mid | LTE 4 | 1GHz – 3GHz | -13 | Pass | | |
| High | LTE 4 | 1GHz – 3GHz | -13 | Pass | | |
| Low | LTE 4 | 3GHz – 18GHz | -13 | Pass | | |
| Mid | LTE 4 | 3GHz – 18GHz | -13 | Pass | | |
| High | LTE 4 | 3GHz – 18GHz | -13 | Pass | | |
| Mid | LTE 4 | 18GHz – 40GHz | -13 | Pass | | |
| | | | | | | |
| Mid | LTE 26/5 | 9kHz – 30MHz | -13 | Pass | .079 | -25 |
| Low | LTE 26/5 | 30MHz – 1 GHz | -13 | Pass | | |
| Mid | LTE 26/5 | 30MHz – 1 GHz | -13 | Pass | | |
| High | LTE 26/5 | 30MHz – 1 GHz | -13 | Pass | | |
| Low | LTE 26/5 | 1GHz – 3GHz | -13 | Pass | | |
| Mid | LTE 26/5 | 1GHz – 3GHz | -13 | Pass | | |
| High | LTE 26/5 | 1GHz – 3GHz | -13 | Pass | | |
| Low | LTE 26/5 | 3GHz – 18GHz | -13 | Pass | | |
| Mid | LTE 26/5 | 3GHz – 18GHz | -13 | Pass | | |
| High | LTE 26/5 | 3GHz – 18GHz | -13 | Pass | | |
| Mid | LTE 26/5 | 18GHz – 40GHz | -13 | Pass | | |
| | | | | | | |
| Mid | LTE 7 | 9kHz – 30MHz | -25 | Pass | .079 | -25 |
| Low | LTE 7 | 30MHz – 1 GHz | -25 | Pass | 750 | -59.3 |
| Mid | LTE 7 | 30MHz – 1 GHz | -25 | Pass | 750 | -59.1 |
| High | LTE 7 | 30MHz – 1 GHz | -25 | Pass | 749.9 | -59.1 |
| Low | LTE 7 | 1GHz – 3GHz | -25 | Pass | | |
| Mid | LTE 7 | 1GHz – 3GHz | -25 | Pass | | |
| High | LTE 7 | 1GHz – 3GHz | -25 | Pass | | |
| Low | LTE 7 | 3GHz – 18GHz | -25 | Pass | | |
| Mid | LTE 7 | 3GHz – 18GHz | -25 | Pass | | |
| High | LTE 7 | 3GHz – 18GHz | -25 | Pass | 5100 | -42.6 |
| Mid | LTE 7 | 18GHz – 40GHz | -25 | Pass | | |
| | | | | | | |
| Mid | LTE 12 | 9kHz – 30MHz | -13 | Pass | 0.079 | -24 |
| Low | LTE 12 | 30MHz – 1 GHz | -13 | Pass | | |
| Mid | LTE 12 | 30MHz – 1 GHz | -13 | Pass | | |
| High | LTE 12 | 30MHz – 1 GHz | -13 | Pass | | |
| Low | LTE 12 | 1GHz – 3GHz | -13 | Pass | 1400 | -29.3 |
| Mid | LTE 12 | 1GHz – 3GHz | -13 | Pass | 1400 | -28.4 |
| High | LTE 12 | 1GHz – 3GHz | -13 | Pass | 1400 | -33.4 |

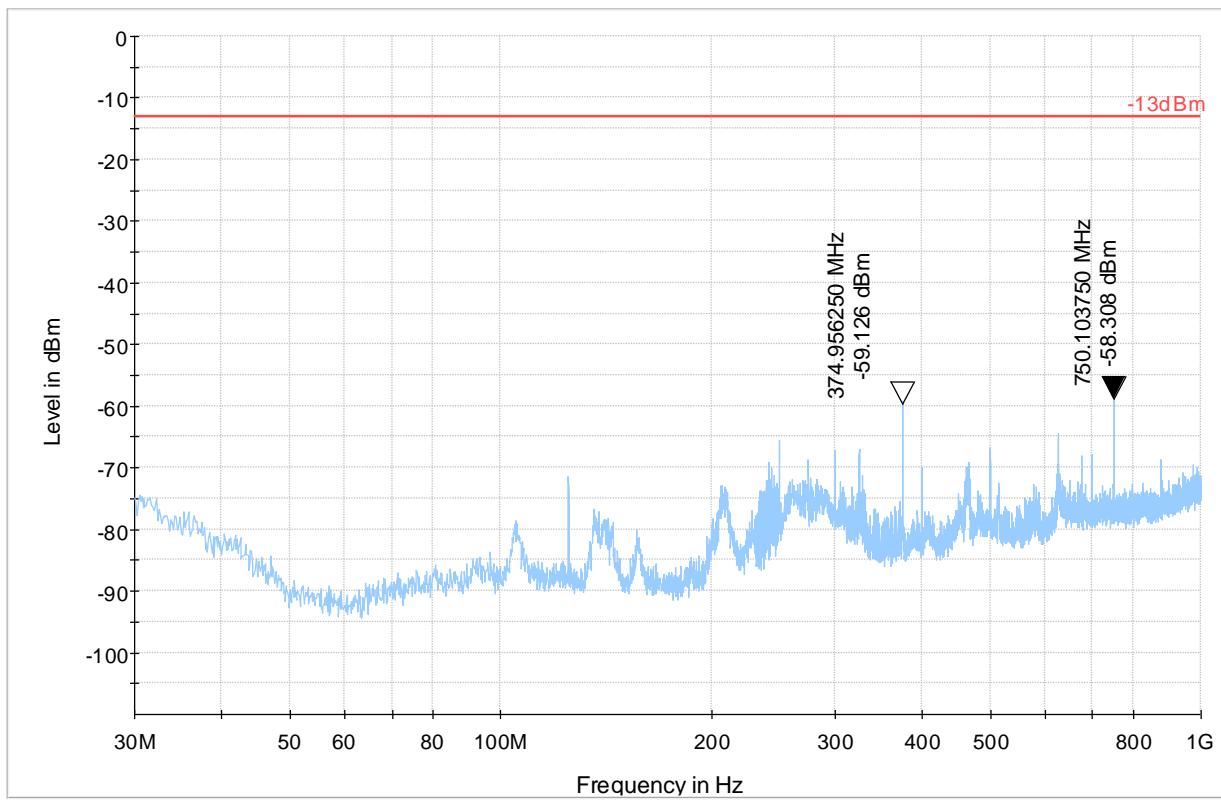
| | | | | | | |
|------|--------|---------------|-----|------|-------|-------|
| Low | LTE 12 | 3GHz – 18GHz | -13 | Pass | | |
| Mid | LTE 12 | 3GHz – 18GHz | -13 | Pass | | |
| High | LTE 12 | 3GHz – 18GHz | -13 | Pass | | |
| Mid | LTE 12 | 18GHz – 40GHz | -13 | Pass | | |
| | | | | | | |
| Mid | LTE 13 | 9kHz – 30MHz | -13 | Pass | 0.079 | -23 |
| Low | LTE 13 | 30MHz – 1 GHz | -13 | Pass | | |
| Mid | LTE 13 | 30MHz – 1 GHz | -13 | Pass | | |
| High | LTE 13 | 30MHz – 1 GHz | -13 | Pass | | |
| Low | LTE 13 | 1GHz – 3GHz | -13 | Pass | | |
| Mid | LTE 13 | 1GHz – 3GHz | -13 | Pass | | |
| High | LTE 13 | 1GHz – 3GHz | -13 | Pass | | |
| Low | LTE 13 | 3GHz – 18GHz | -13 | Pass | | |
| Mid | LTE 13 | 3GHz – 18GHz | -13 | Pass | | |
| High | LTE 13 | 3GHz – 18GHz | -13 | Pass | | |
| Mid | LTE 13 | 18GHz – 40GHz | -13 | Pass | | |
| | | | | | | |
| Mid | LTE 30 | 9kHz – 30MHz | -13 | Pass | .079 | -27 |
| Low | LTE 30 | 30MHz – 1 GHz | -13 | Pass | 375 | -58.9 |
| Mid | LTE 30 | 30MHz – 1 GHz | -13 | Pass | 374 | -57.5 |
| High | LTE 30 | 30MHz – 1 GHz | -13 | Pass | 325 | -60.2 |
| Low | LTE 30 | 1GHz – 3GHz | -13 | Pass | | |
| Mid | LTE 30 | 1GHz – 3GHz | -13 | Pass | | |
| High | LTE 30 | 1GHz – 3GHz | -13 | Pass | | |
| Low | LTE 30 | 3GHz – 18GHz | -13 | Pass | | |
| Mid | LTE 30 | 3GHz – 18GHz | -13 | Pass | | |
| High | LTE 30 | 3GHz – 18GHz | -13 | Pass | | |
| Mid | LTE 30 | 18GHz – 40GHz | -13 | Pass | | |
| | | | | | | |
| Mid | LTE 41 | 9kHz – 30MHz | -25 | Pass | 0.079 | -28 |
| Low | LTE 41 | 30MHz – 1 GHz | -25 | Pass | | |
| Mid | LTE 41 | 30MHz – 1 GHz | -25 | Pass | 325 | -58 |
| High | LTE 41 | 30MHz – 1 GHz | -25 | Pass | 374 | -56 |
| Low | LTE 41 | 1GHz – 3GHz | -25 | Pass | | |
| Mid | LTE 41 | 1GHz – 3GHz | -25 | Pass | | |
| High | LTE 41 | 1GHz – 3GHz | -25 | Pass | | |
| Low | LTE 41 | 3GHz – 18GHz | -25 | Pass | | |
| Mid | LTE 41 | 3GHz – 18GHz | -25 | Pass | 1290 | -28.9 |
| High | LTE 41 | 3GHz – 18GHz | -25 | Pass | 8000 | -13.3 |
| Mid | LTE 41 | 18GHz – 40GHz | -25 | Pass | | |
| | | | | | | |

10.5 Measurement Plots WCDMA/UMTS FDD II

10.5.1 9 kHz – 30MHz, Ch. mid

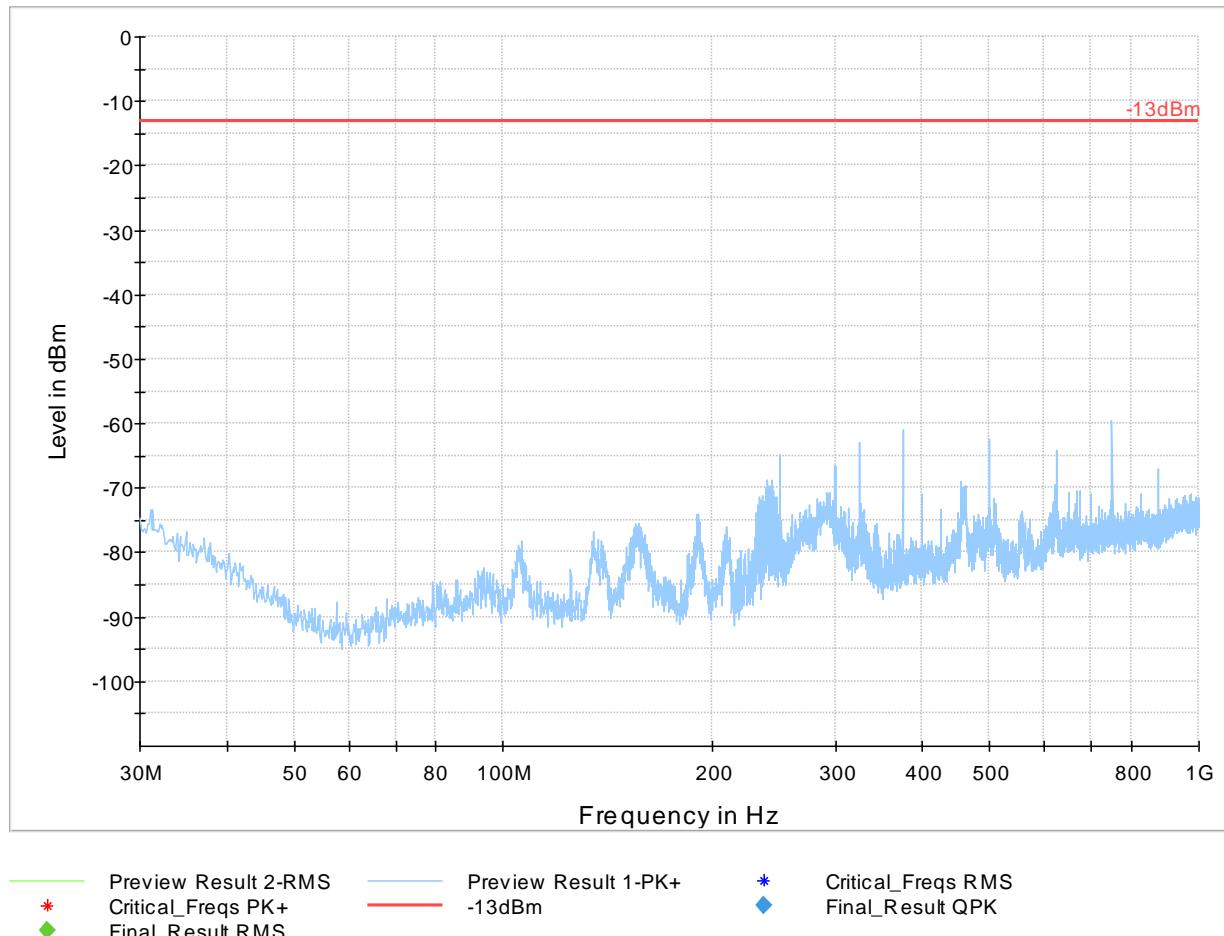


10.5.2 30MHz - 1GHz, Ch. Low

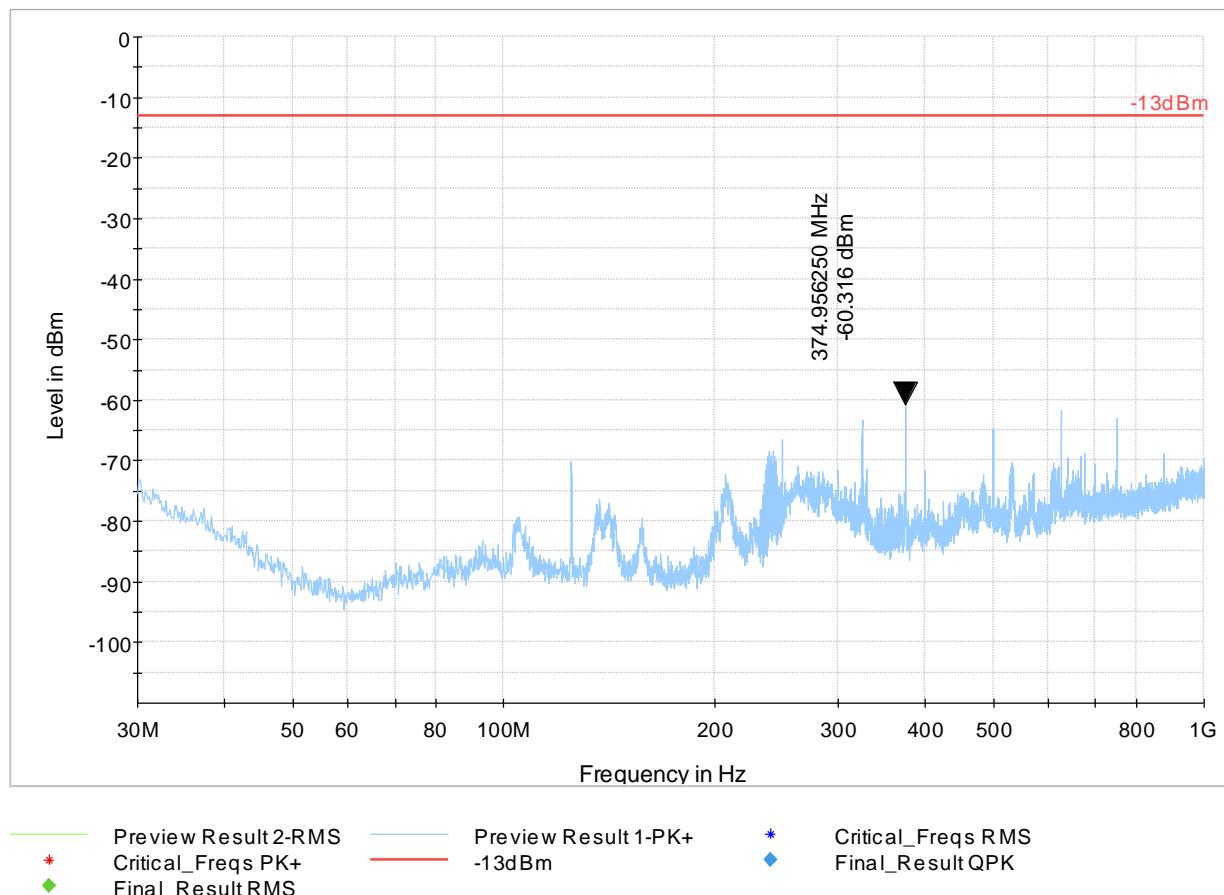


| | | |
|---|--|--|
| — * Preview Result 2-RMS | — Preview Result 1-PK+ | * Critical_Freqs RMS |
| ◆ Critical_Freqs PK+ | — -13dBm | ◆ Final_Result QPK |
| ◆ Final_Result RMS | | |

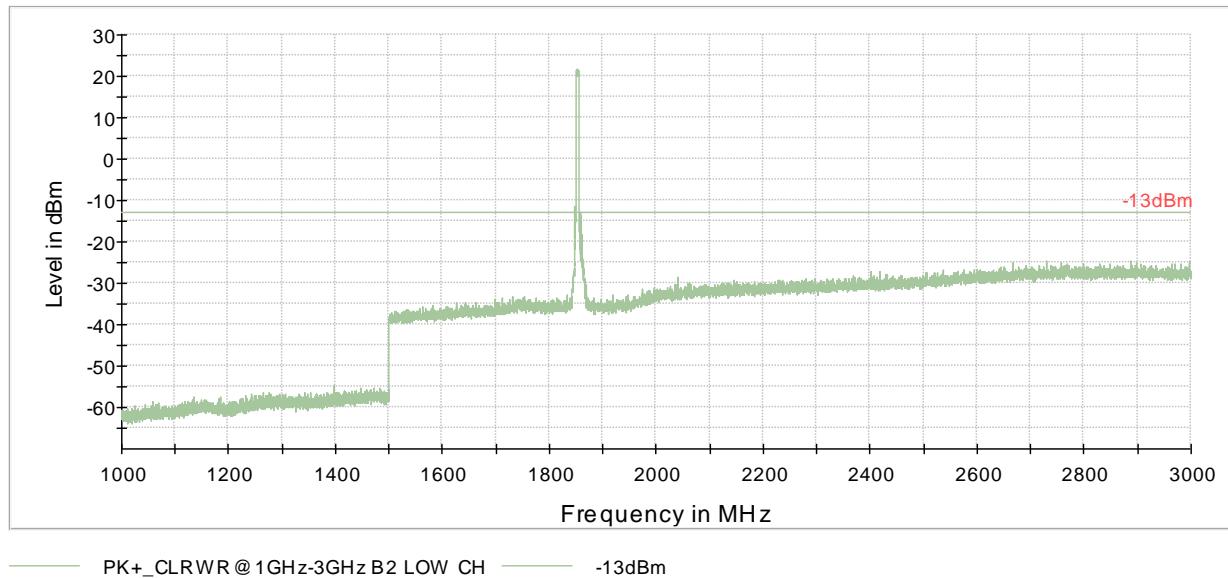
10.5.3 30MHz - 1GHz, Ch. Mid



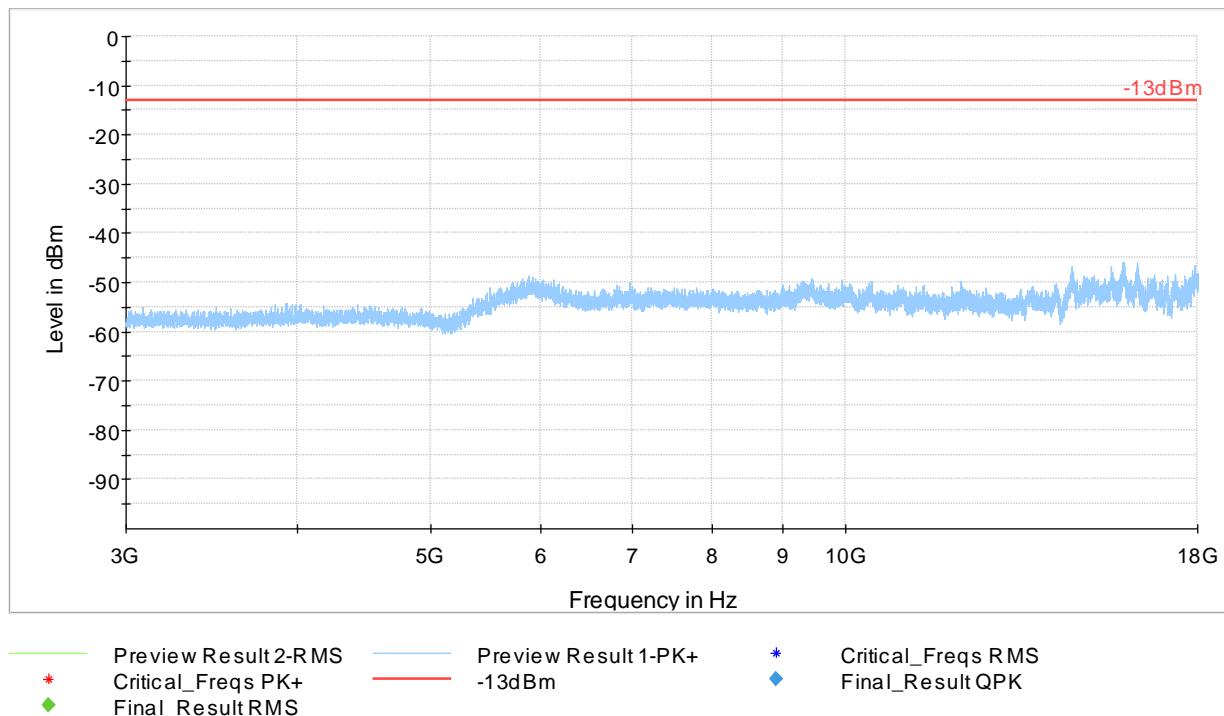
10.5.4 30MHz - 1GHz, Ch. High



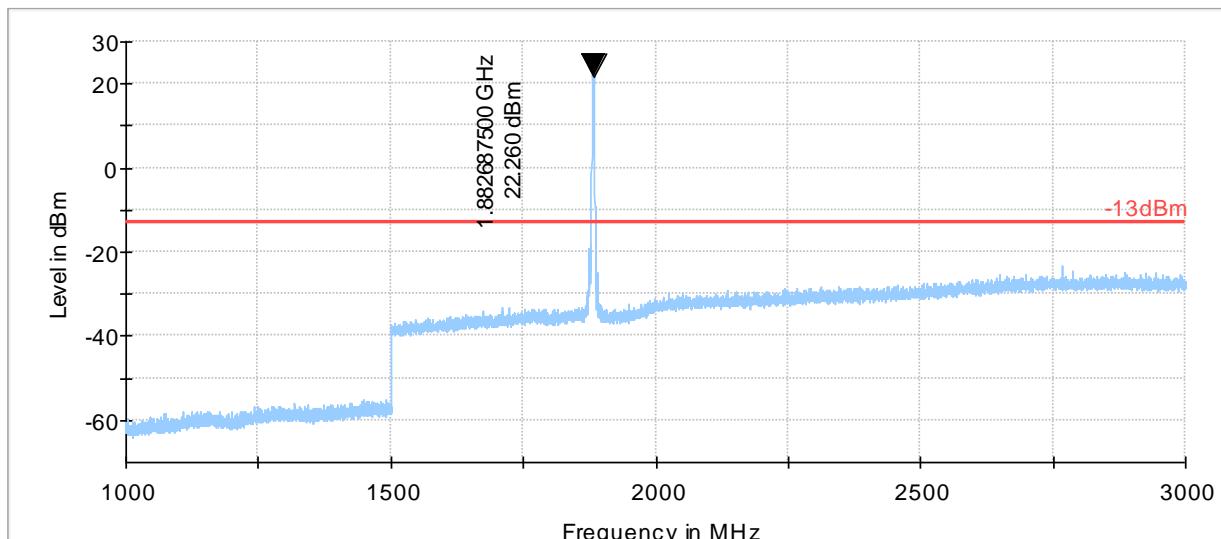
10.5.5 1 - 3GHz, Ch. Low



10.5.6 3GHz – 18GHz, Ch. Low

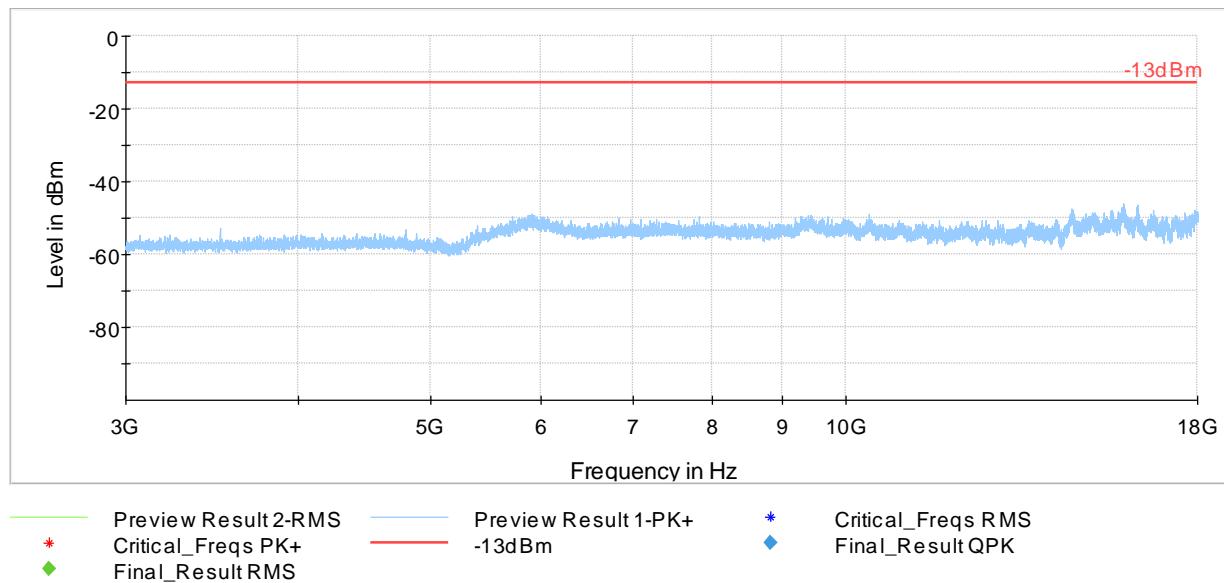


10.5.7 1GHz - 3GHz, Ch. Mid

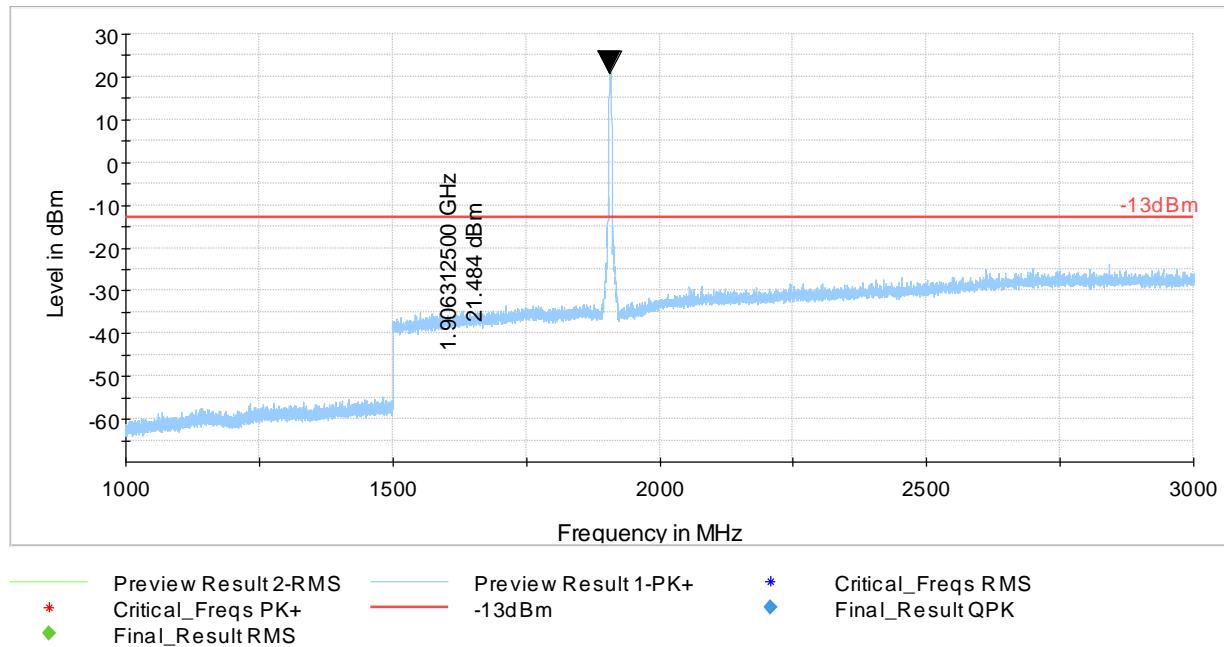


- * Preview Result 2-RMS [Preview Result 2.Result:2]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- ◆ Critical_Freqs RMS [Critical_Freqs.Result:5]
- ◆ Critical_Freqs PK+ [Critical_Freqs.Result:4]

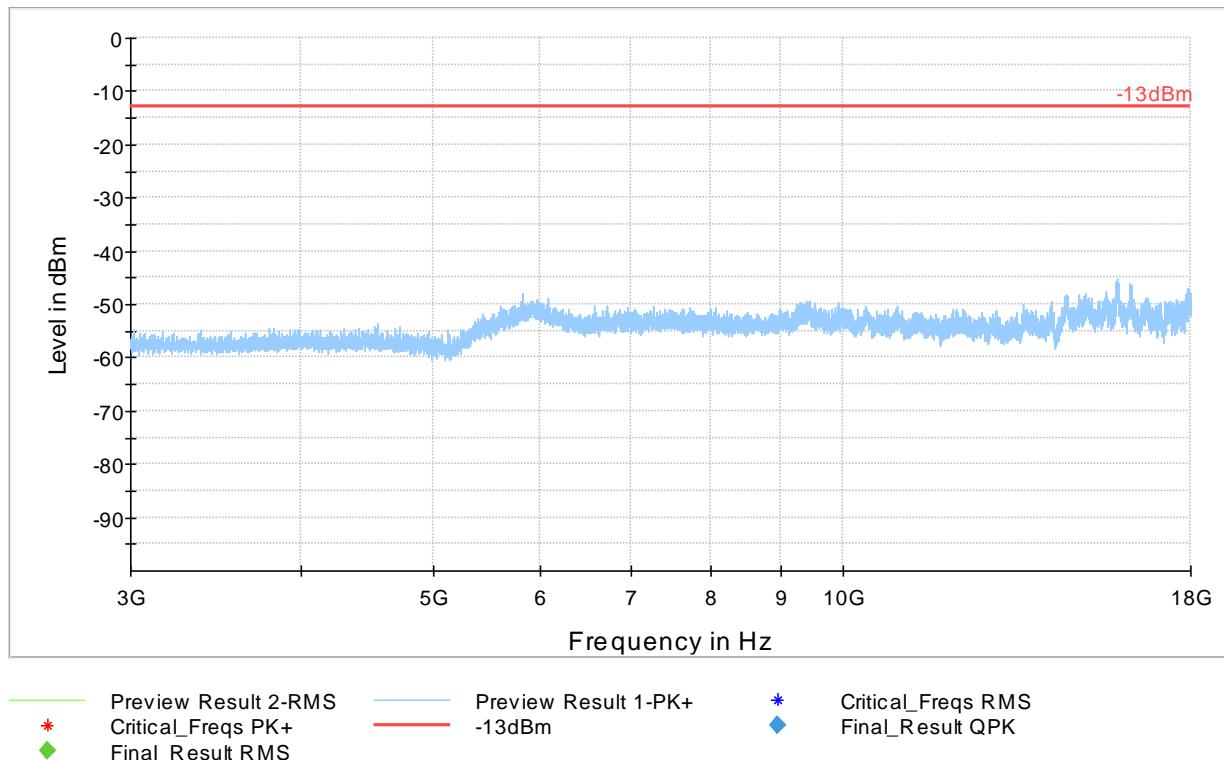
10.5.8 3GHz - 18GHz, Ch. Mid



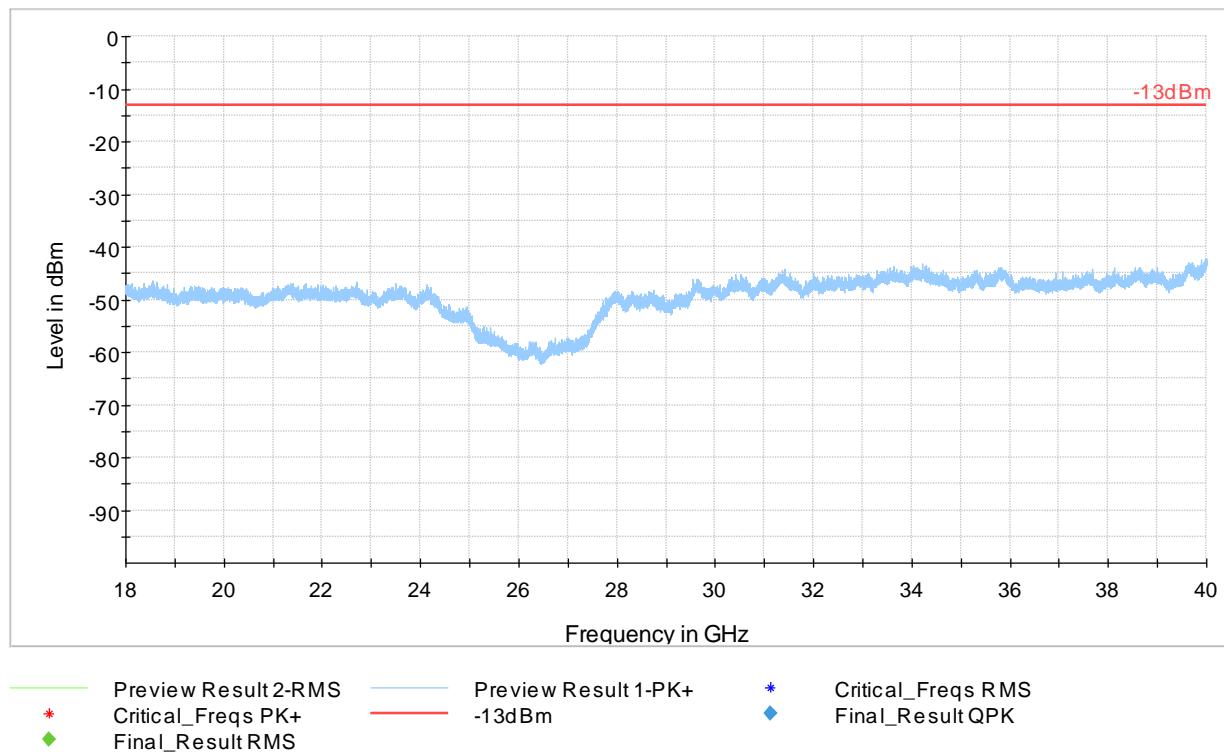
10.5.9 1GHz - 3GHz, Ch. High



10.5.10 3GHz - 18GHz, Ch. High

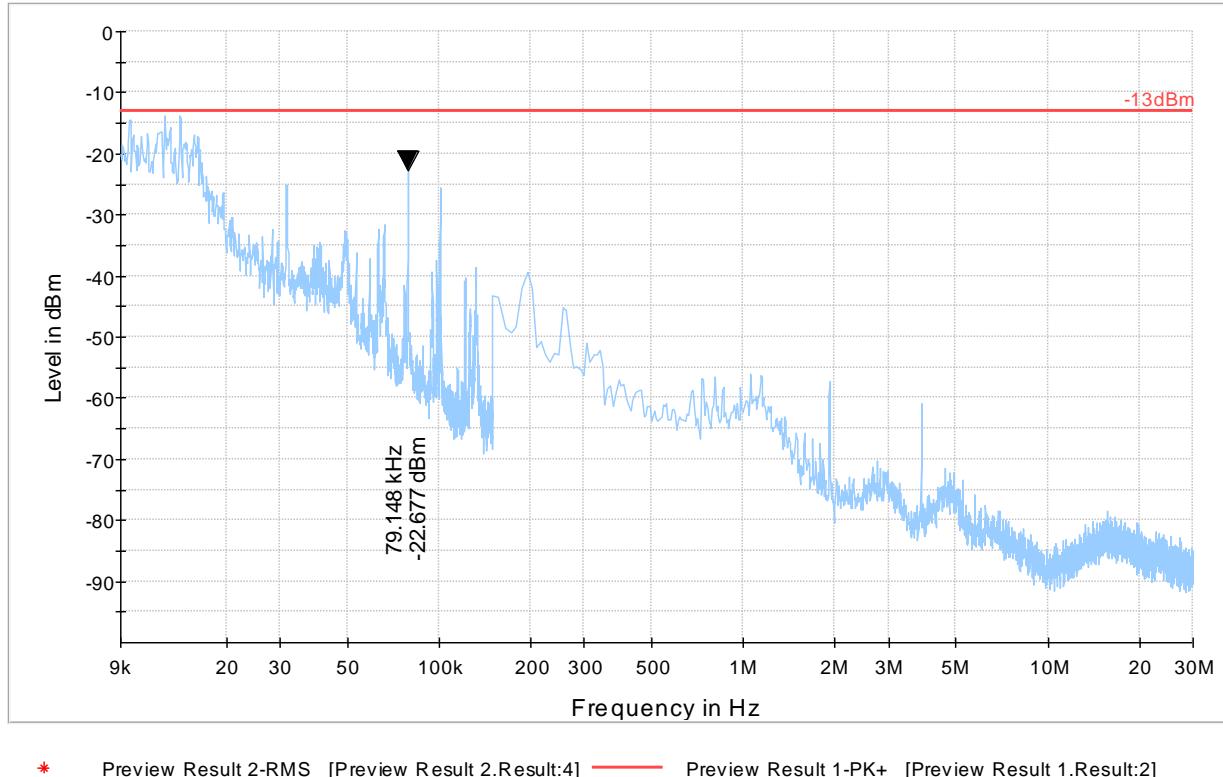


10.5.11 18 - 40 GHz, Ch. Mid

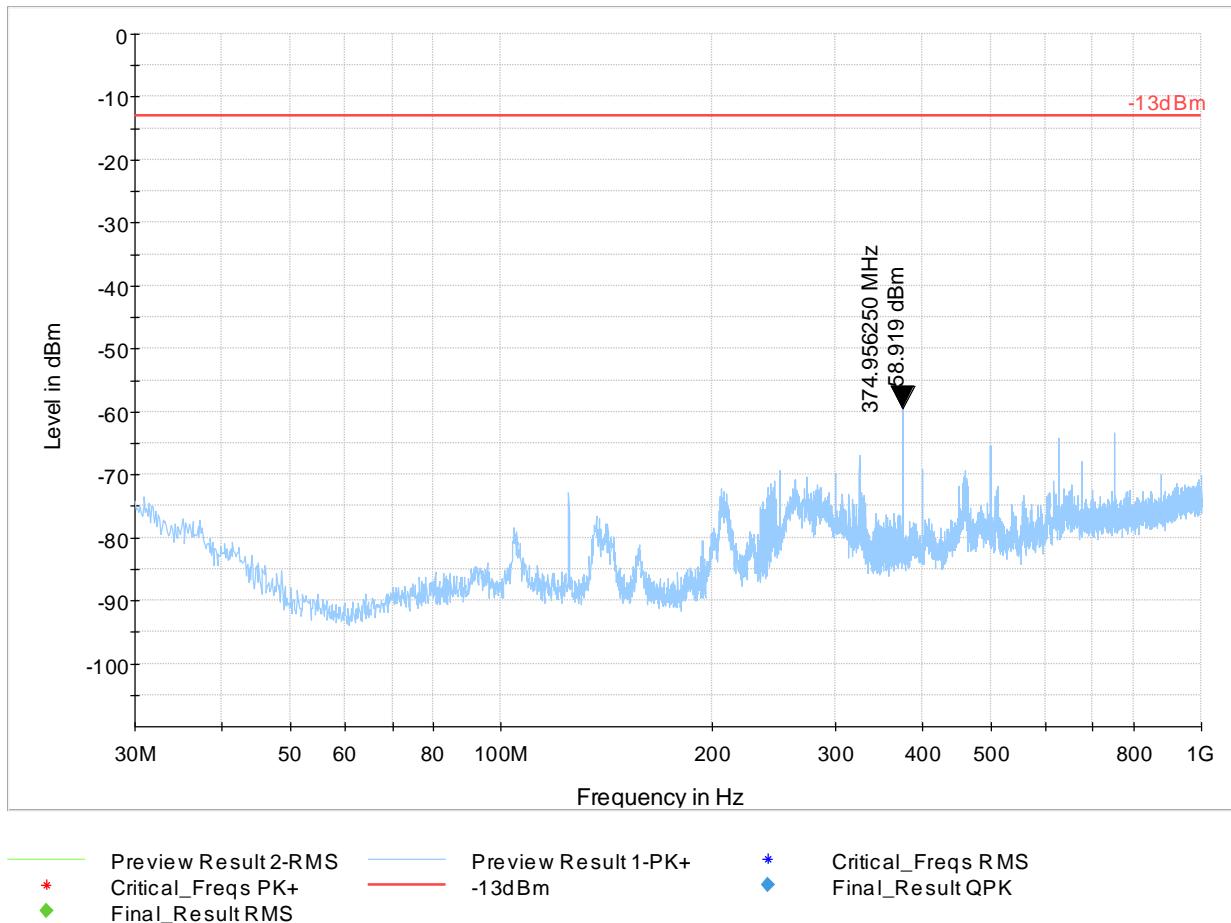


10.6 Measurement Plots WCDMA/UMTS FDD IV

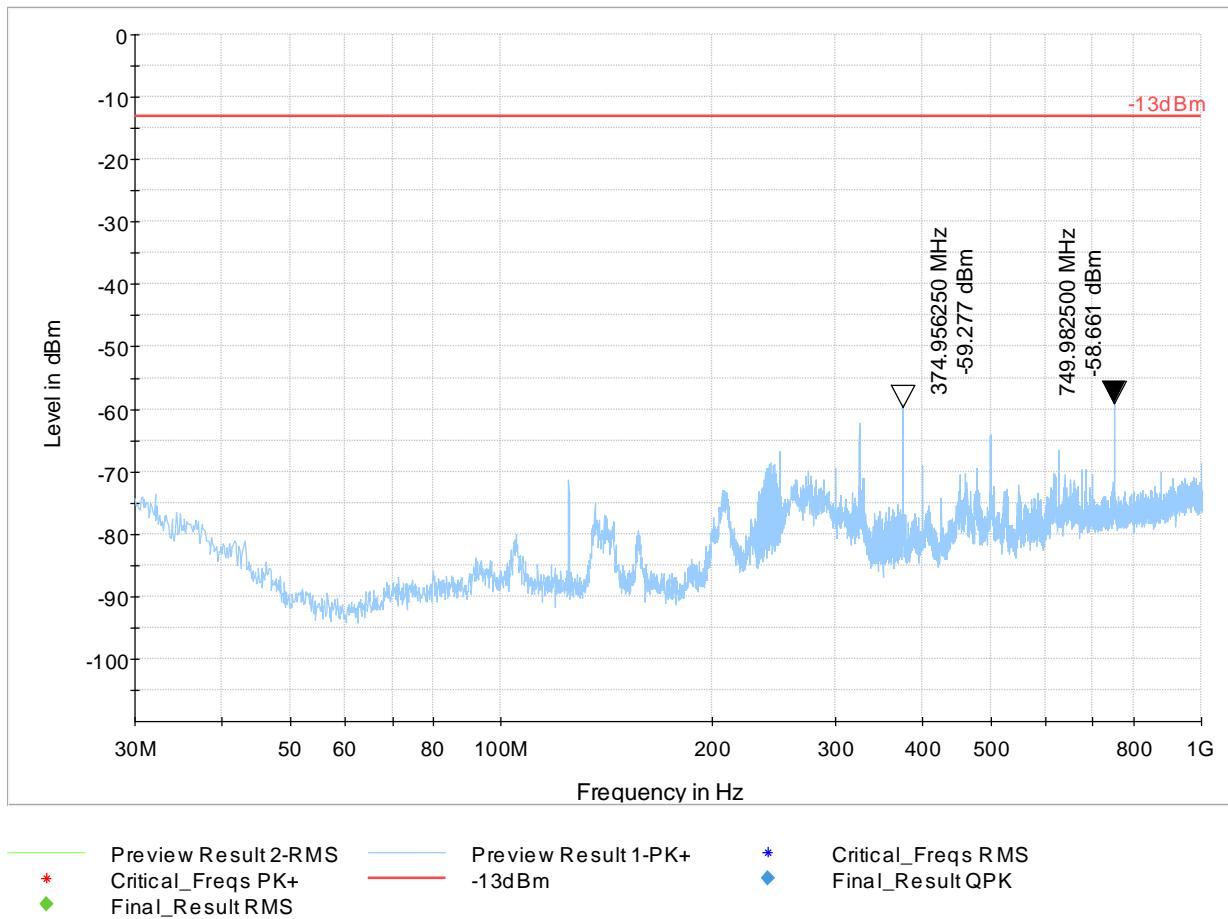
10.6.1 9 kHz – 30MHz, Ch. Mid



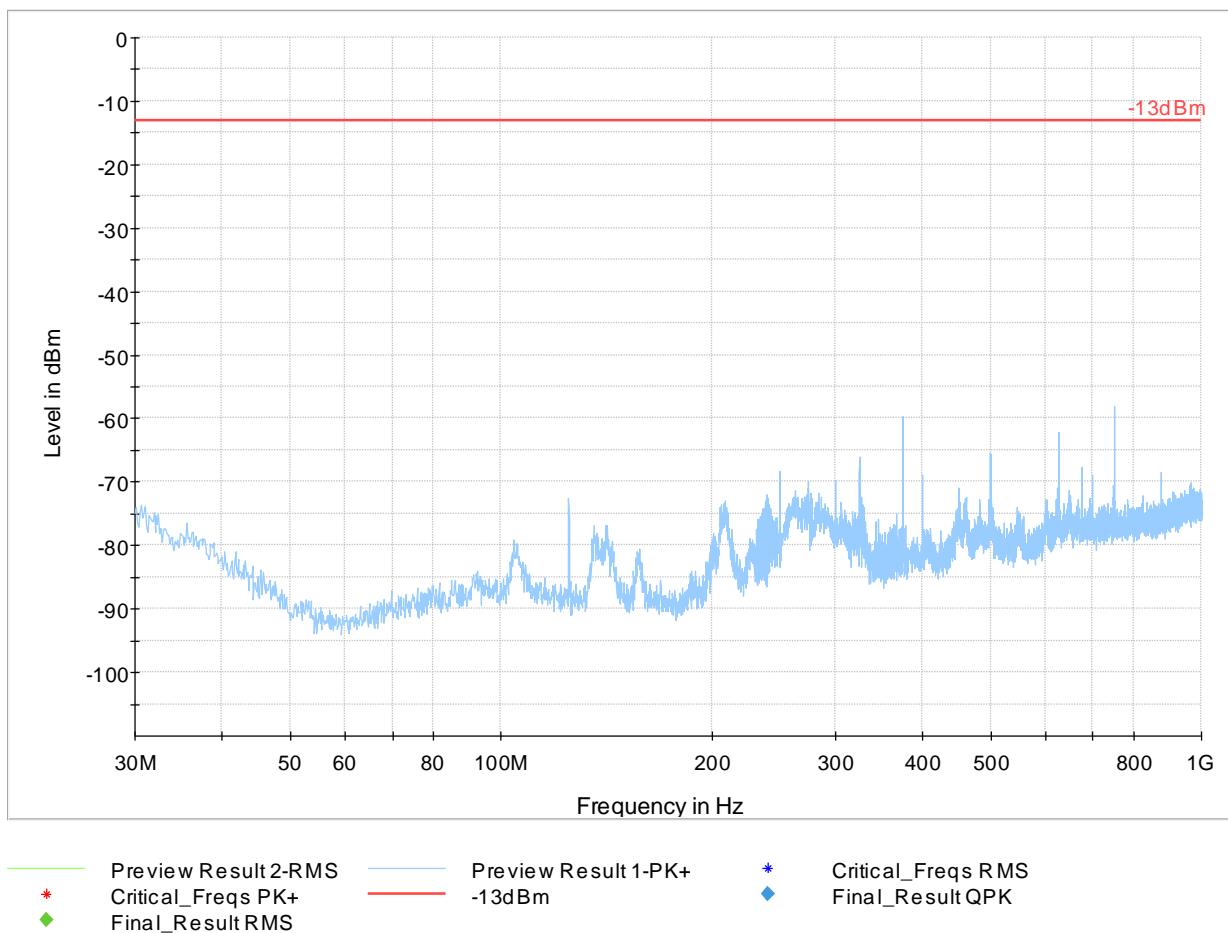
10.6.2 30MHz – 1GHz, Ch. Low



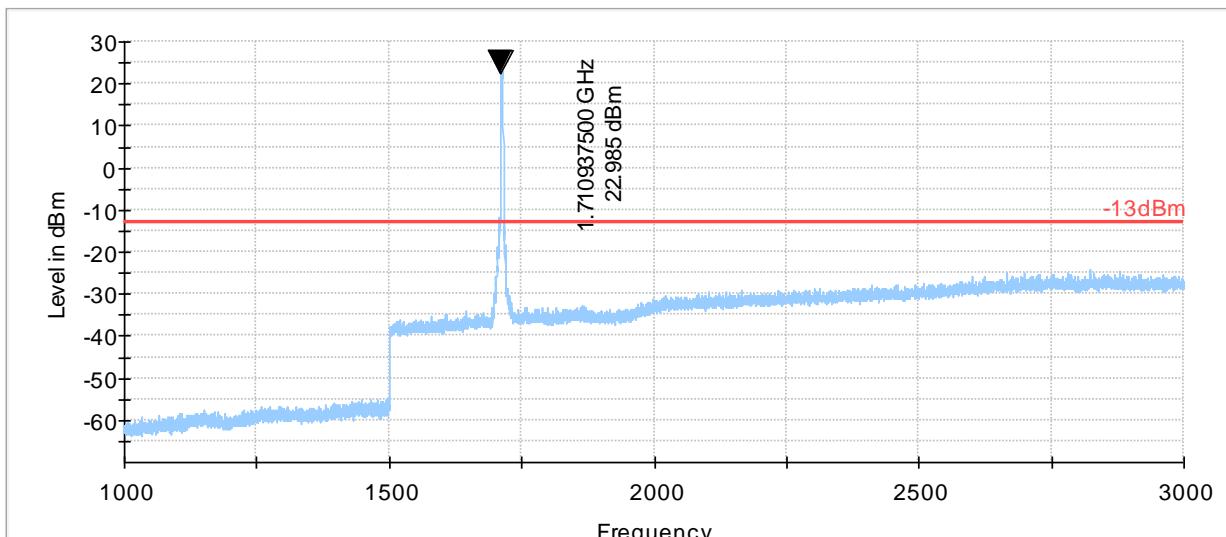
10.6.3 30MHz – 1GHz, Ch. Mid



10.6.4 30MHz – 1GHz, Ch. High

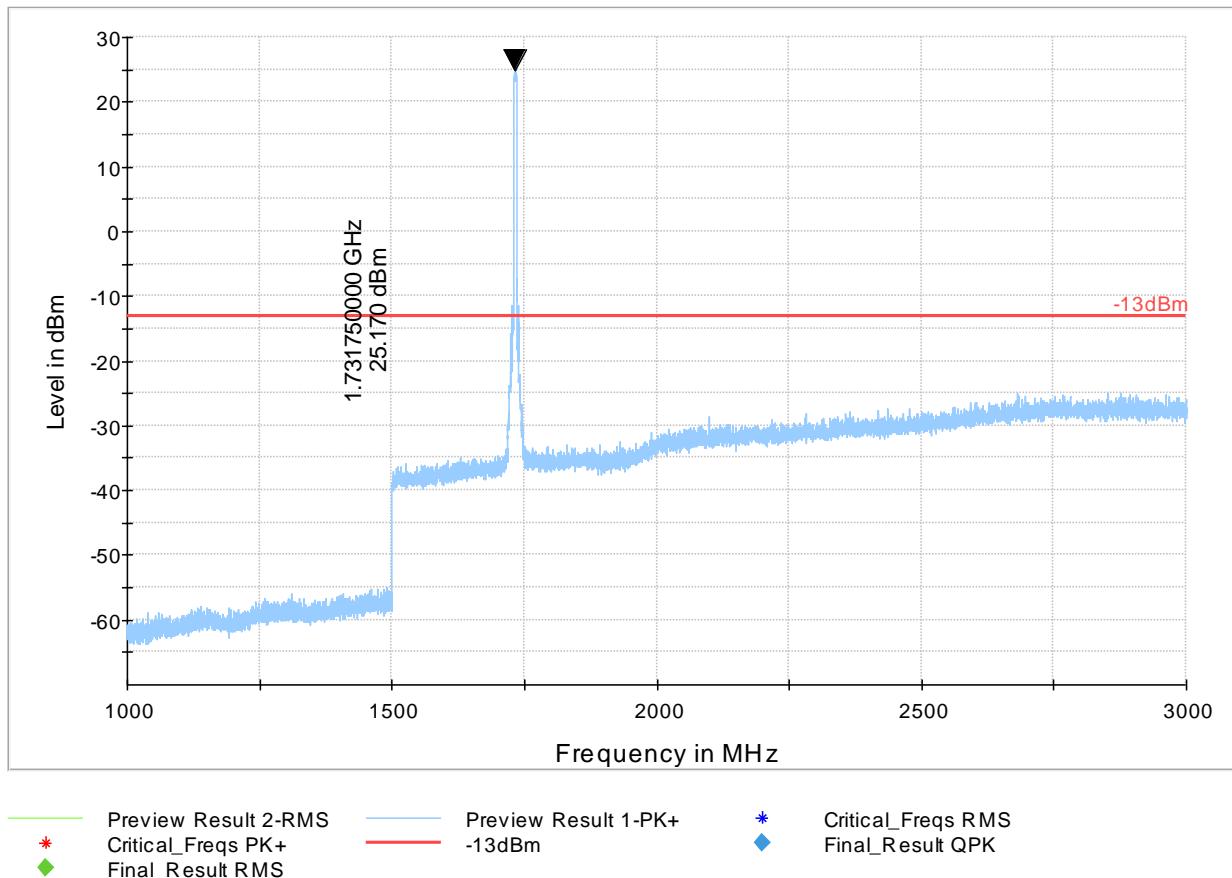


10.6.5 1GHz – 3GHz, Ch. Low

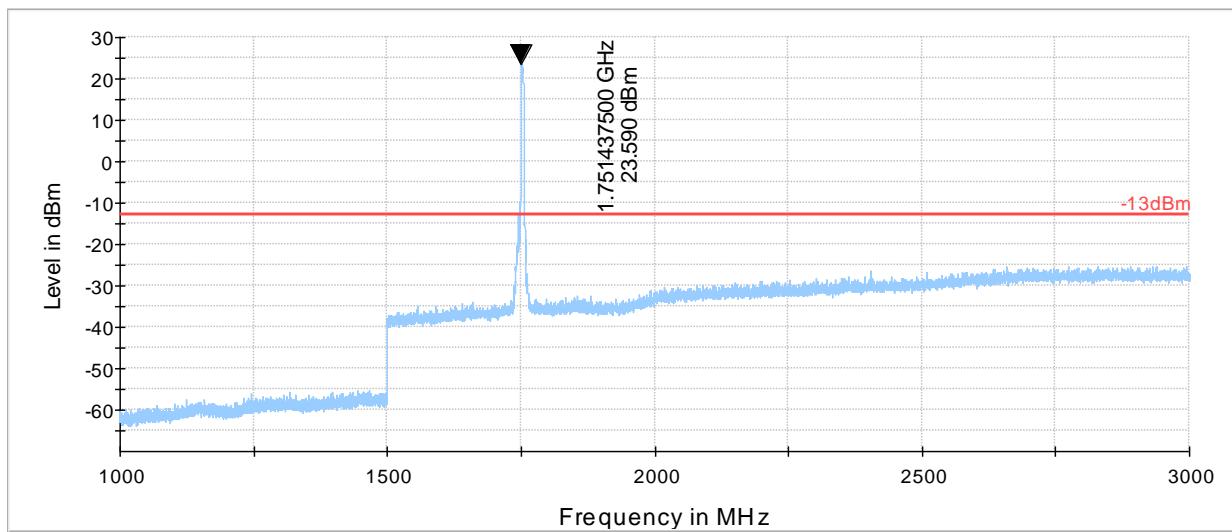


- * Preview Result 2-RMS [Preview Result 2.Result:2]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- ◆ Critical_Freqs RMS [Critical_Freqs.Result:5]
- ◆ Critical_Freqs PK+ [Critical_Freqs.Result:4]

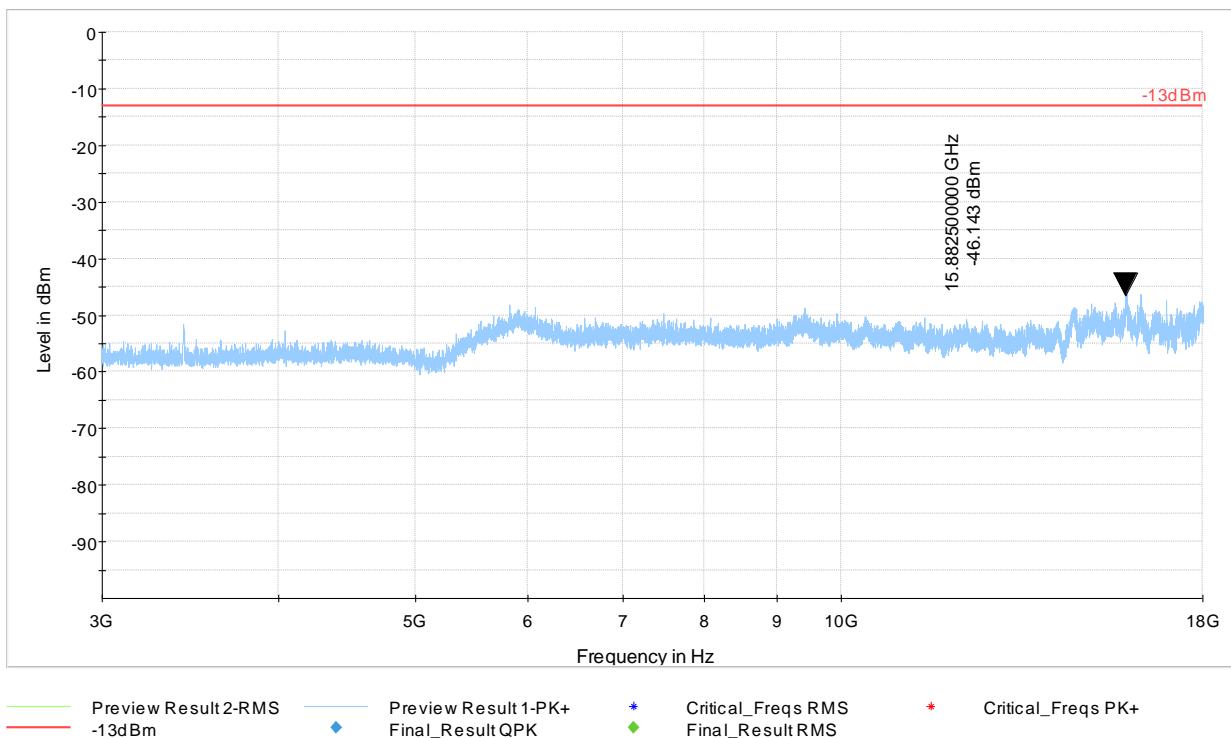
10.6.6 1GHz – 3GHz, Ch. Mid



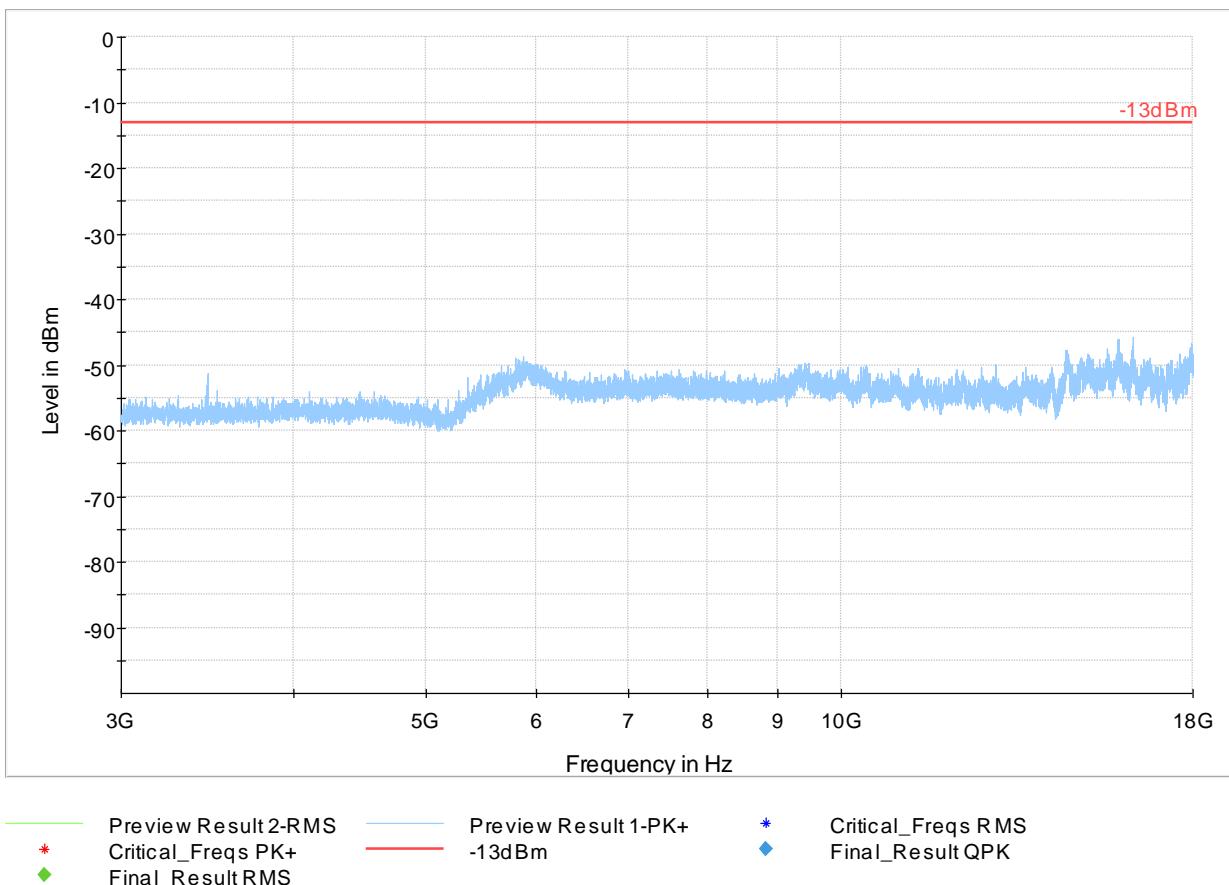
10.6.7 1GHz – 3GHz, Ch. High



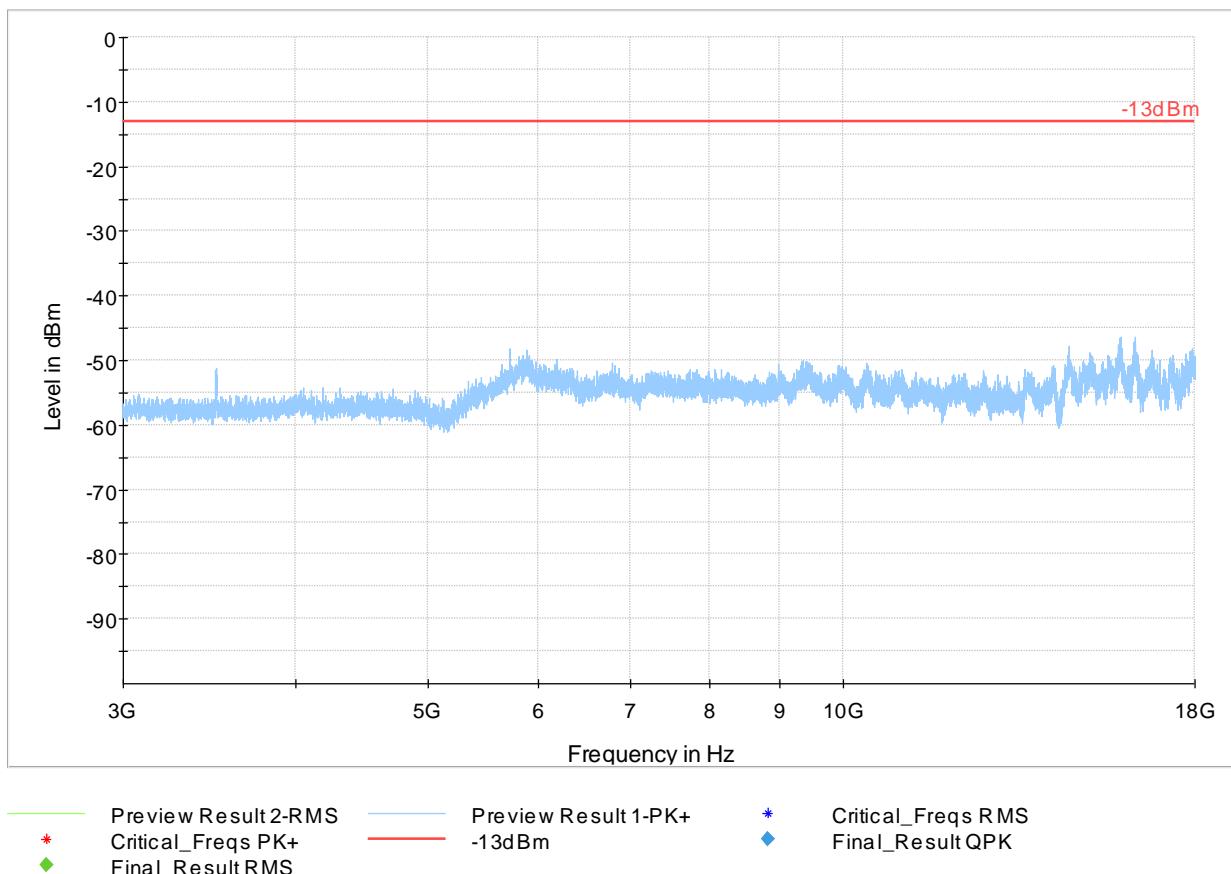
10.6.8 3GHz – 18GHz, Ch. Low



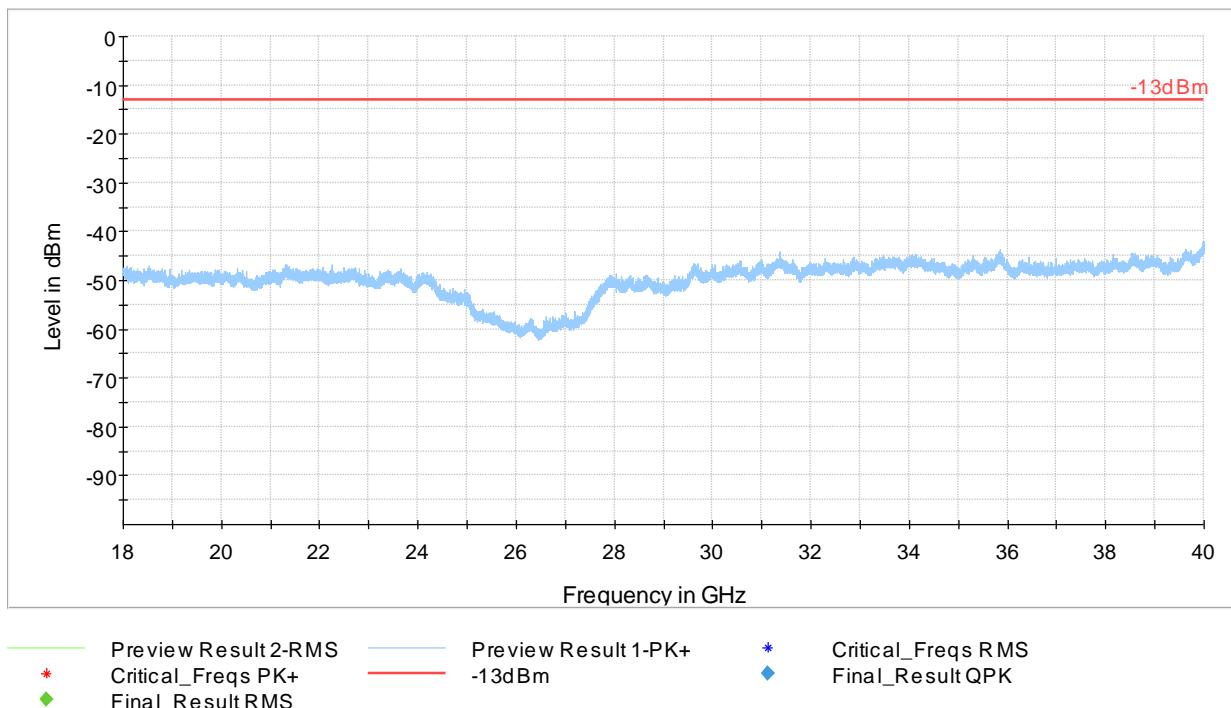
10.6.9 3GHz – 18GHz, Ch. Mid



10.6.10 3GHz – 18GHz, Ch. High

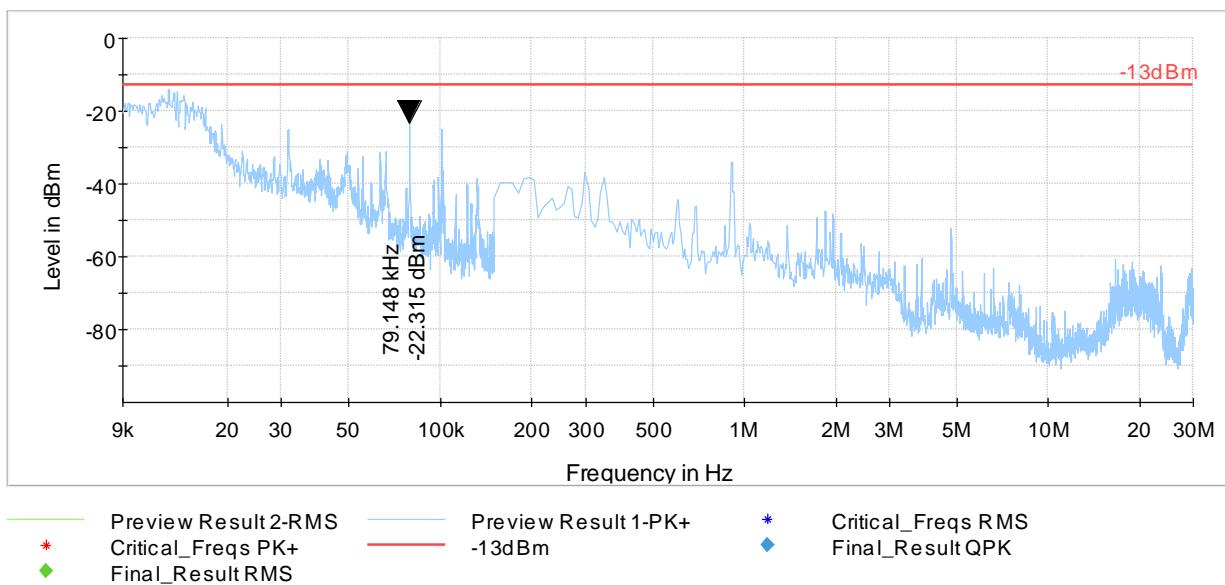


10.6.11 18GHz – 40GHz, Ch. Mid

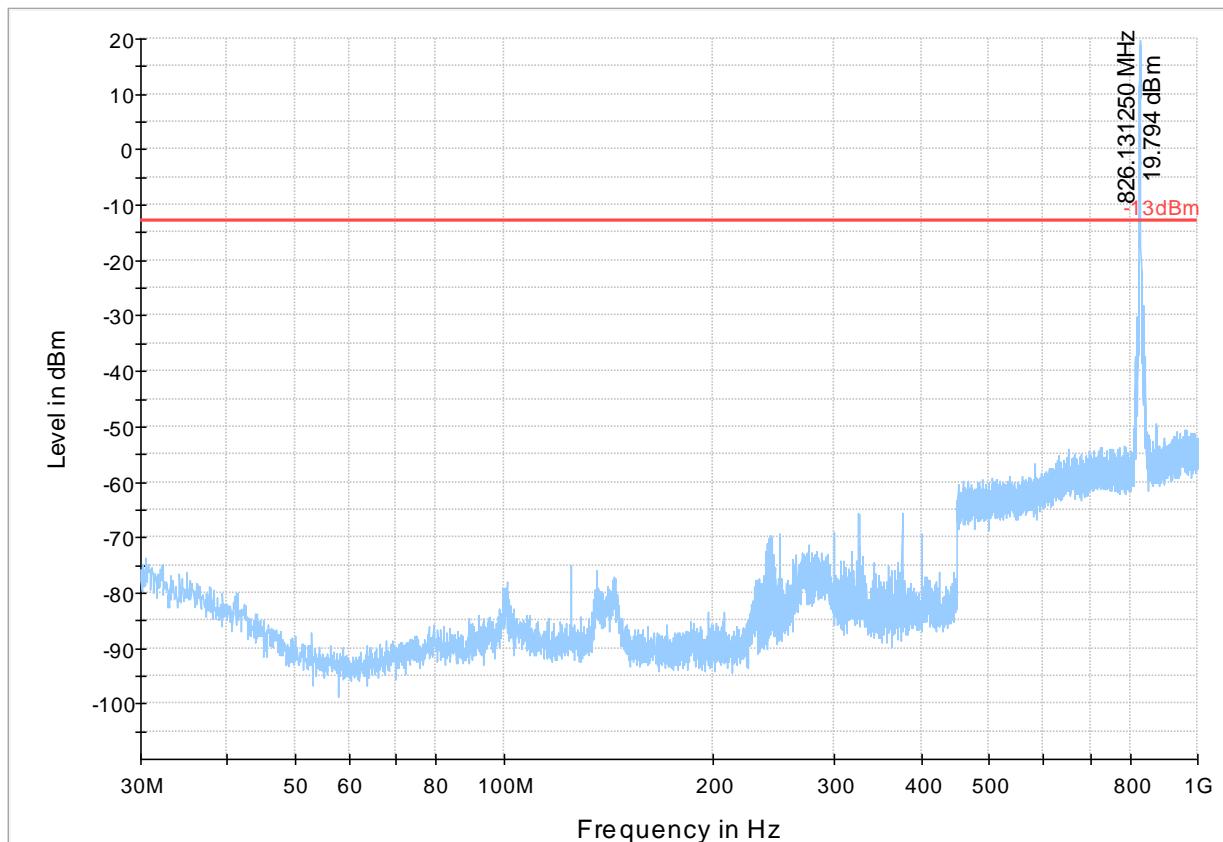


10.7 Measurement Plots WCDMA/UMTS FDD V:

10.7.1 9 kHz – 30MHz, Ch. mid

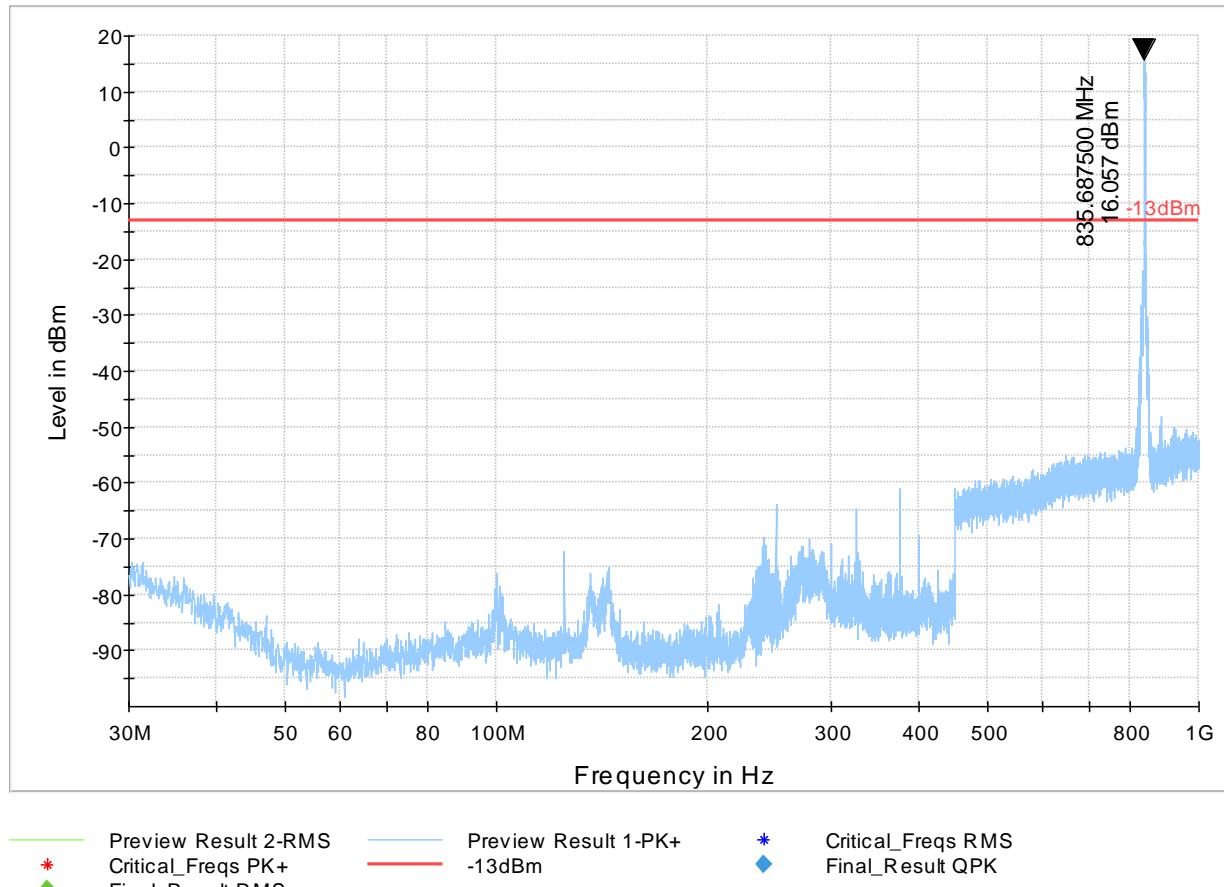


10.7.2 30 MHz – 1 GHz, Ch. Low

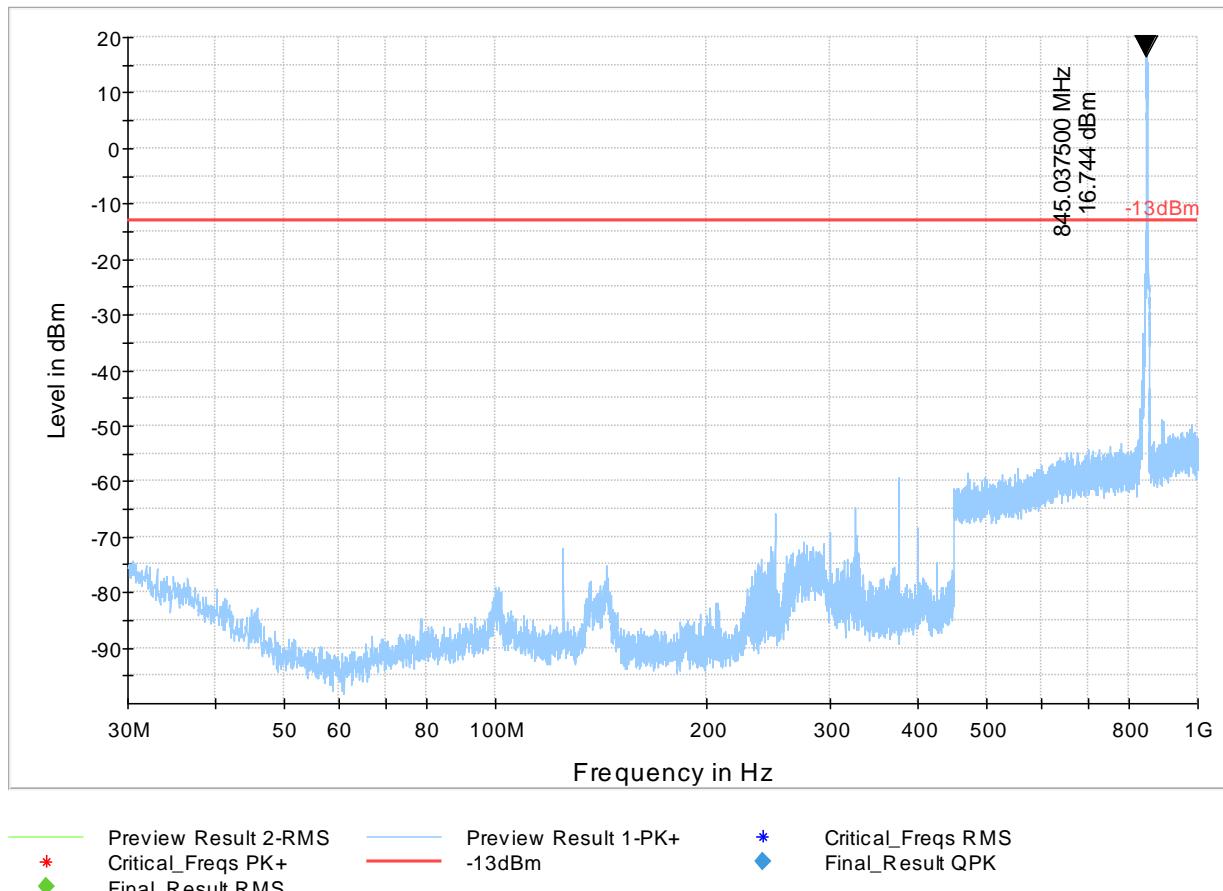


Preview Result 2-RMS Preview Result 1-PK+ Critical_Freqs RMS
* Critical_Freqs PK+ -13dBm * Final_Result QPK
◆ Final_Result RMS

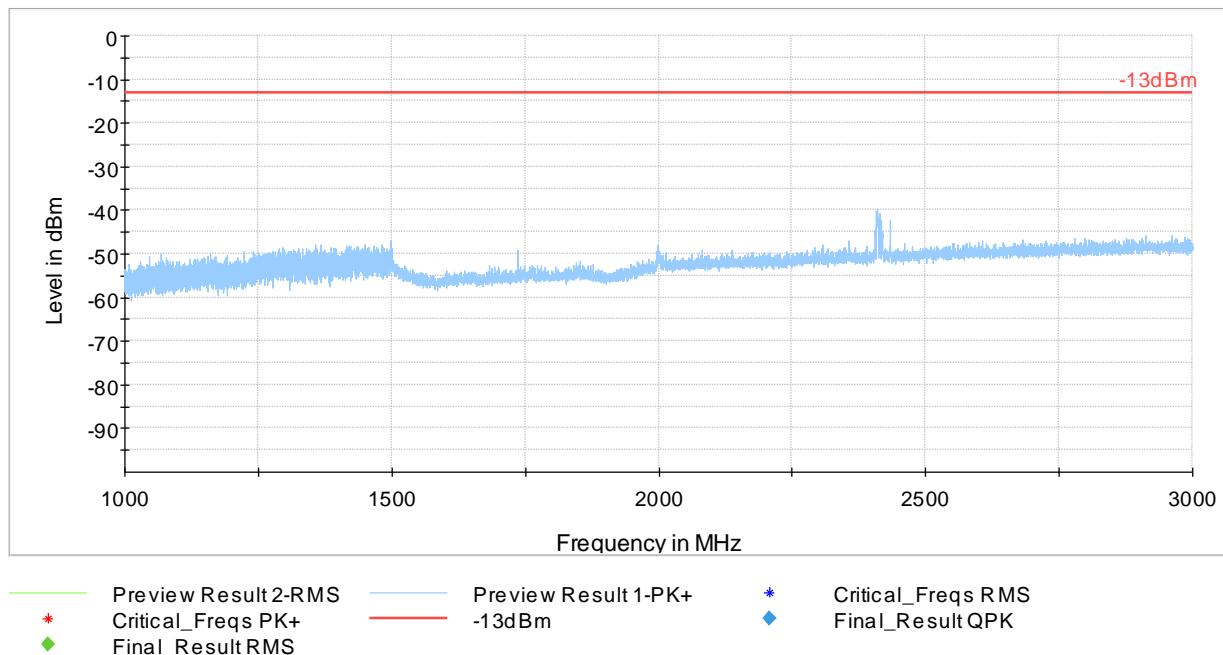
10.7.3 30 MHz – 1 GHz, Ch. Mid



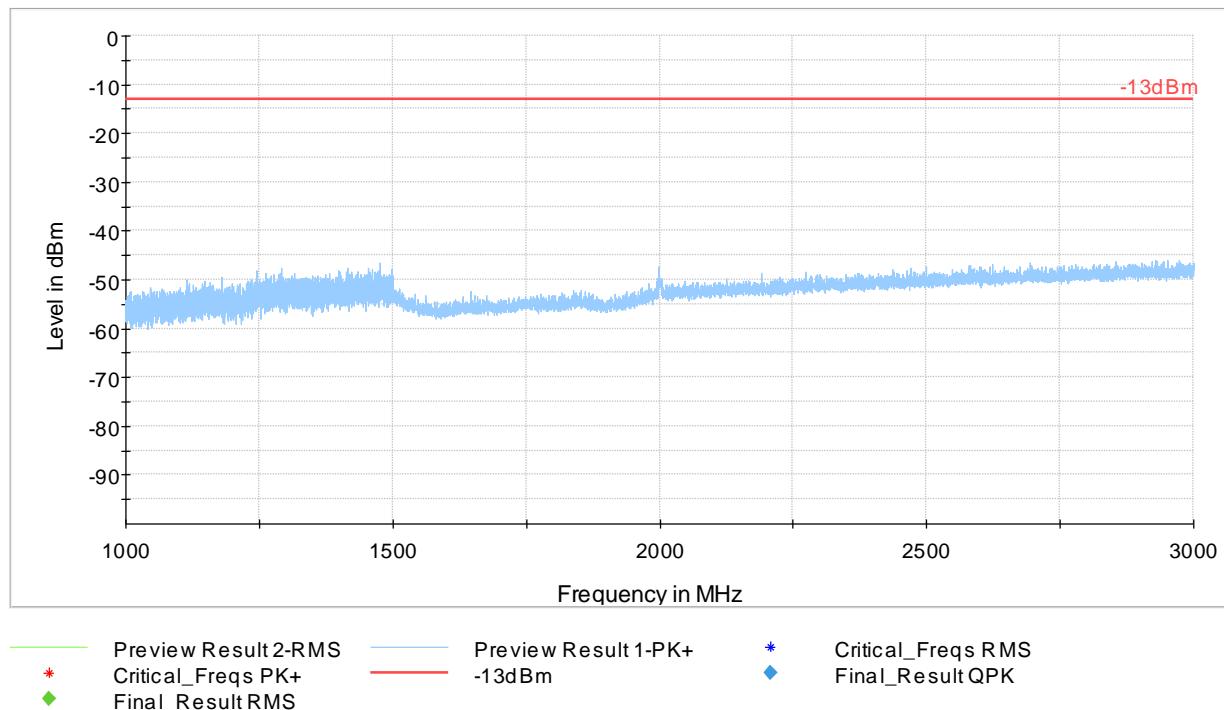
10.7.4 30 MHz – 1 GHz, Ch. High



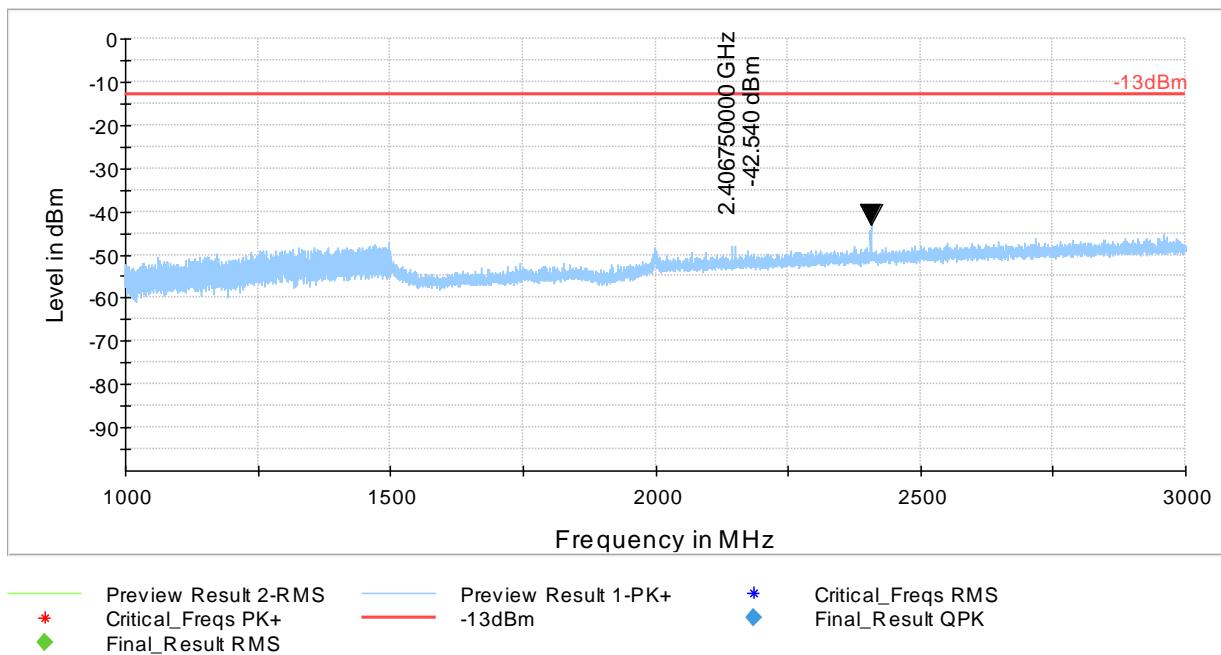
10.7.5 1 GHz – 3GHz, Ch. Low



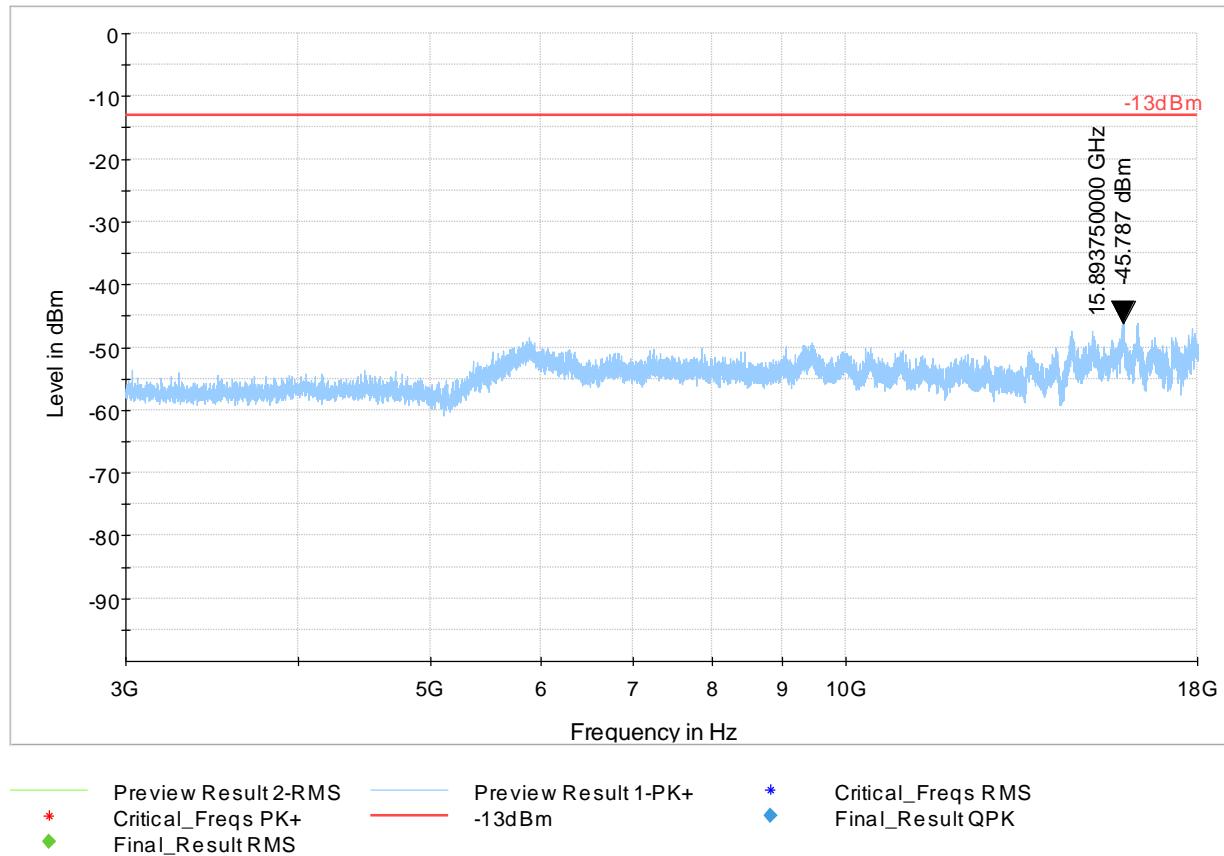
10.7.6 1 GHz – 3 GHz, Ch. Mid



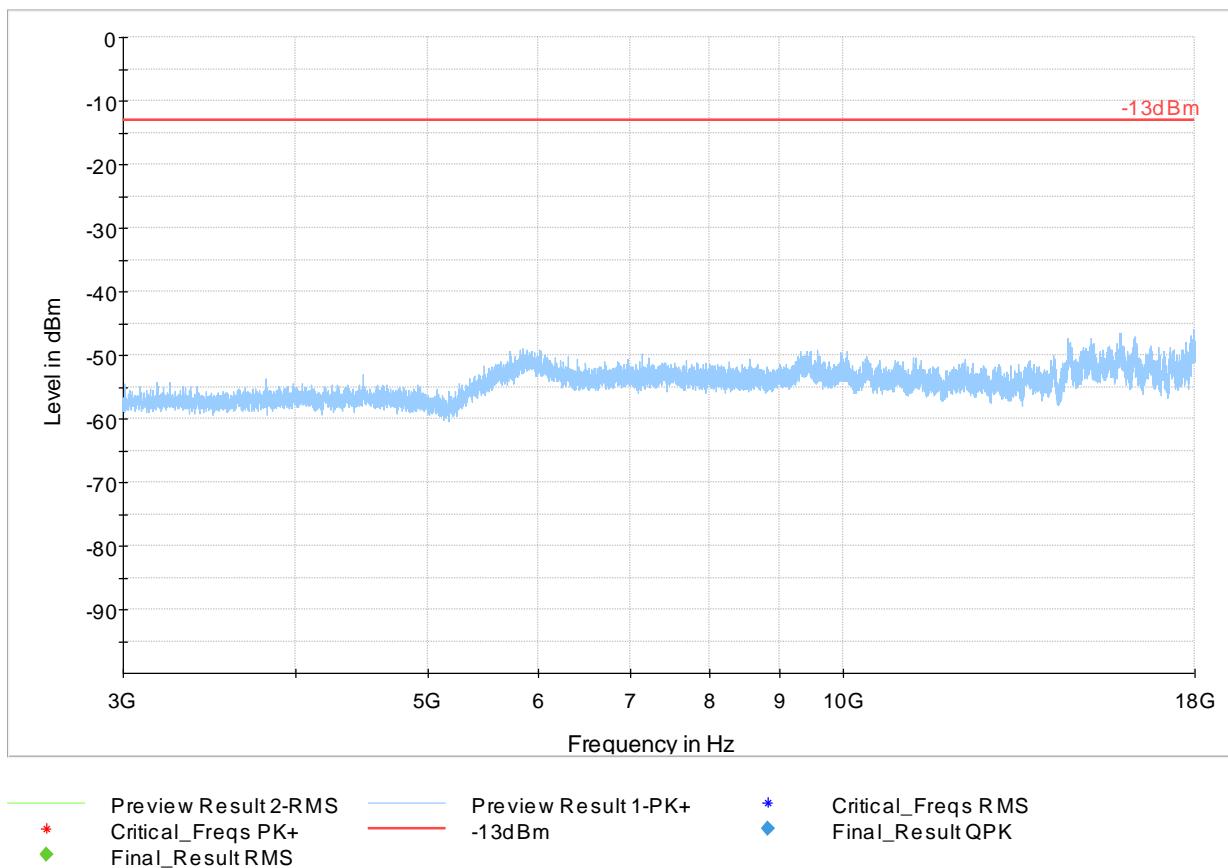
10.7.7 1 GHz – 3 GHz, Ch. High



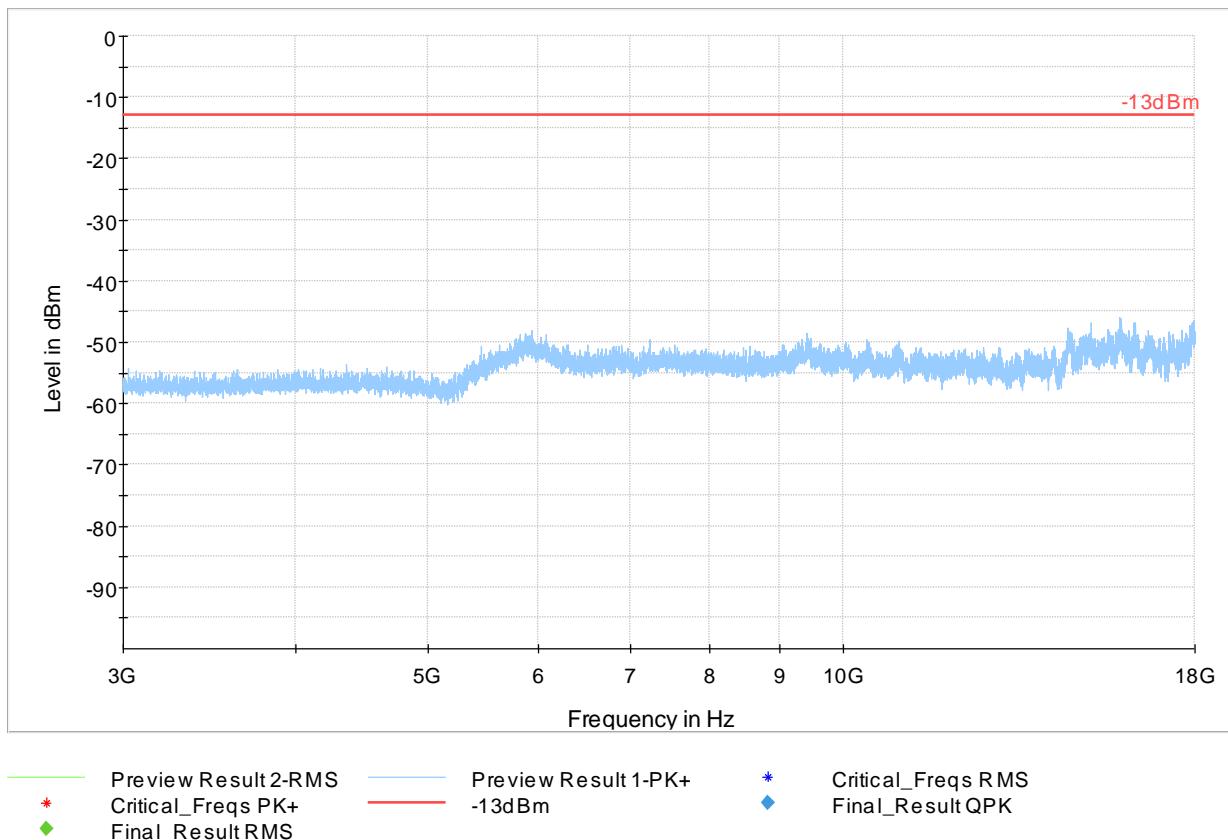
10.7.8 3 GHz – 18GHz, Ch. Low



10.7.9 3 GHz – 18GHz, Ch. High

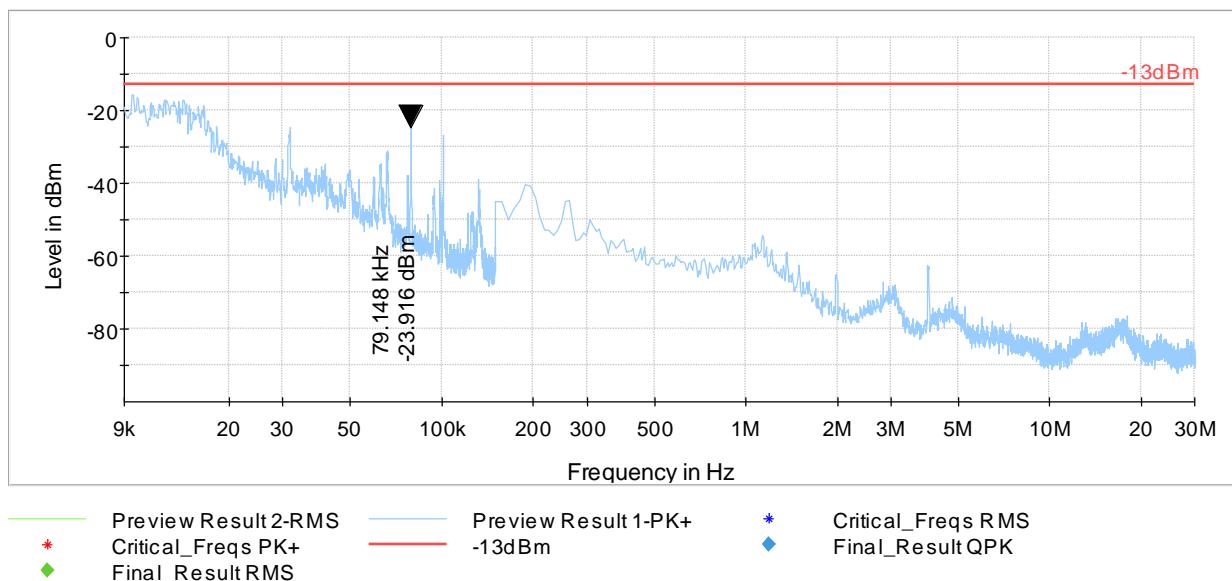


10.7.10 3 GHz – 18GHz, Ch. Mid

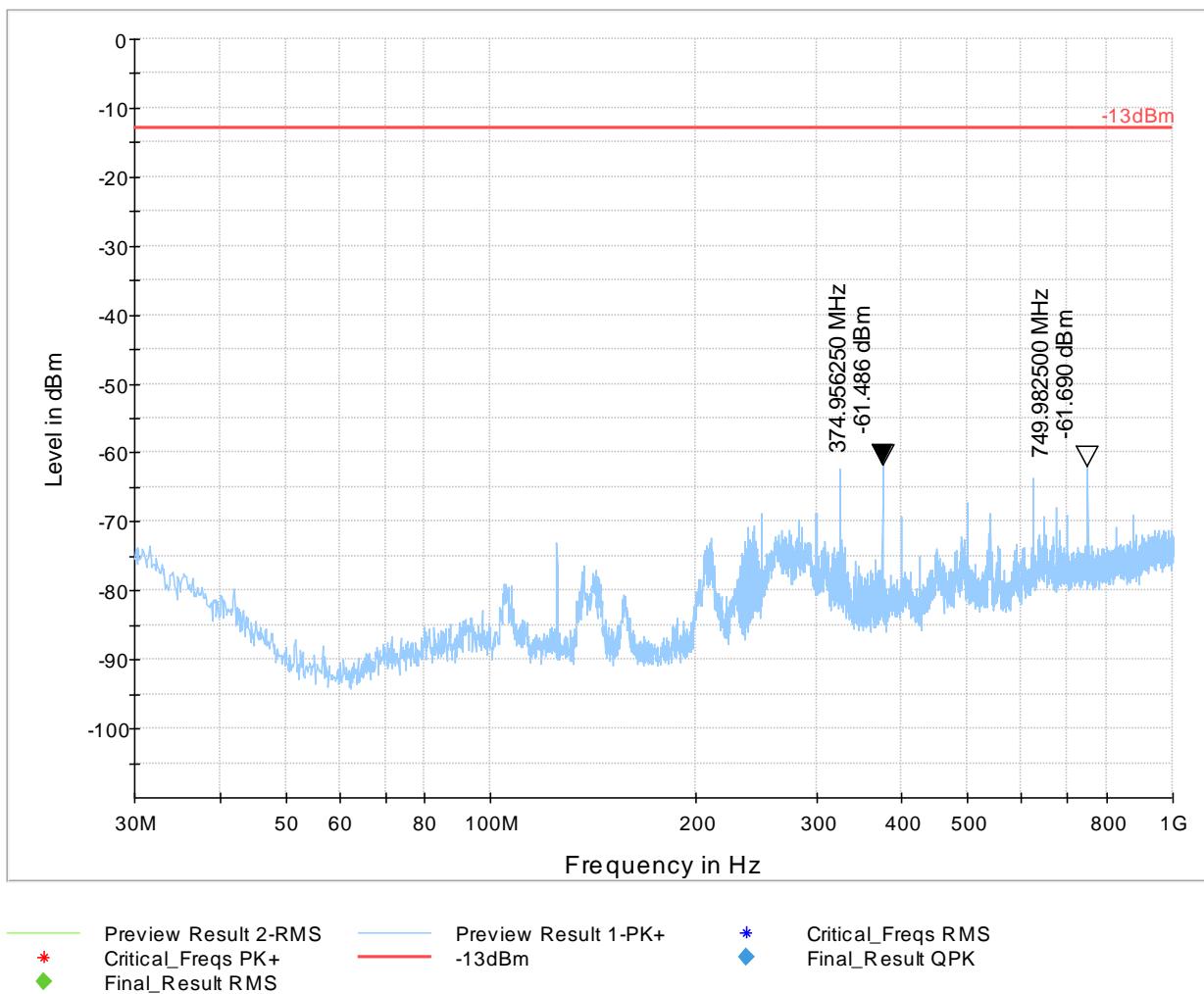


10.8 Measurement Plots LTE Band 25/ Band 2:

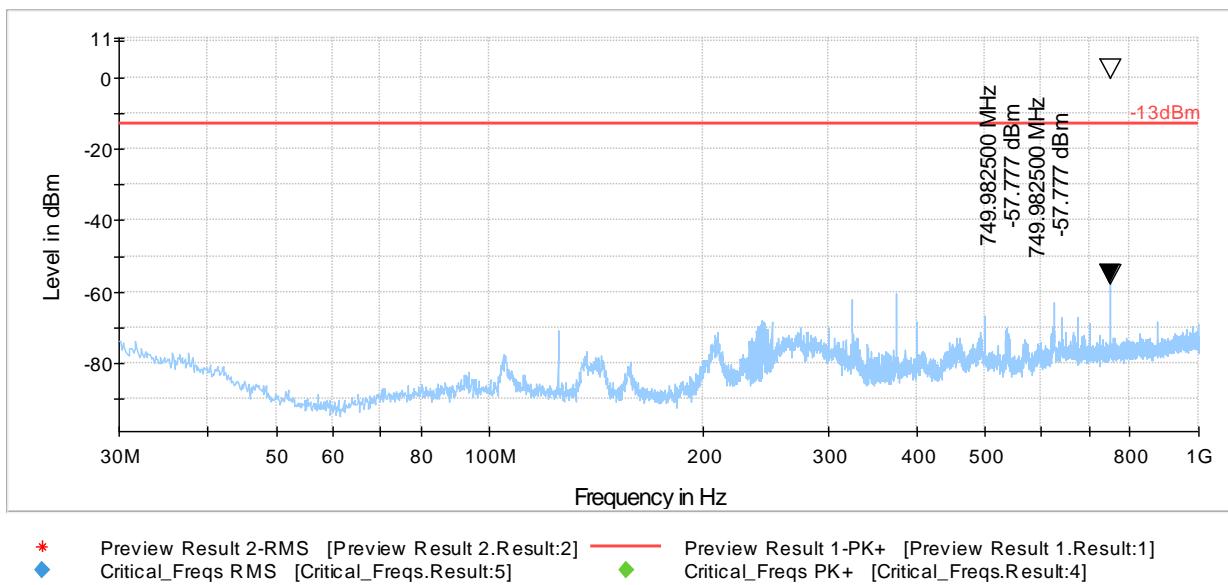
10.8.1 9 kHz – 30MHz, Ch. Mid



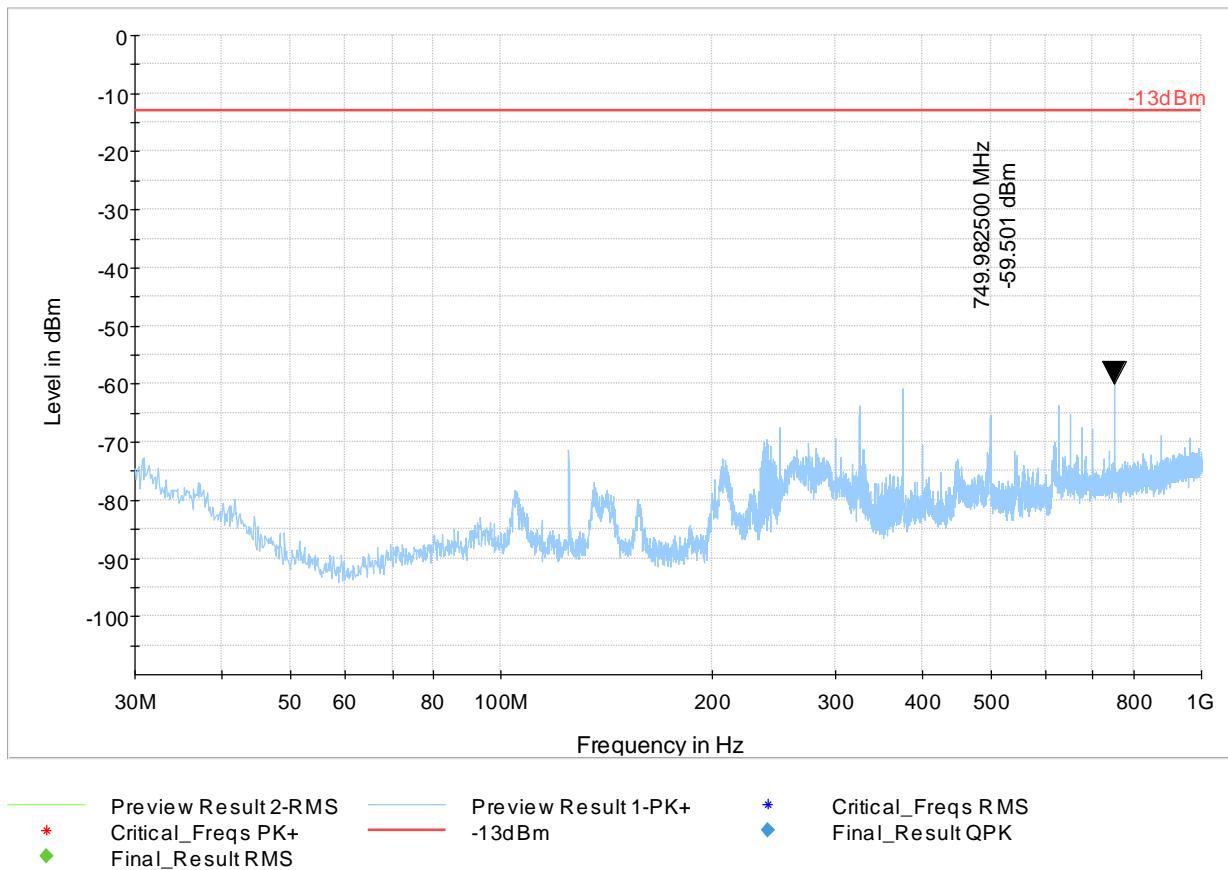
10.8.2 30MHz – 1GHz, Ch. Low



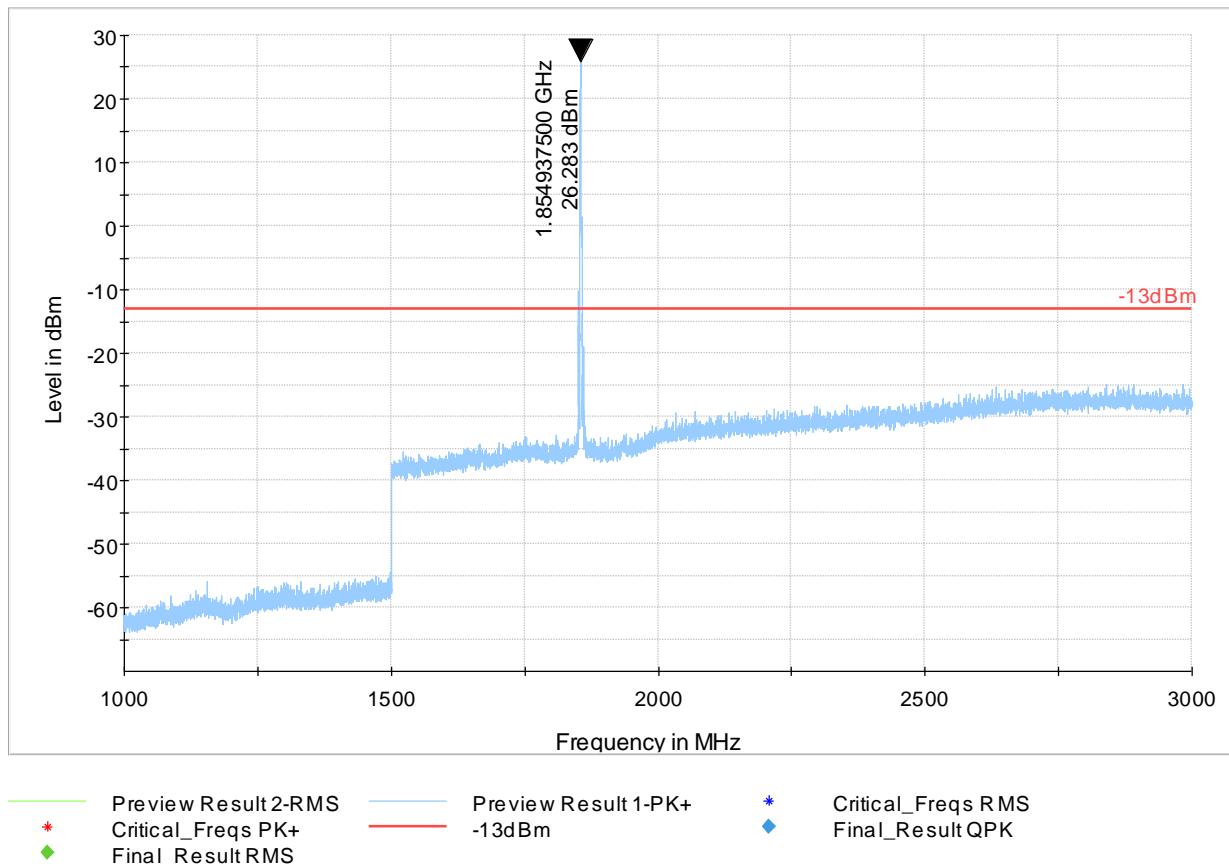
10.8.3 30MHz – 1GHz, Ch. Mid



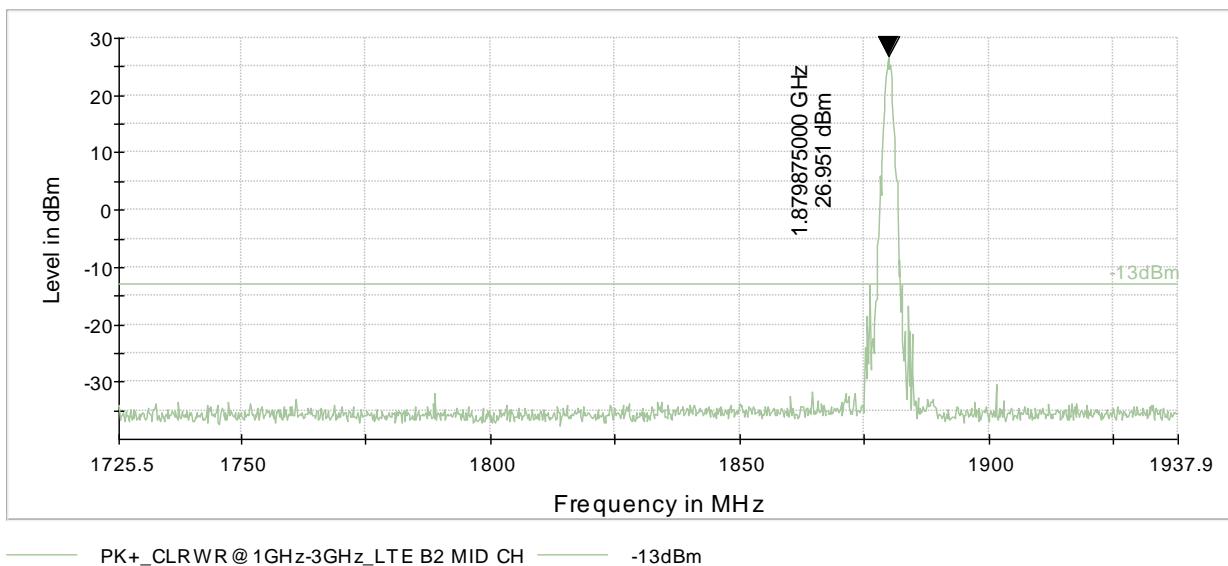
10.8.4 30MHz – 1GHz, Ch. High



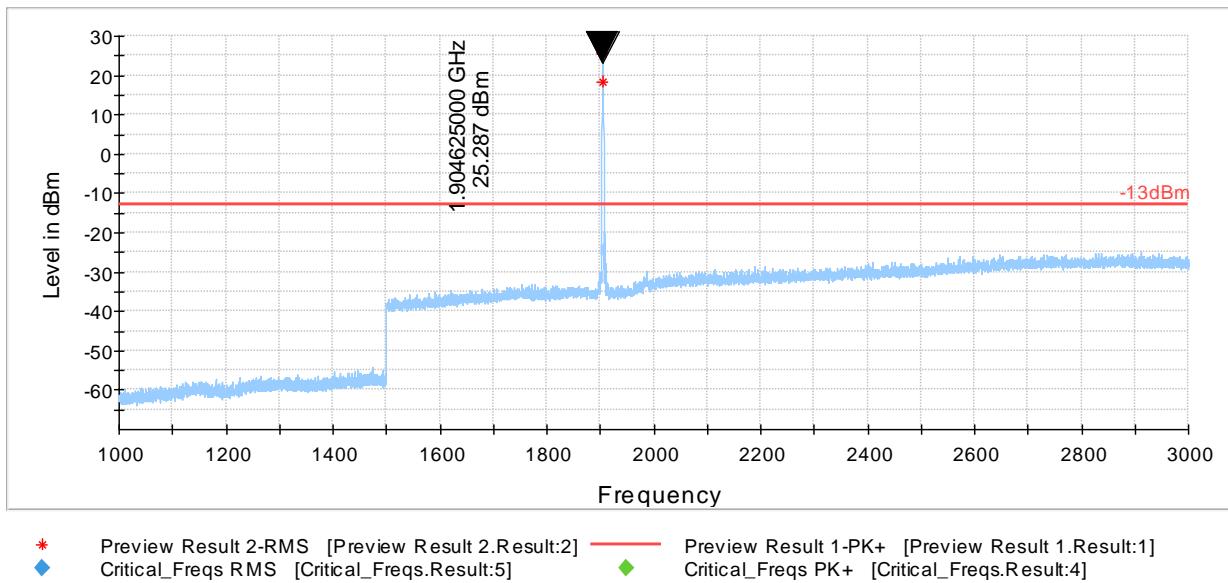
10.8.5 1GHz – 3GHz, Ch. Low



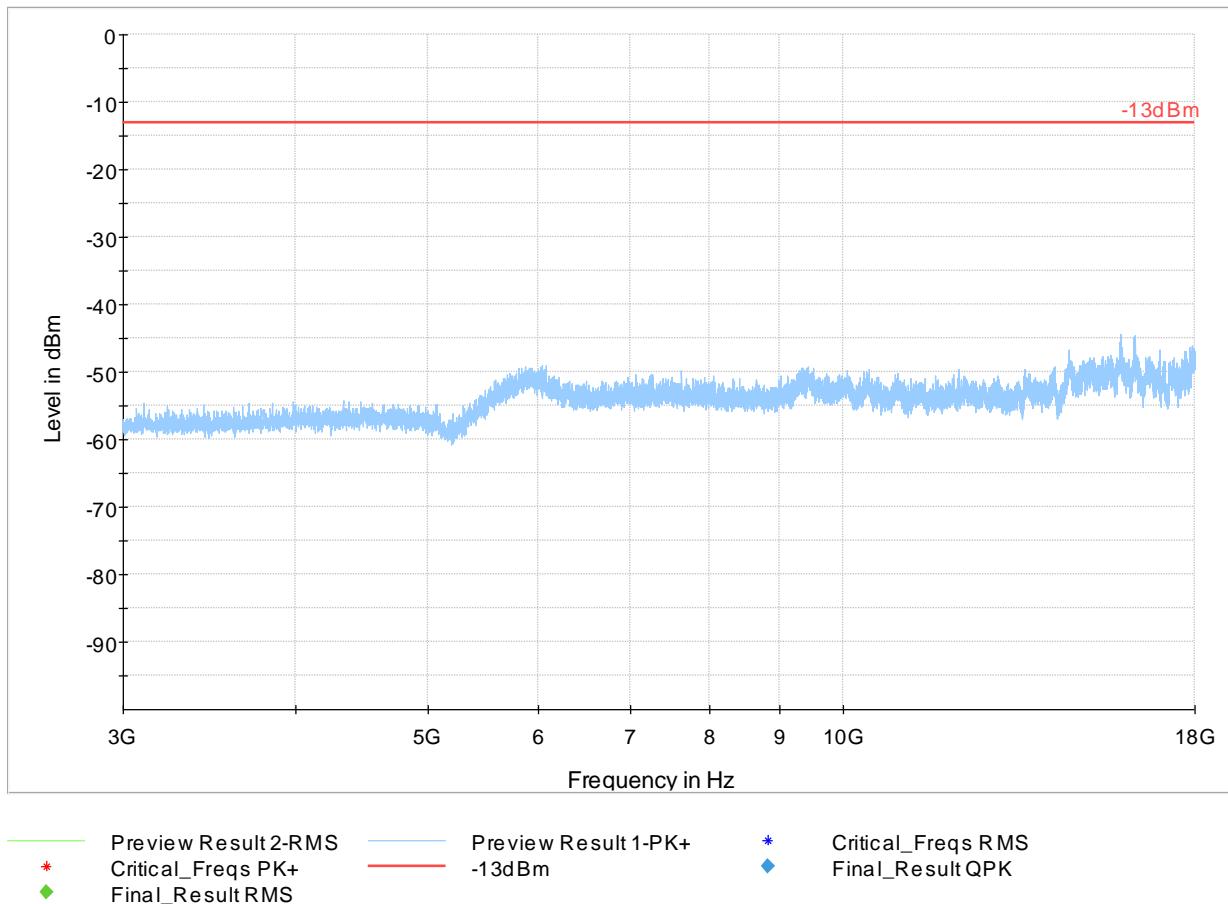
10.8.6 1GHz – 3GHz, Ch. Mid



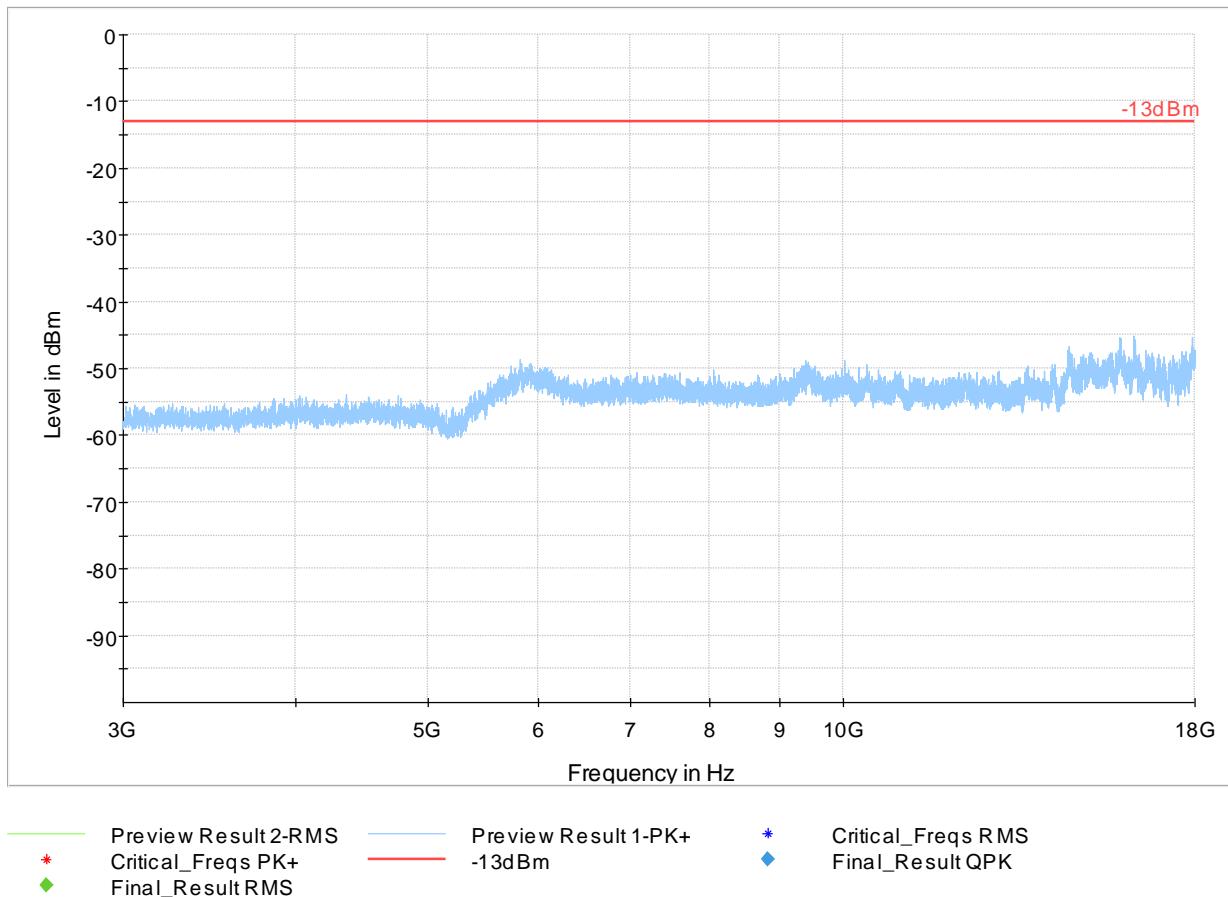
10.8.7 1GHz – 3GHz, Ch. High



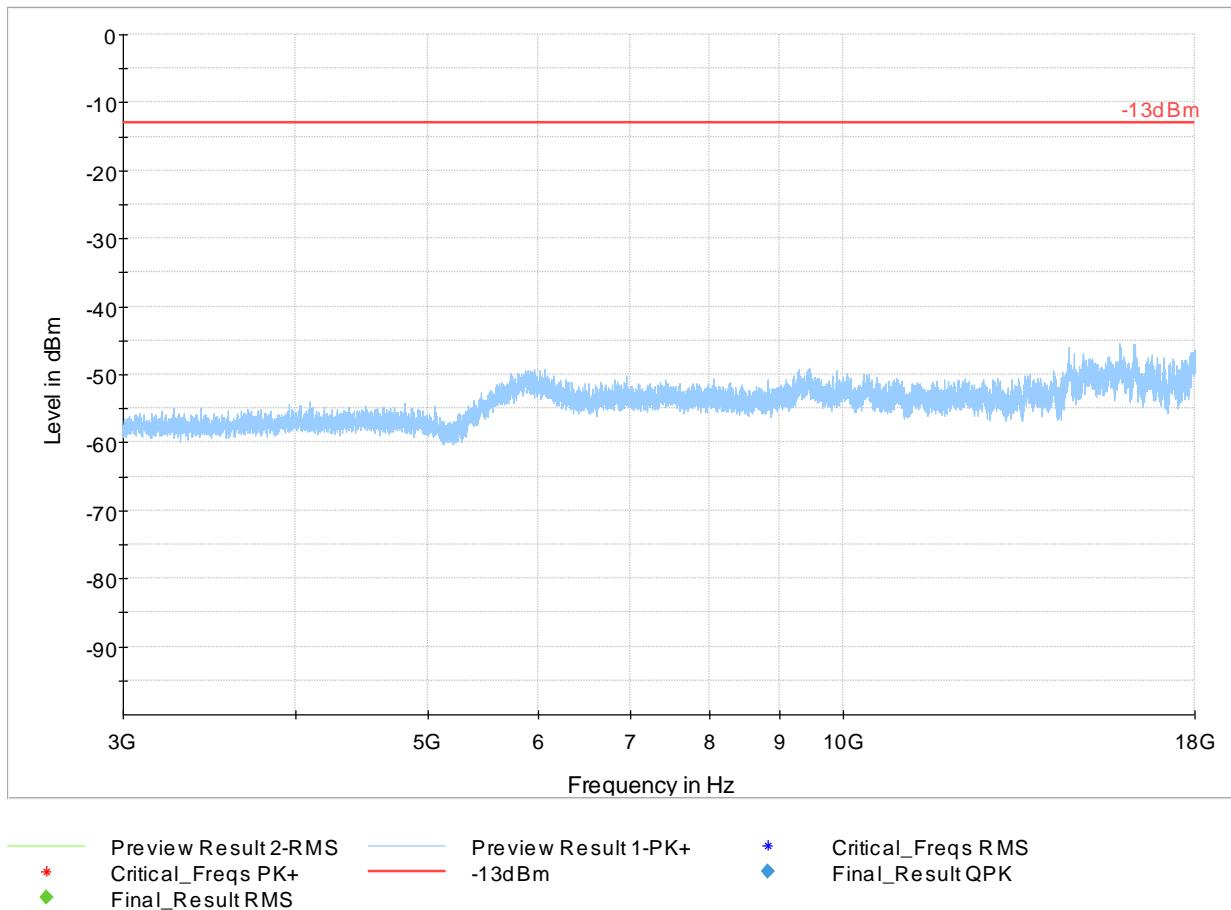
10.8.8 3GHz – 18GHz, Ch. Low



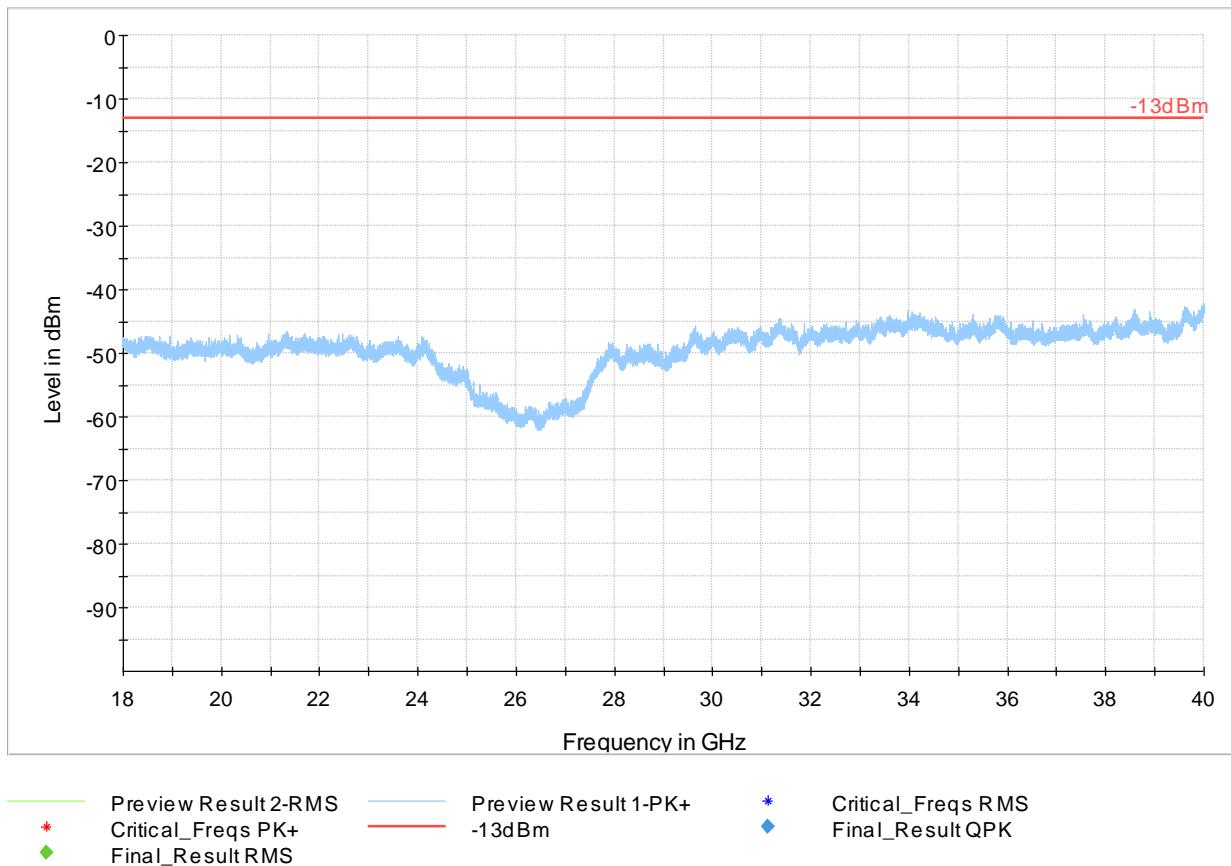
10.8.9 3GHz – 18GHz, Ch. Mid



10.8.10 3GHz – 18GHz, Ch. High

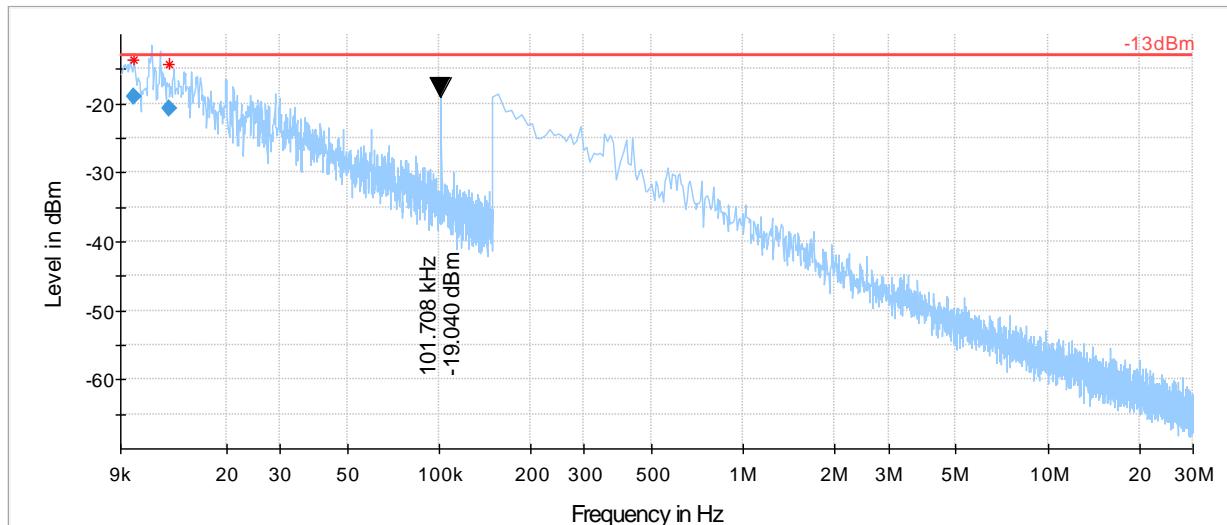


10.8.11 18GHz – 40GHz, Ch. Mid



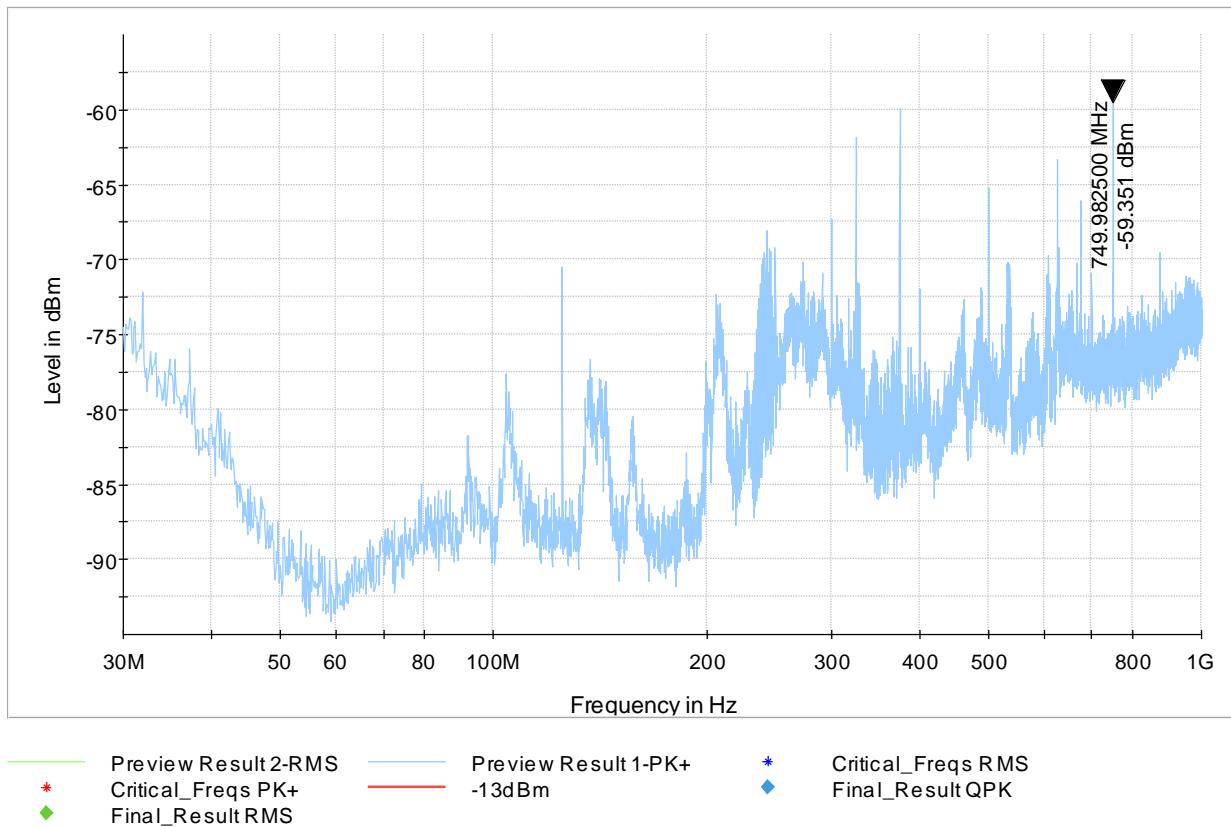
10.9 Measurement Plots LTE Band 4:

10.9.1 9 KHz – 30MHz, Ch. Mid

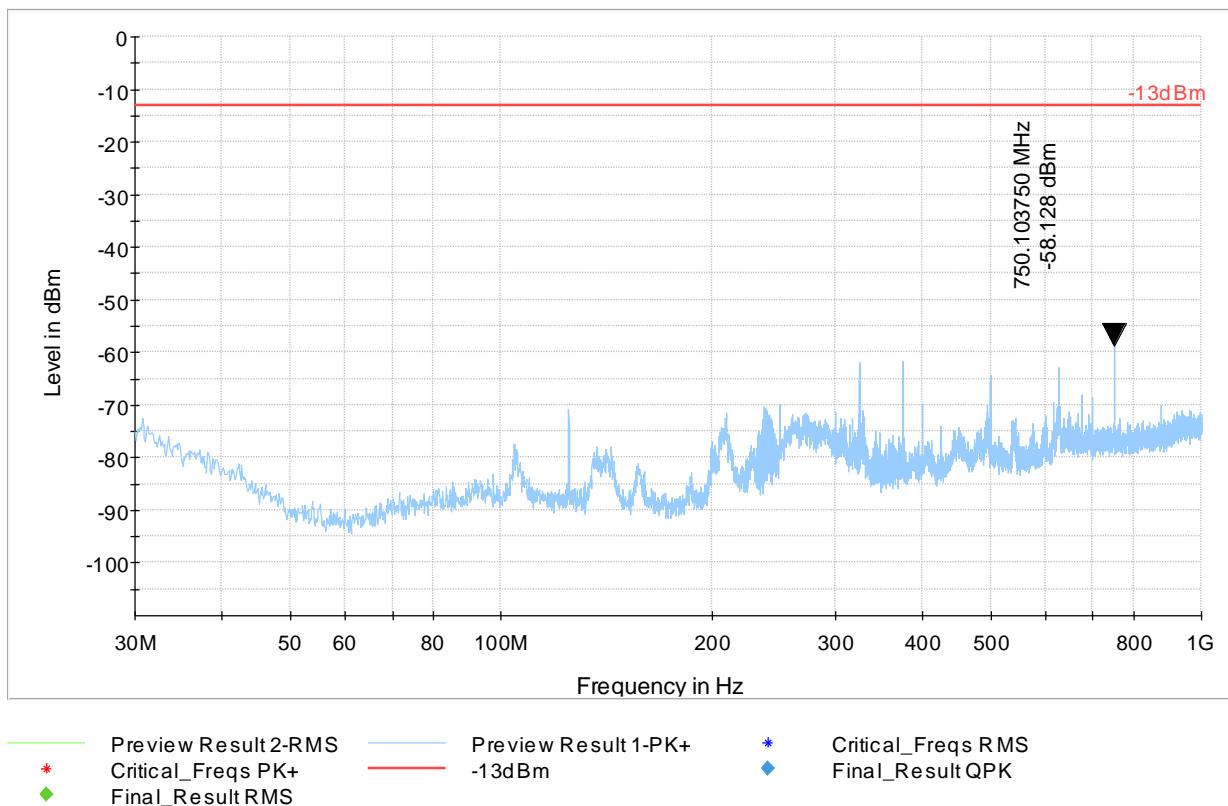


◆ Preview Result 2-RMS [Preview Result 2.Result:2]

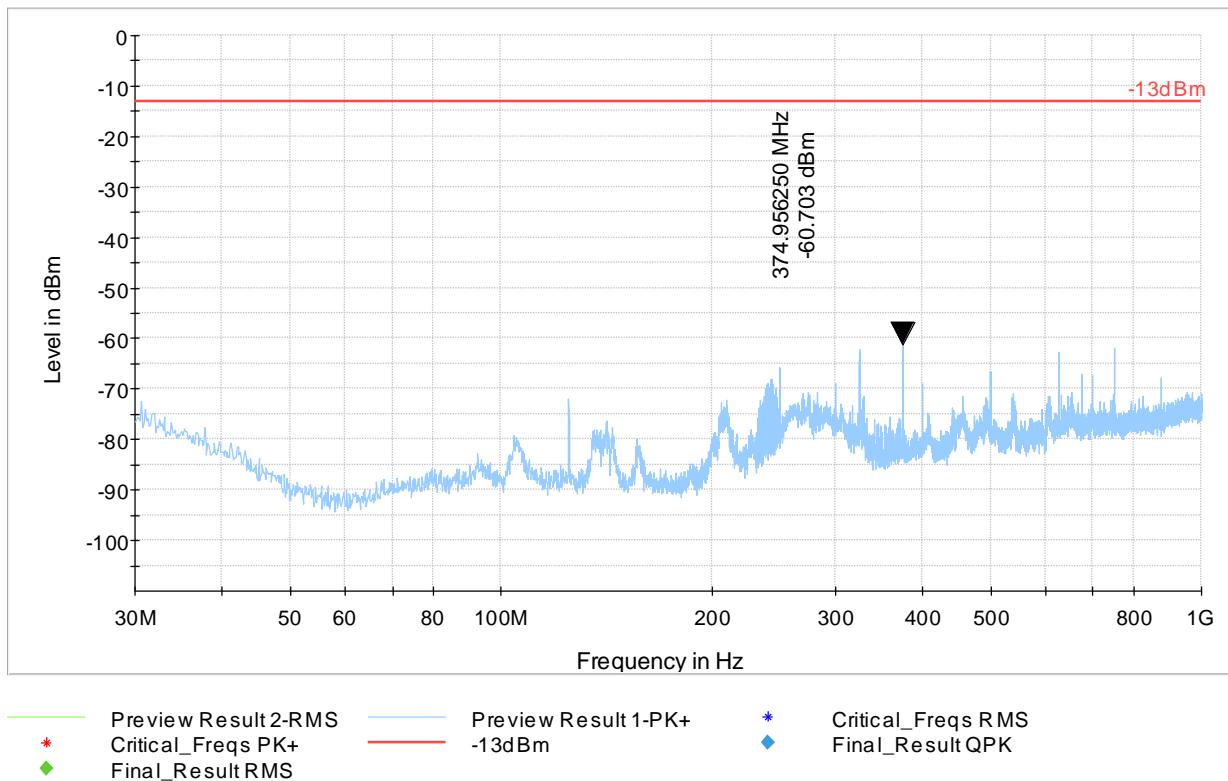
10.9.2 30MHz – 1GHz, Ch. Low



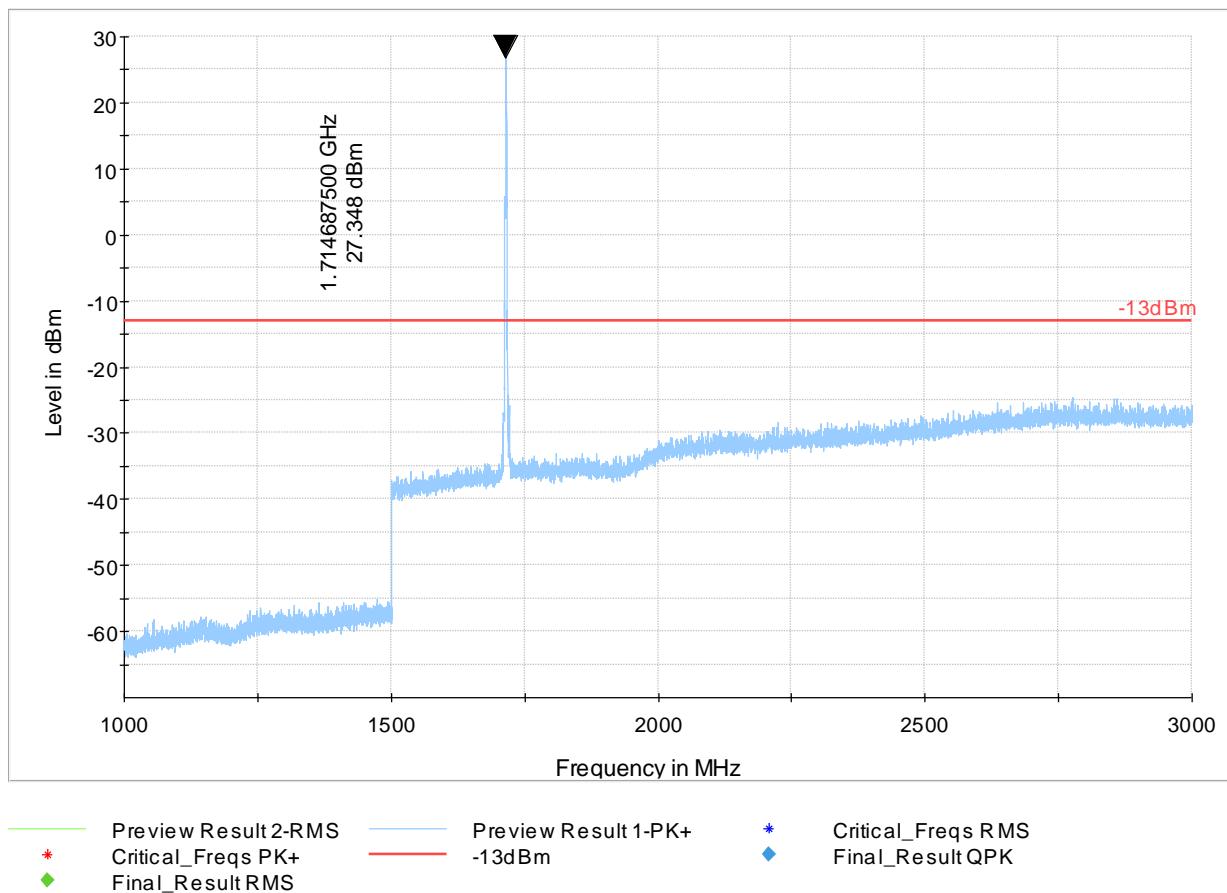
10.9.3 30MHz – 1GHz, Ch. Mid



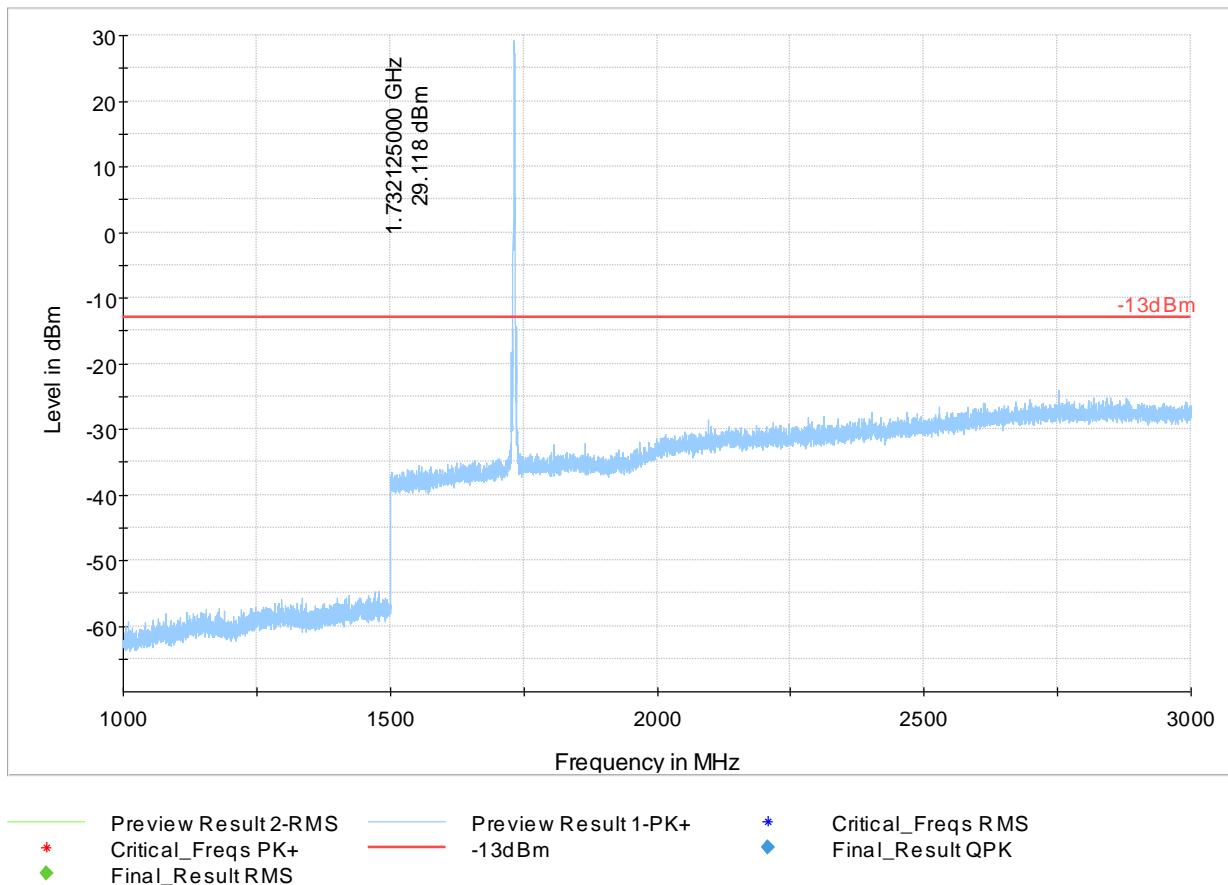
10.9.4 30MHz – 1GHz, Ch. High



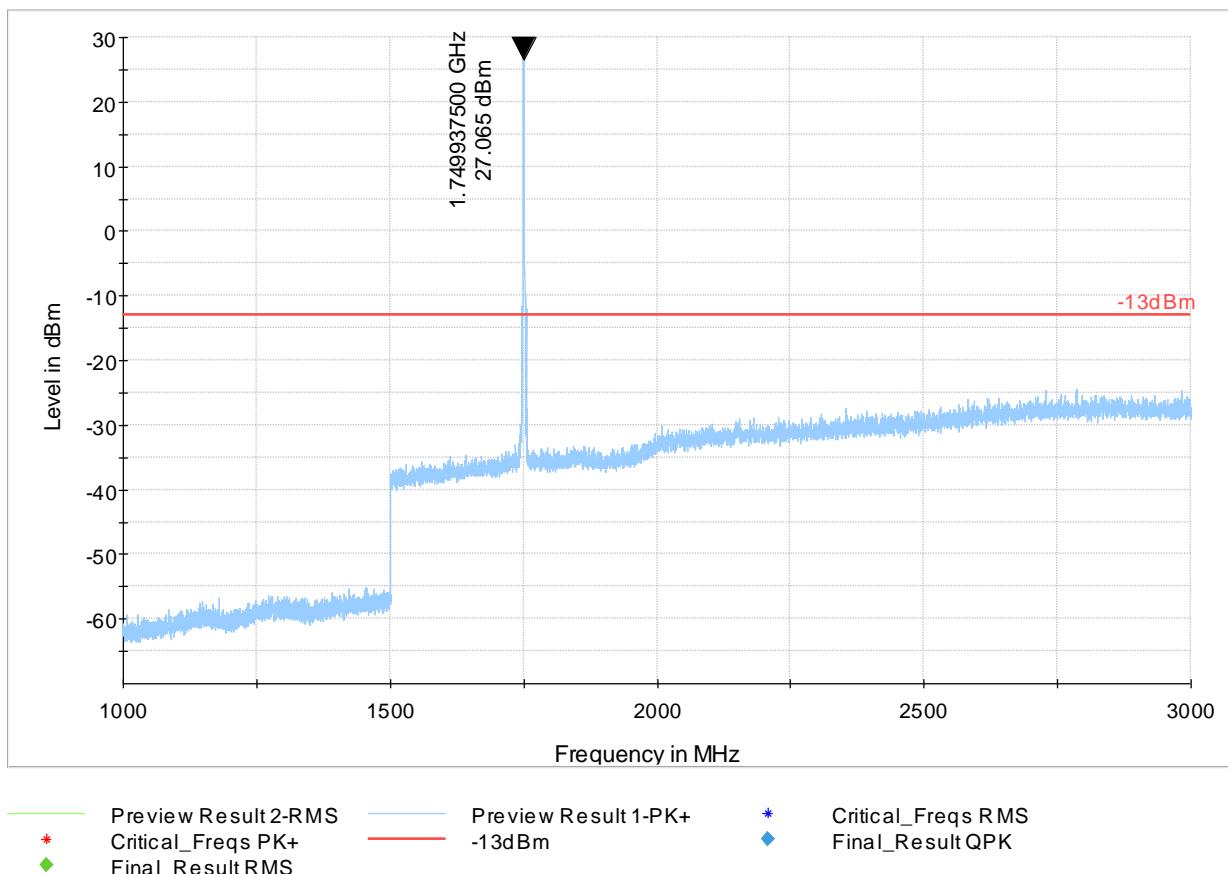
10.9.5 1GHz – 3GHz, Ch. Low



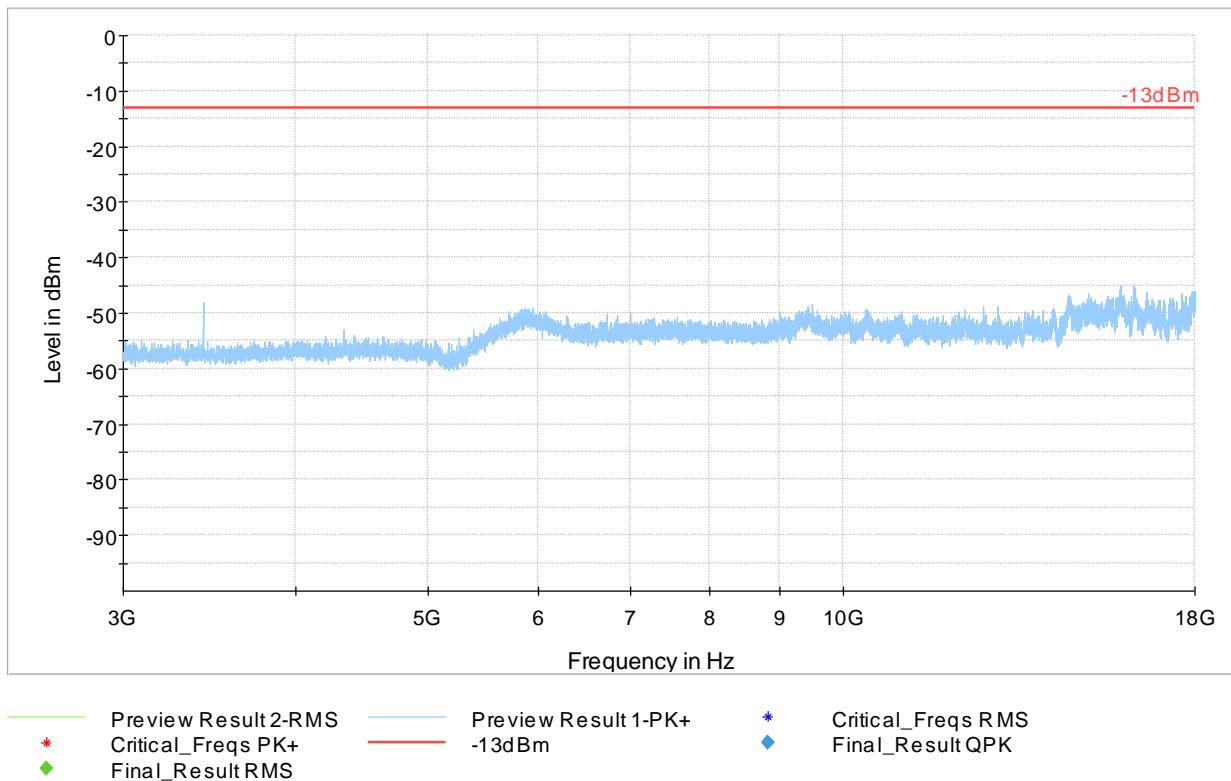
10.9.6 1GHz – 3GHz, Ch. Mid



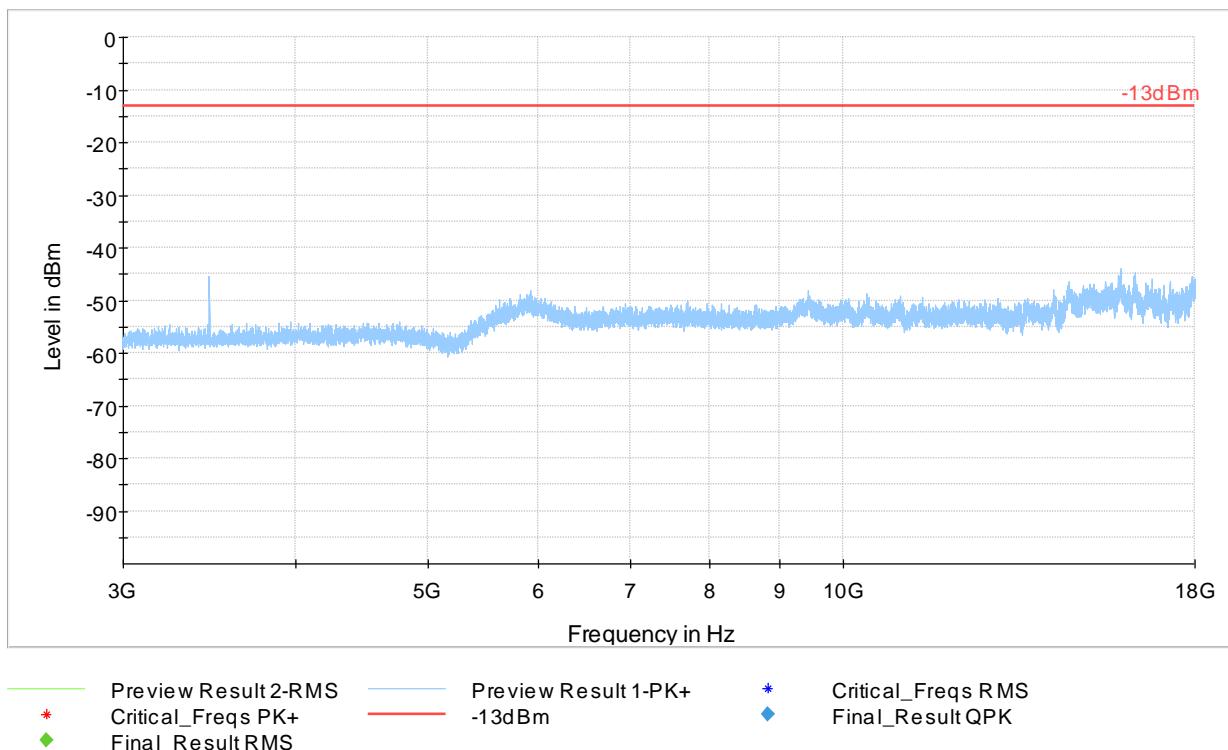
10.9.7 1GHz – 3GHz, Ch. High



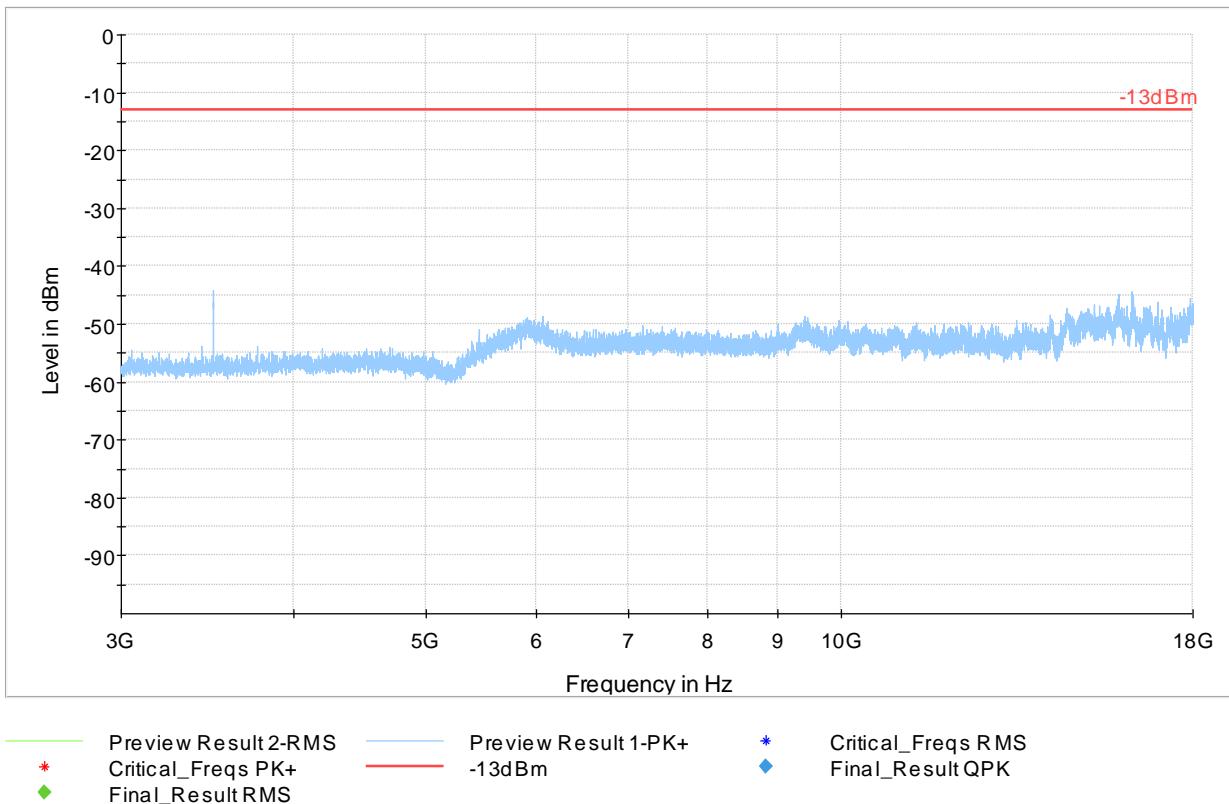
10.9.8 3GHz – 18GHz, Ch. Low



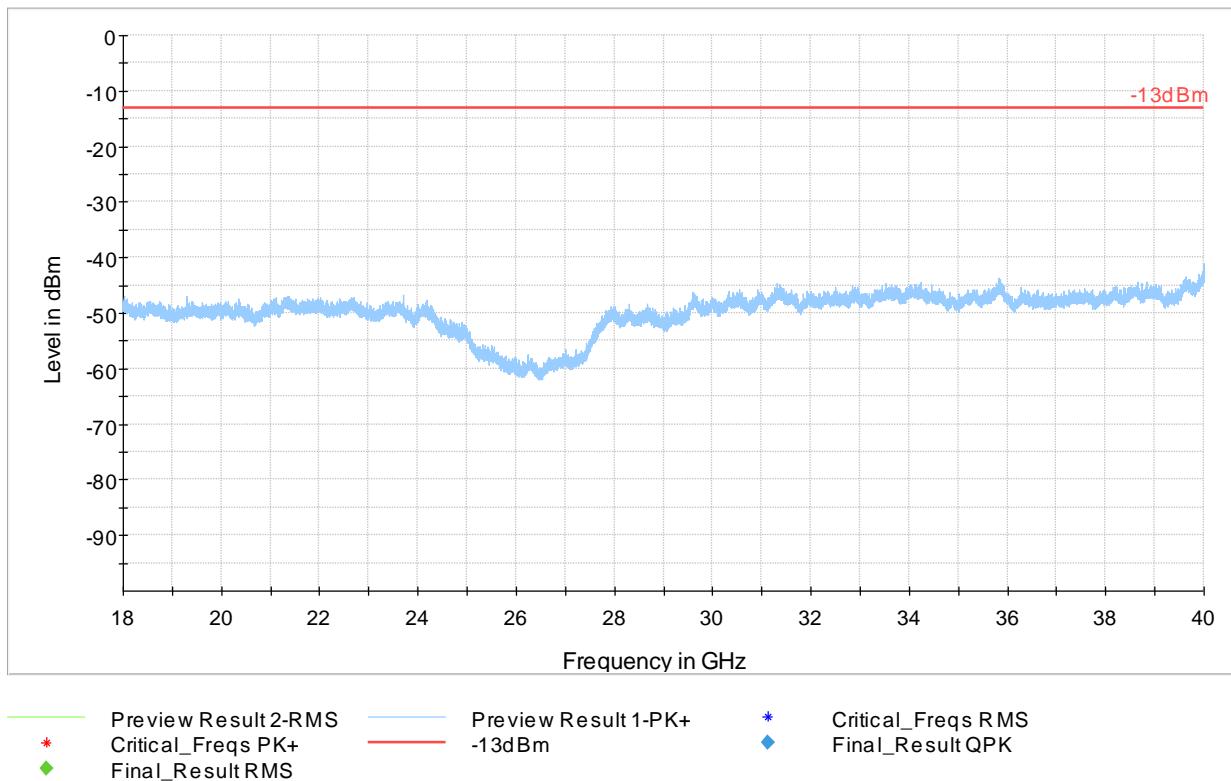
10.9.9 3GHz – 18GHz, Ch. Mid



10.9.10 3GHz – 18GHz, Ch. High

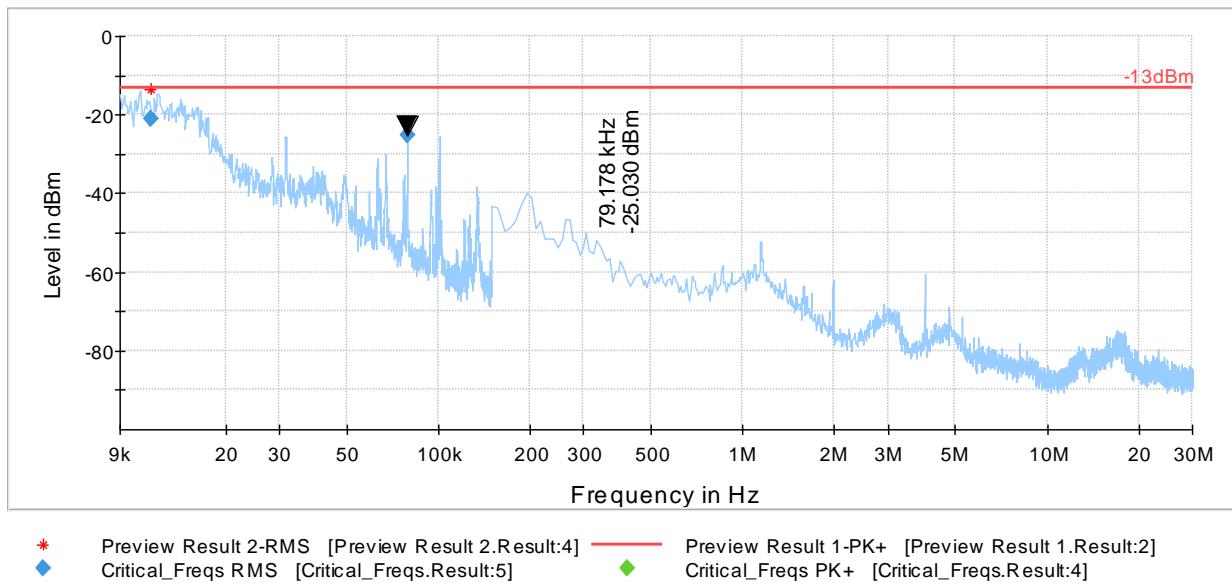


10.9.11 18GHz – 40GHz, Ch. Mid

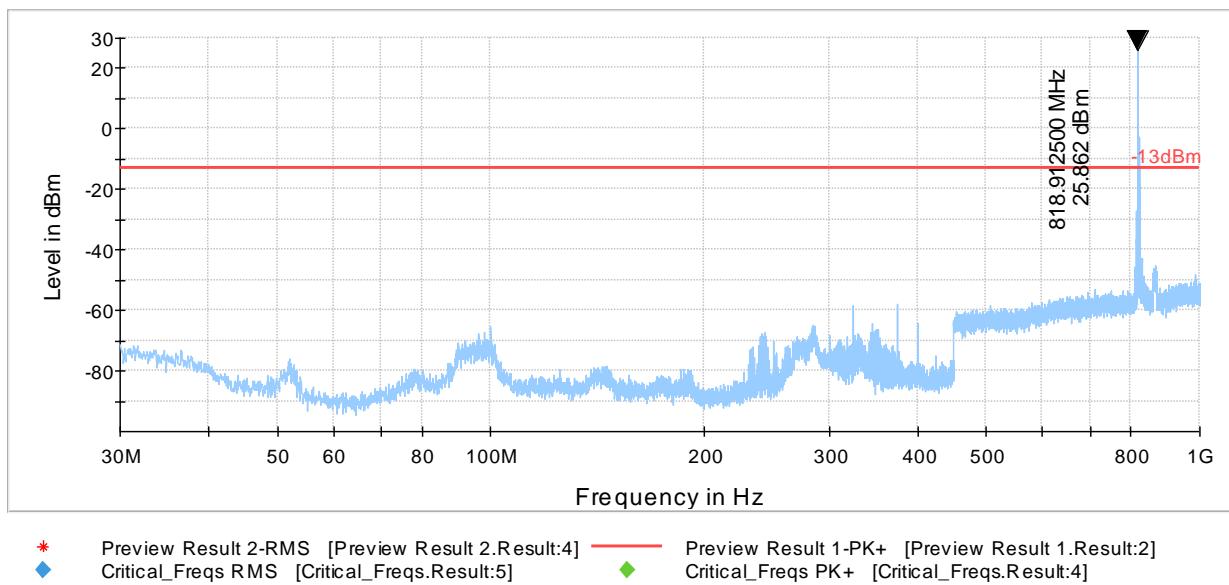


10.10 Measurement Plots LTE Band 26/ Band 5:

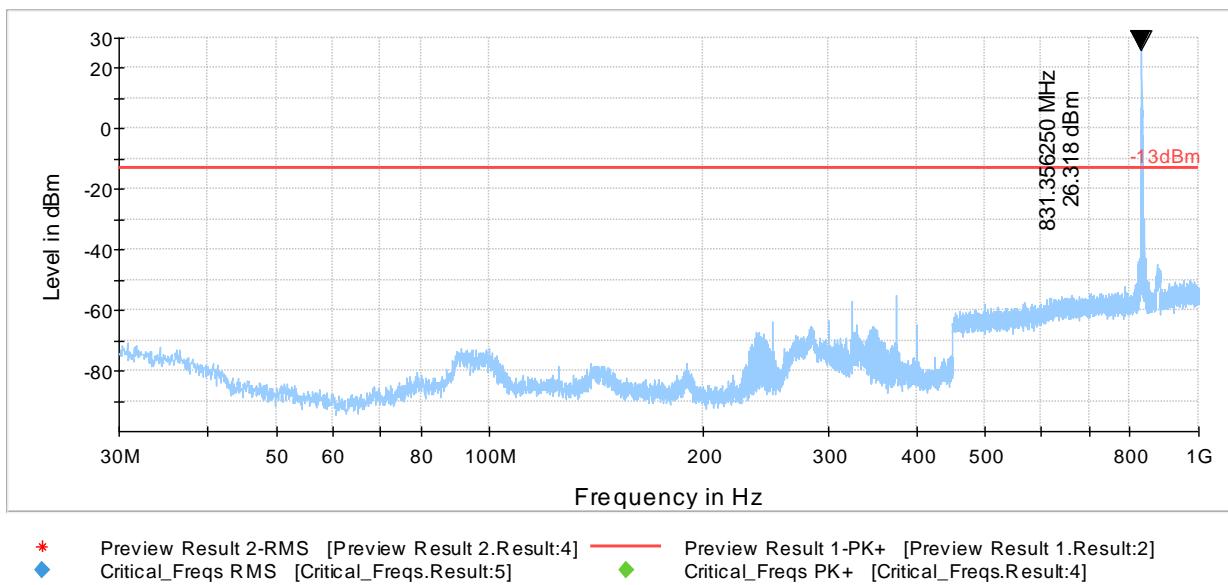
10.10.1 9 KHz – 30MHz, Ch. Mid



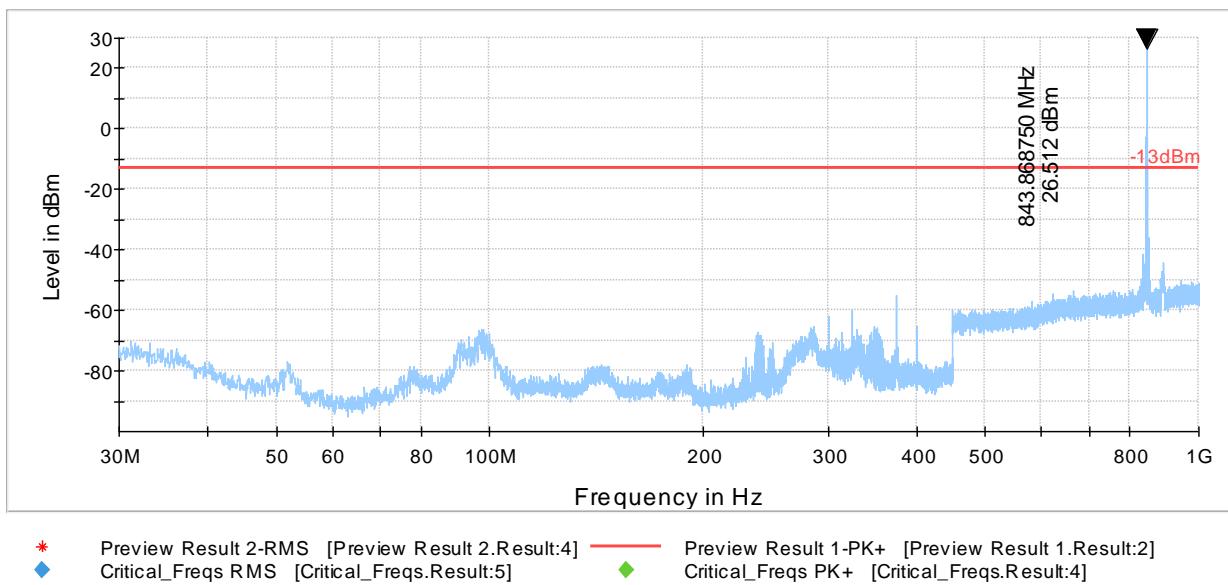
10.10.2 30MHz – 1GHz, Ch. Low



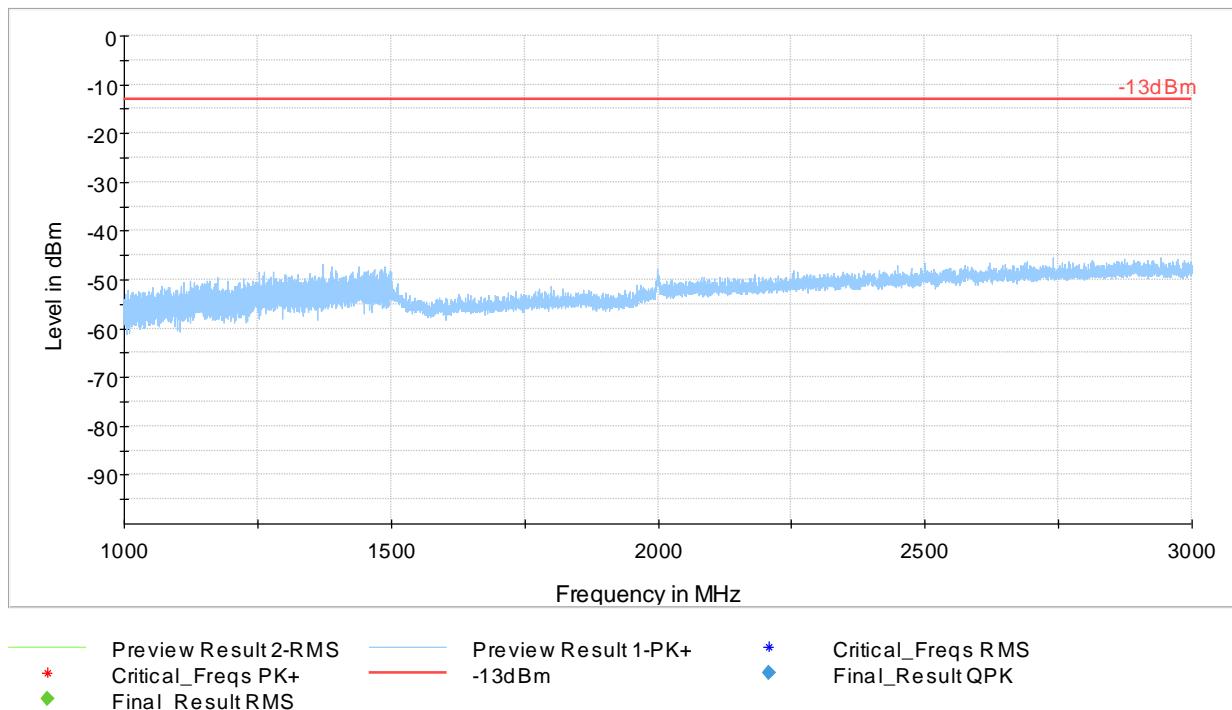
10.10.3 30MHz – 1GHz, Ch. Mid



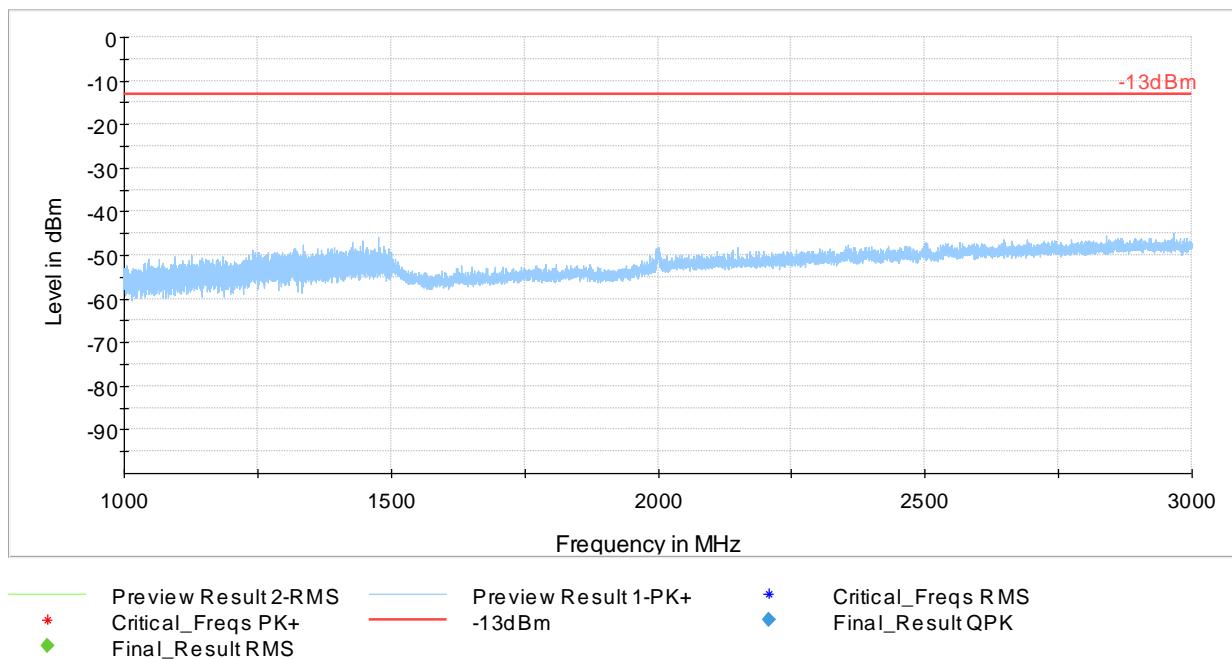
10.10.4 30MHz – 1GHz, Ch. High



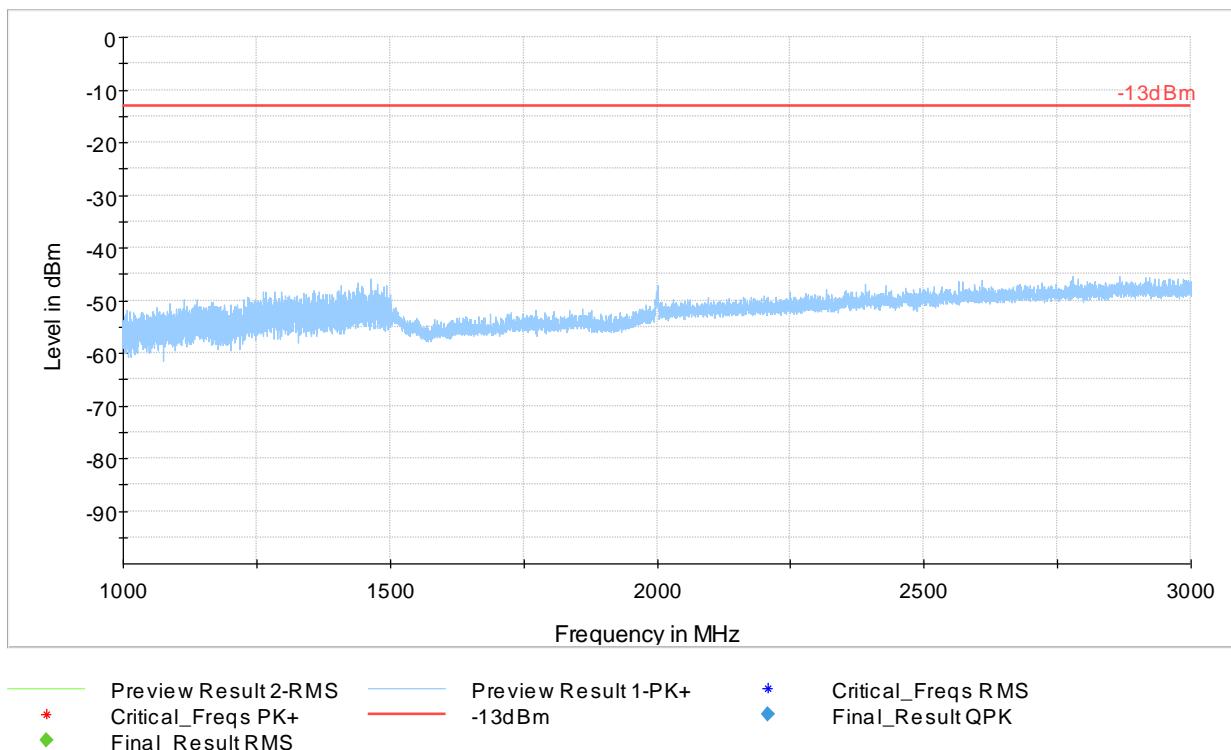
10.10.5 1GHz – 3GHz, Ch. Low



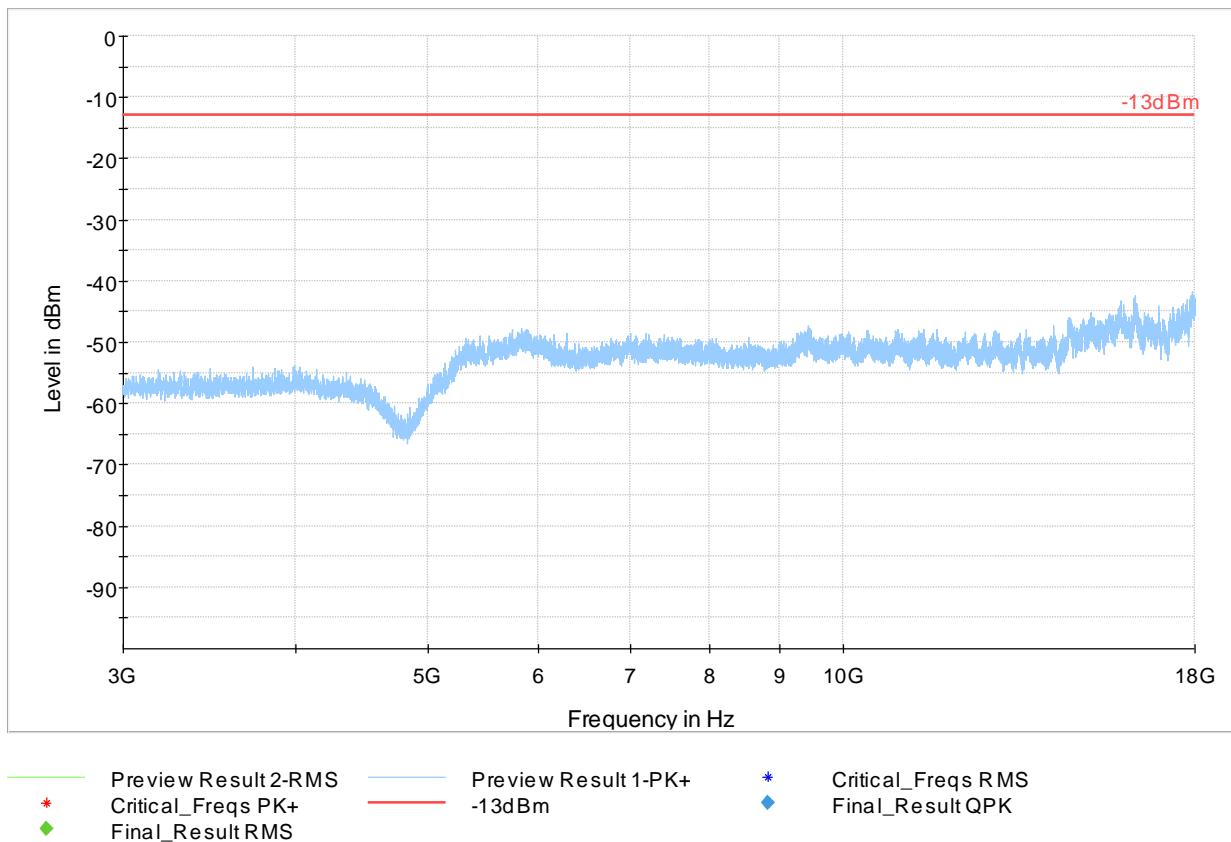
10.10.6 1GHz – 3GHz, Ch. Mid



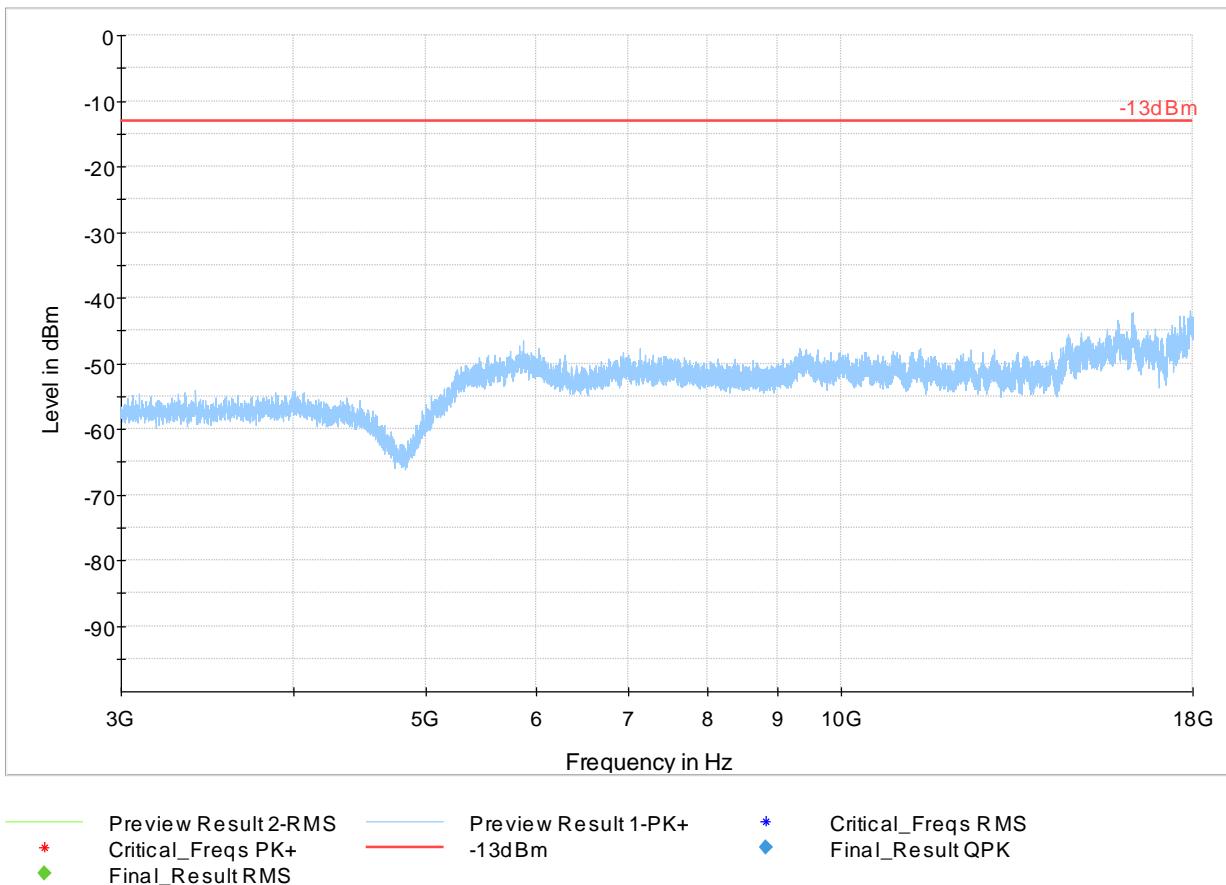
10.10.7 1GHz – 3GHz, Ch. High



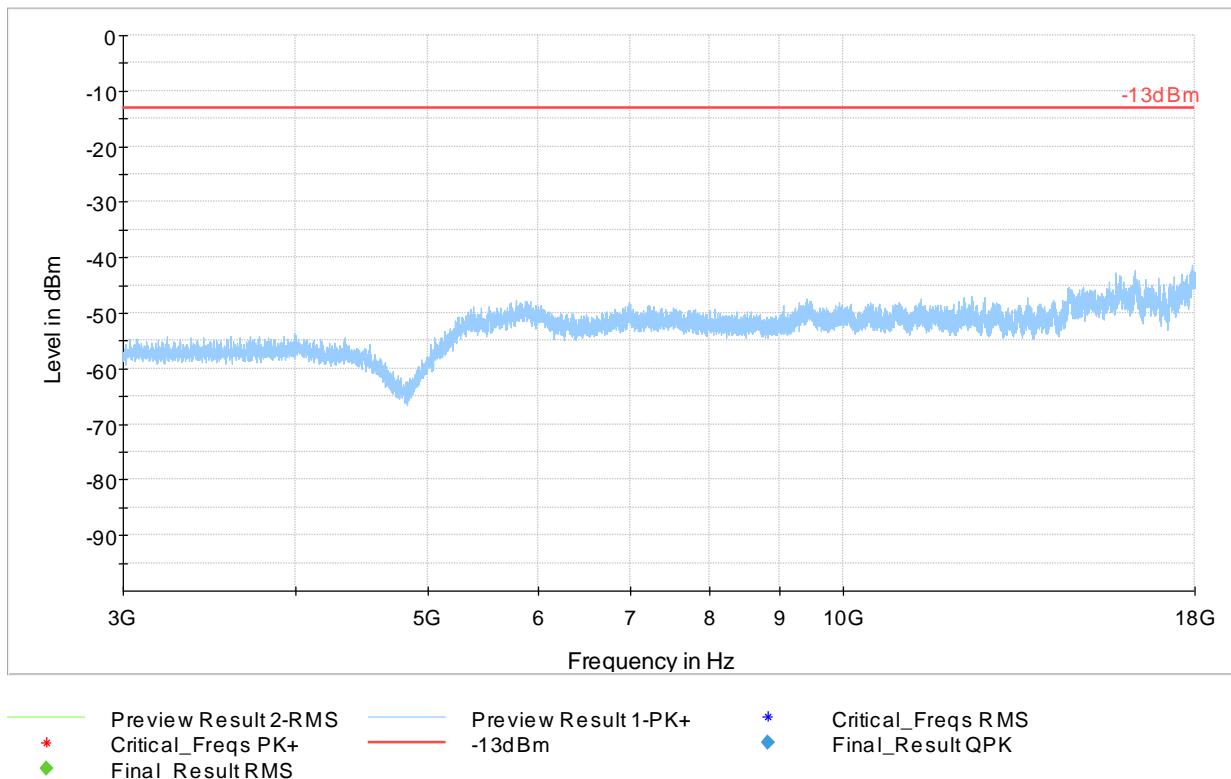
10.10.8 3GHz – 18GHz, Ch. Low



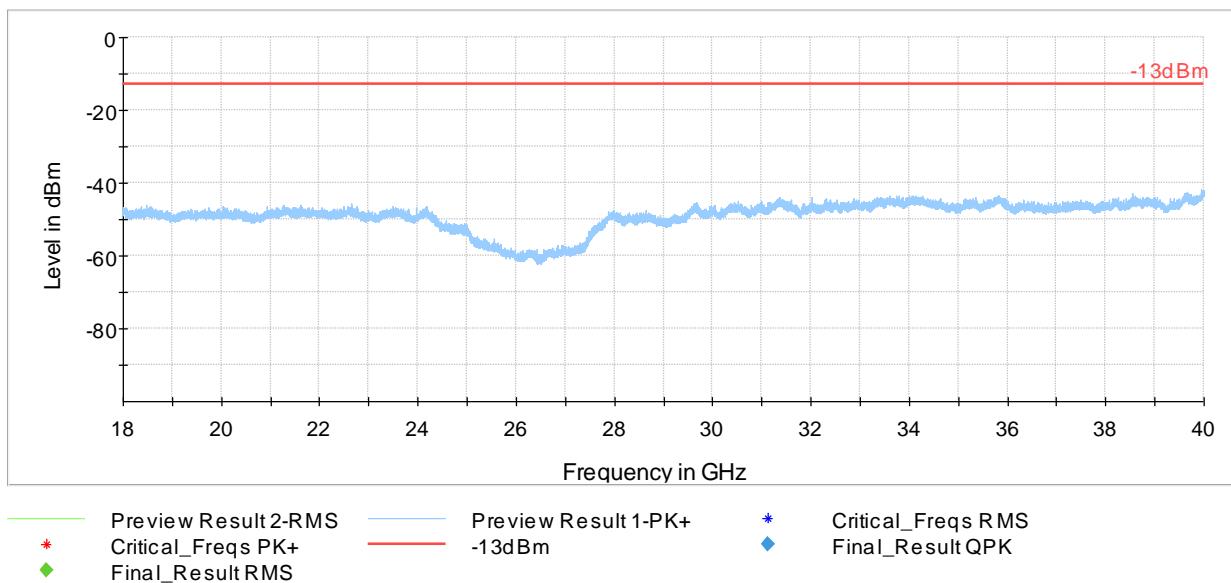
10.10.9 3GHz – 18GHz, Ch. Mid



10.10.10 3GHz – 18GHz, Ch. High

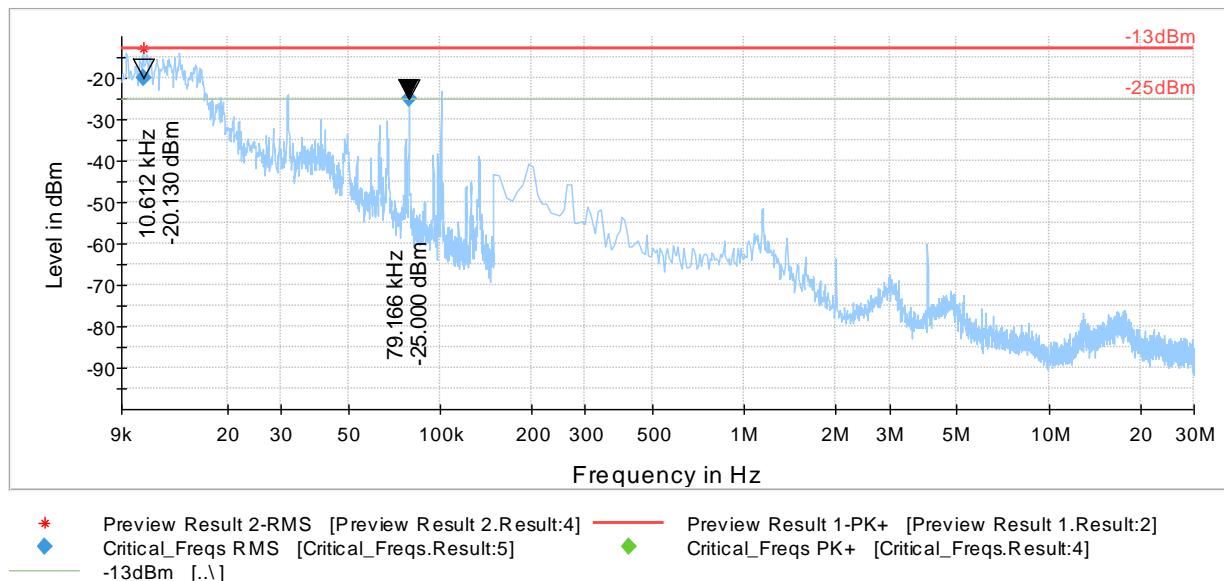


10.10.11 18GHz – 40GHz, Ch. Mid

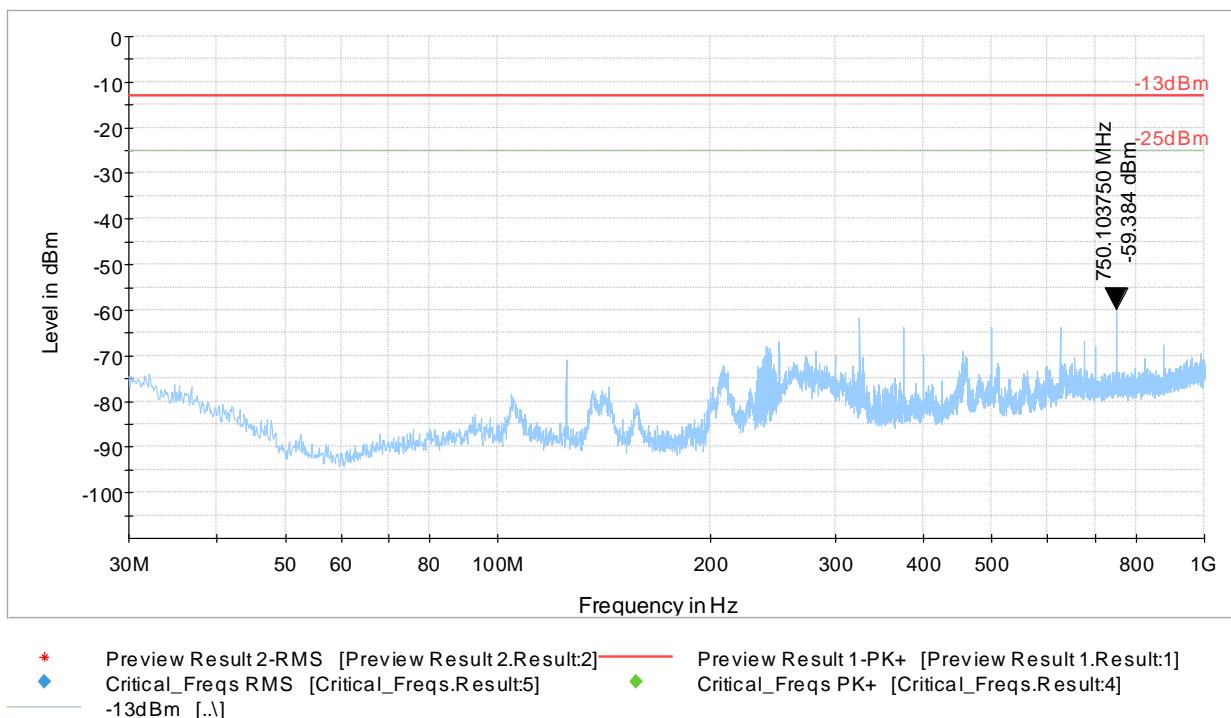


10.11 Measurement Plots LTE Band 7:

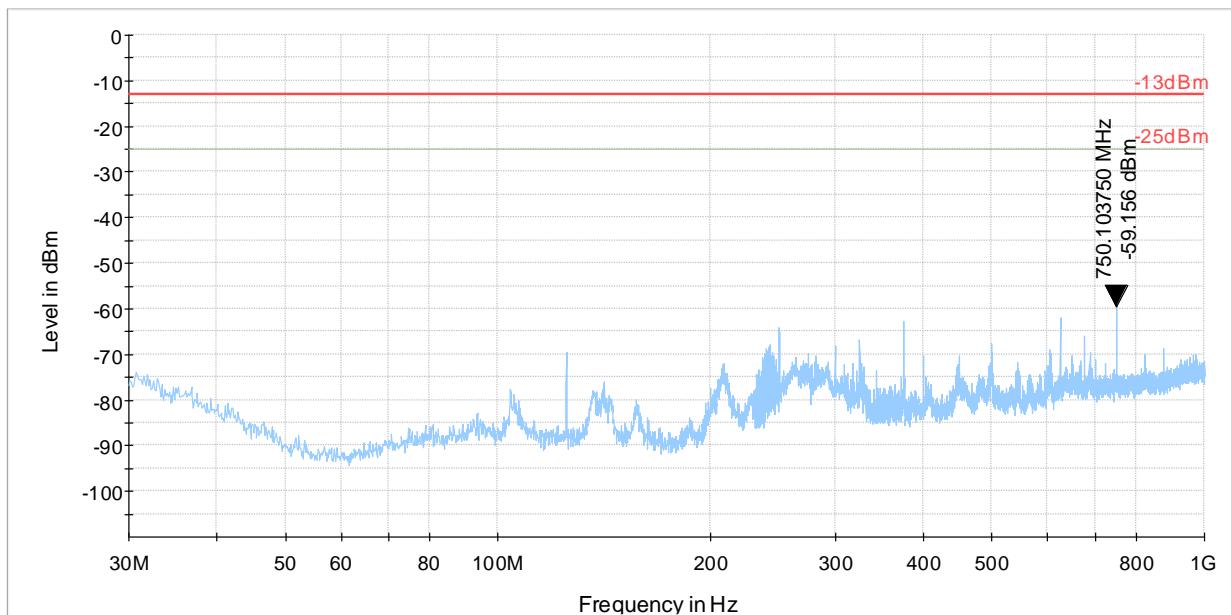
10.11.1 9 KHz – 30MHz, Ch. Mid



10.11.2 30MHz – 1GHz, Ch. Low

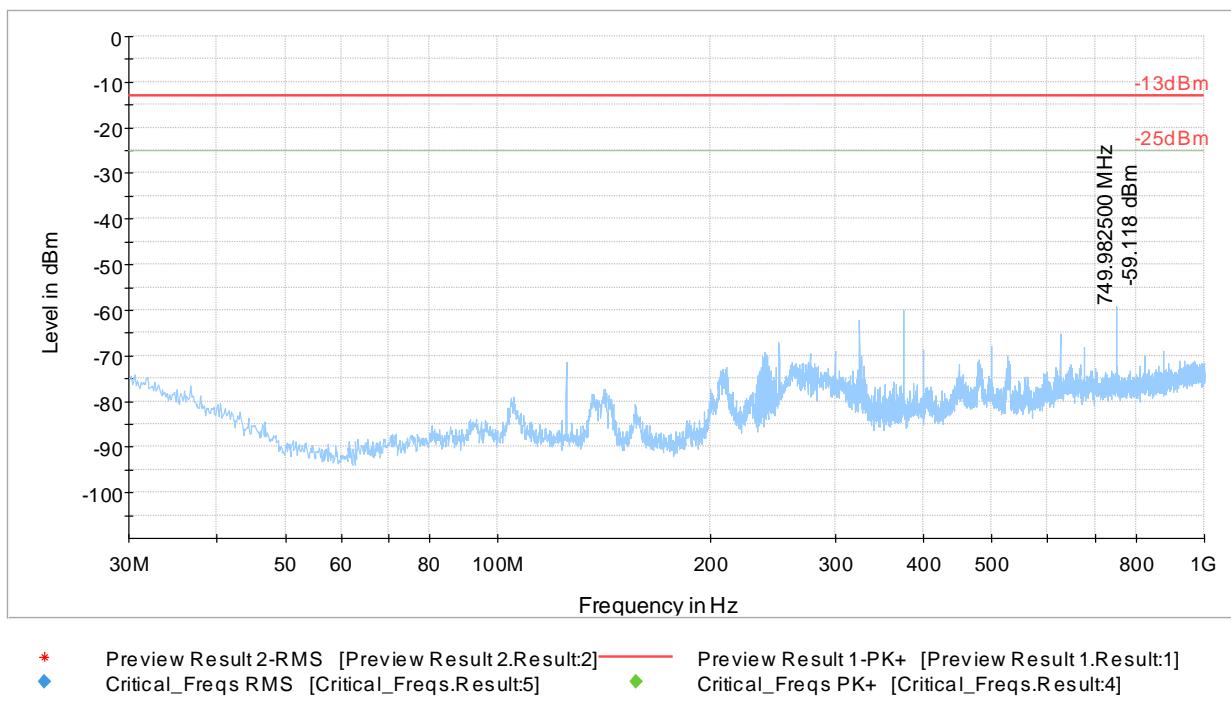


10.11.3 30MHz – 1GHz, Ch. Mid

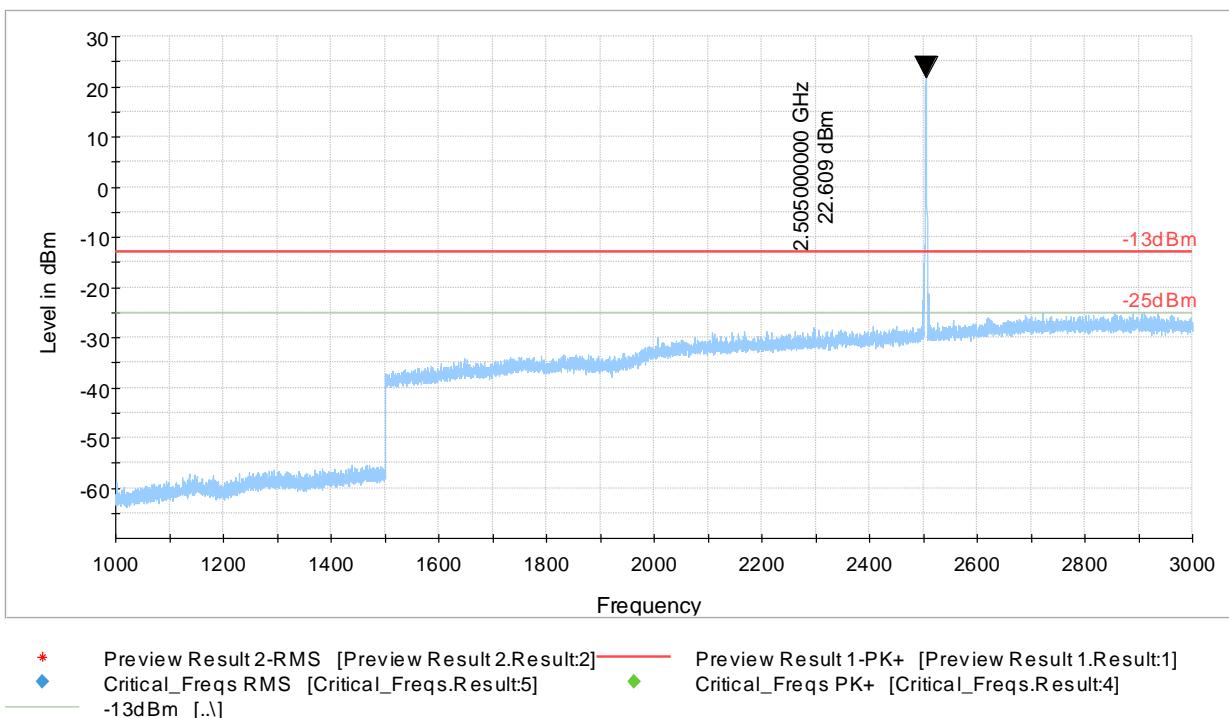


* Preview Result 2-RMS [Preview Result 2.Result:2] Preview Result 1-PK+ [Preview Result 1.Result:1]
◆ Critical_Freqs RMS [Critical_Freqs.Result:5] ♦ Critical_Freqs PK+ [Critical_Freqs.Result:4]
-13dBm [..]

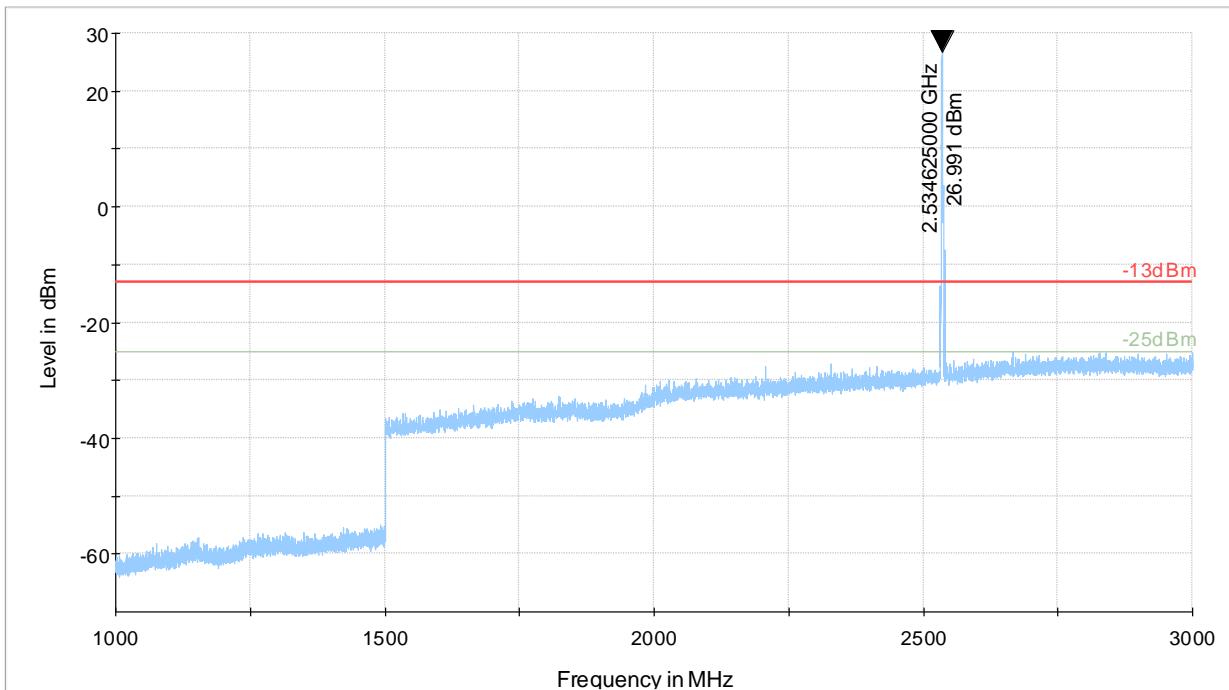
10.11.4 30MHz – 1GHz, Ch. High



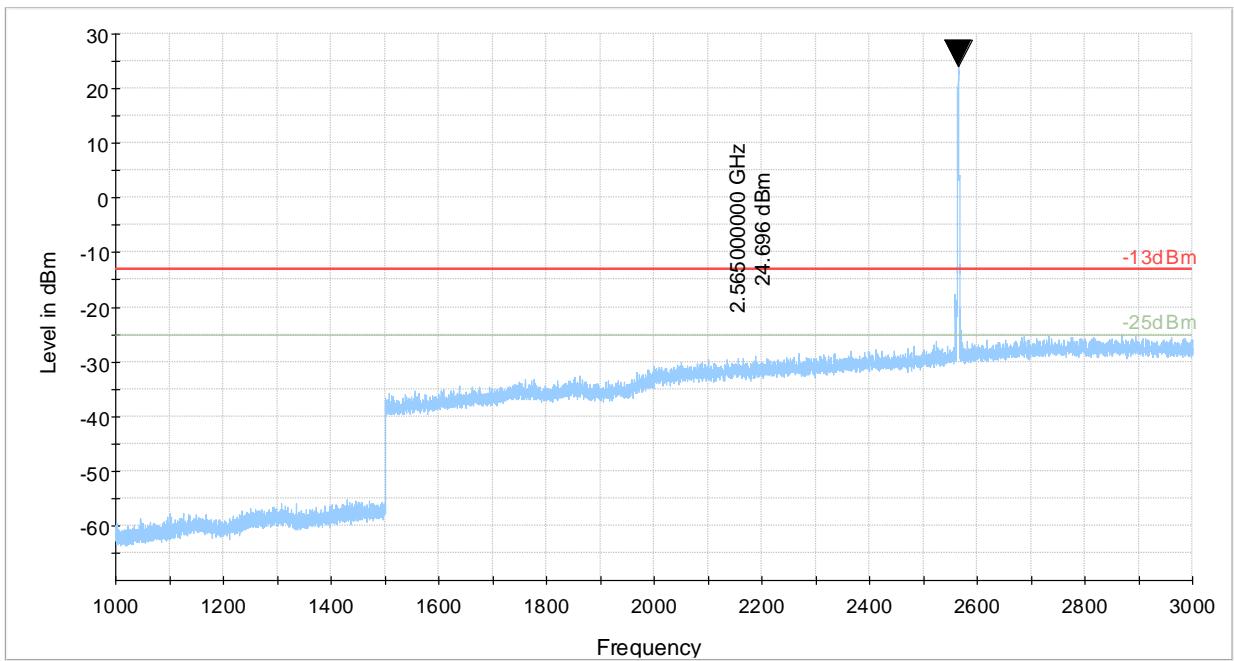
10.11.5 1GHz – 3GHz, Ch. Low



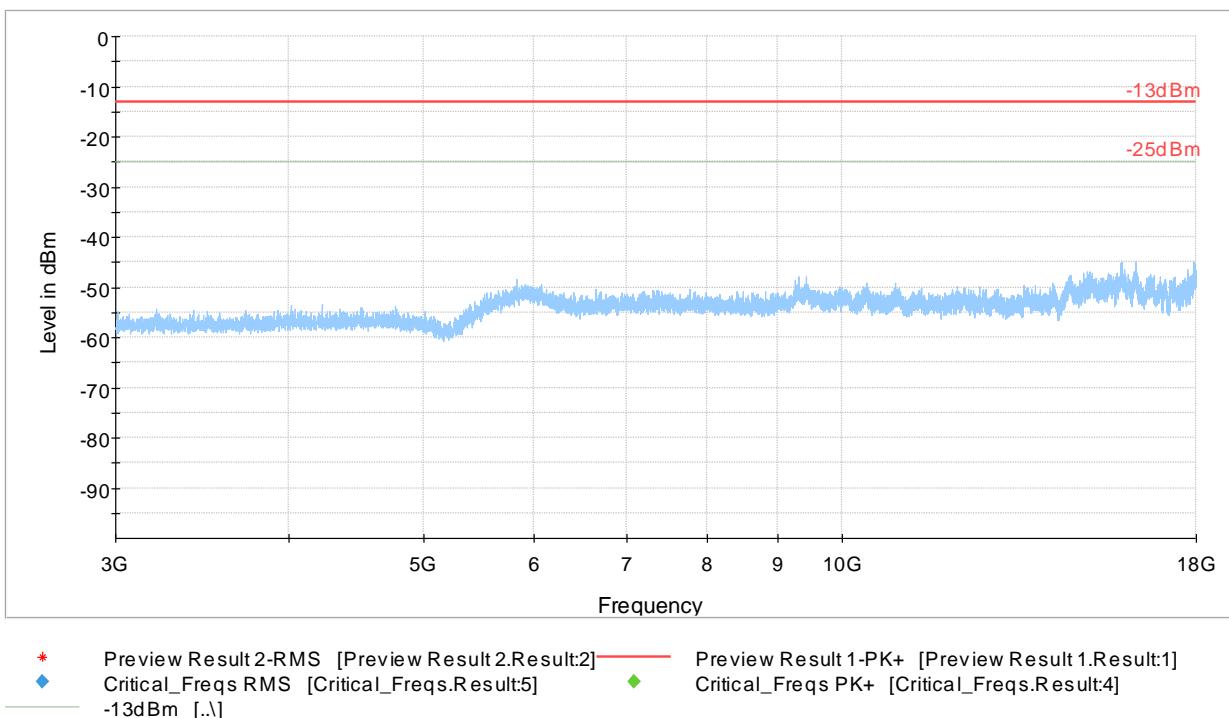
10.11.6 1GHz – 3GHz, Ch. Mid



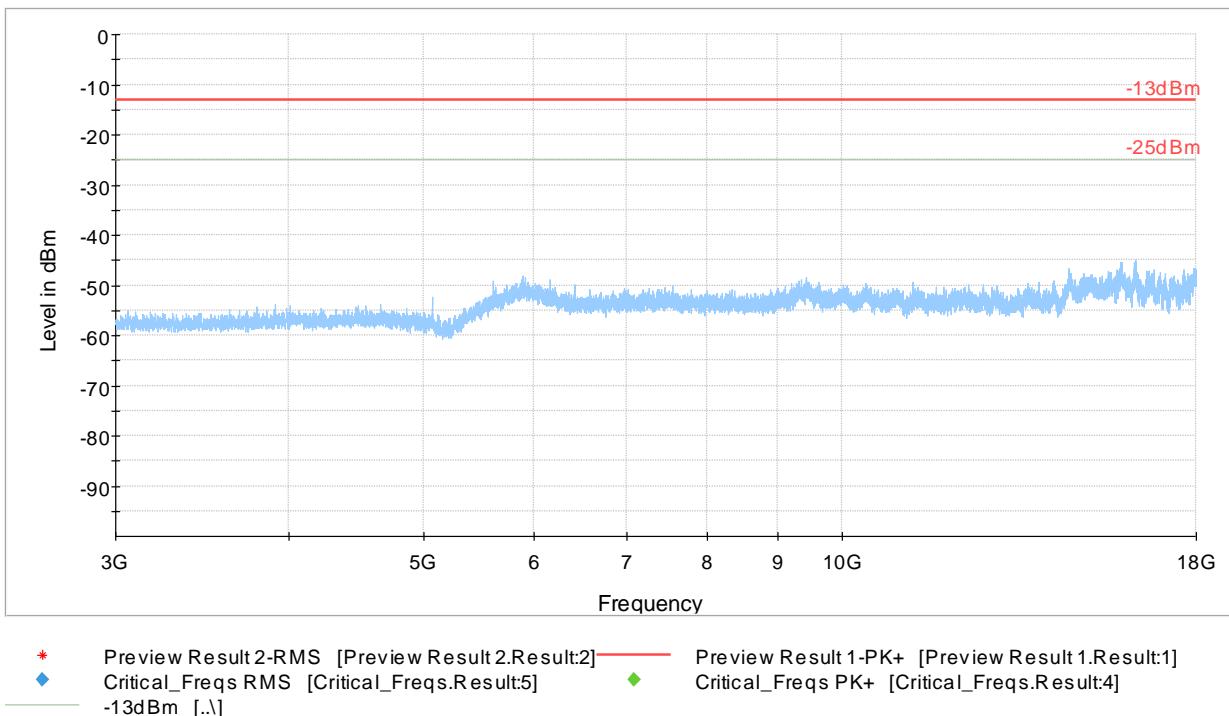
10.11.7 1GHz – 3GHz, Ch. High



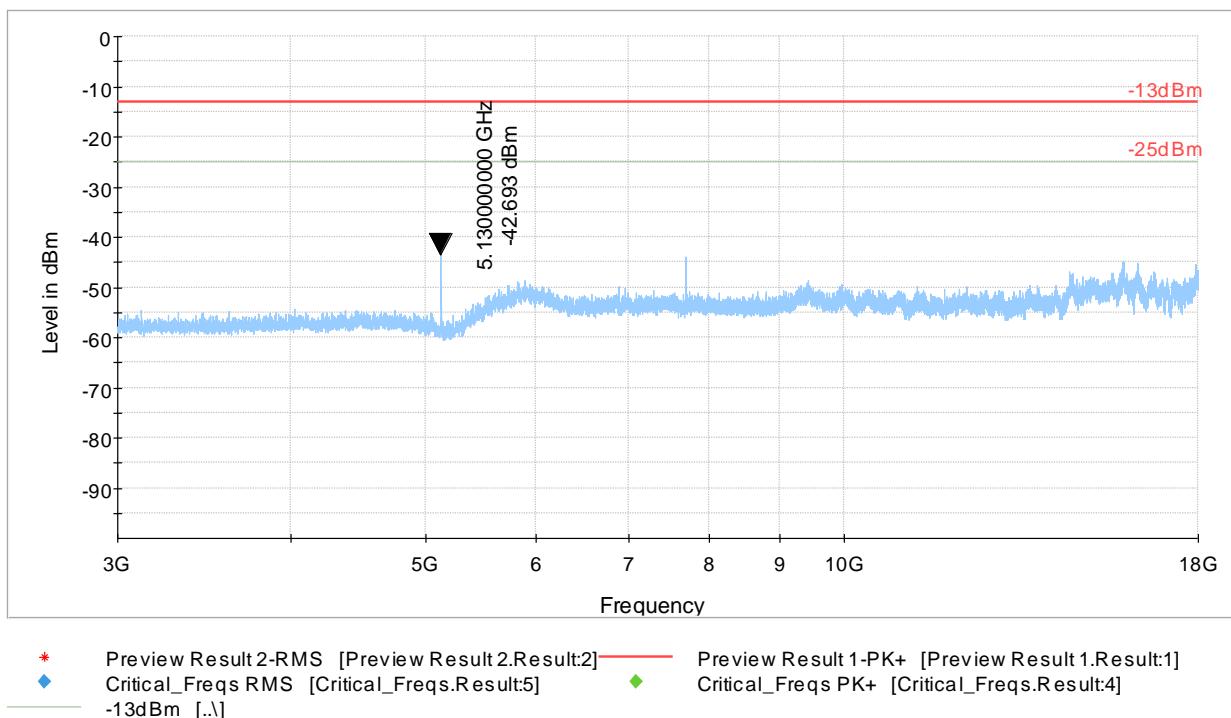
10.11.8 3GHz – 18GHz, Ch. Low



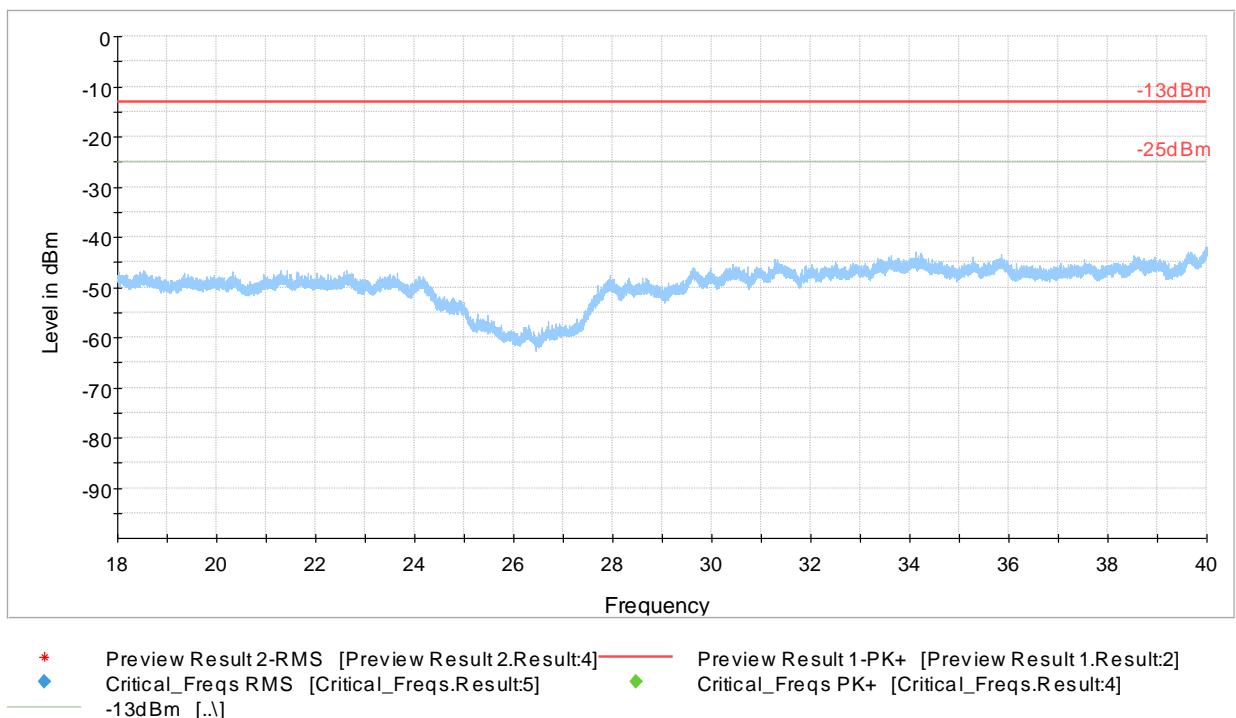
10.11.9 3GHz – 18GHz, Ch. Mid



10.11.10 3GHz – 18GHz, Ch. High

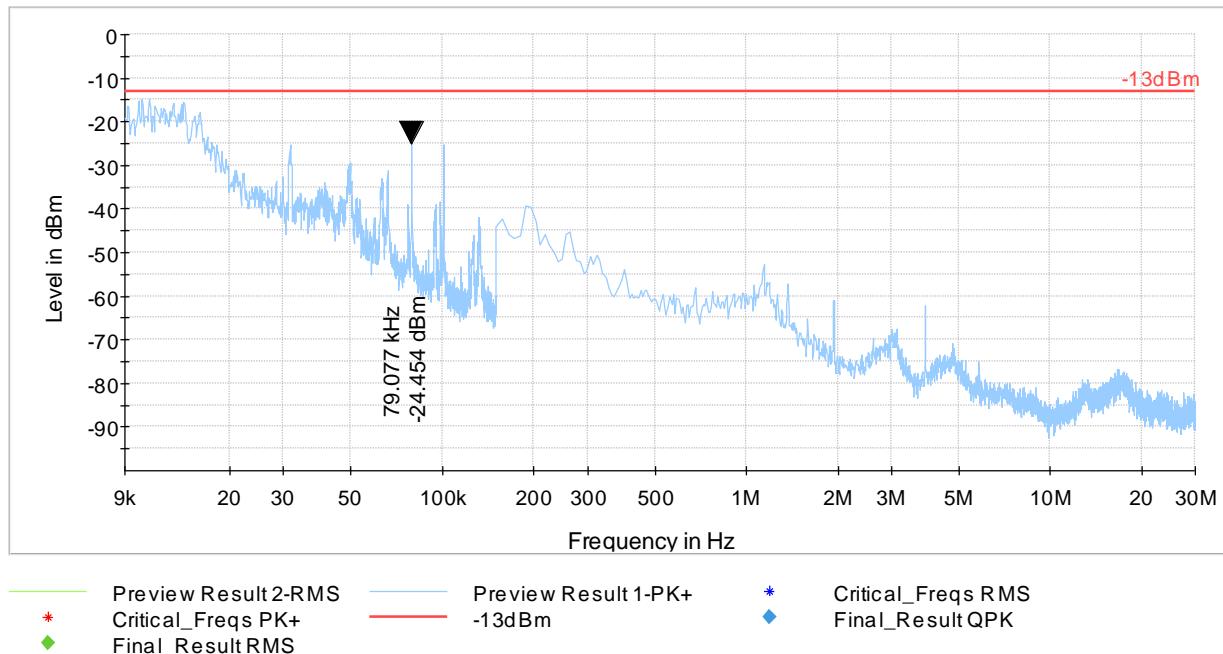


10.11.11 18GHz – 40GHz, Ch. Mid

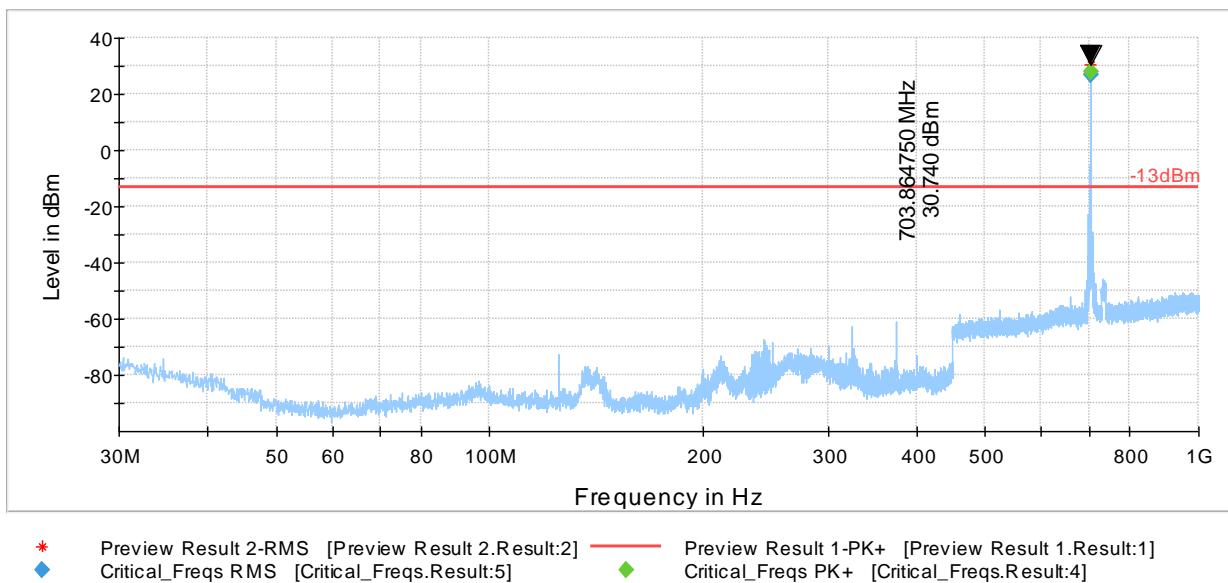


10.12 Measurement Plots LTE Band 12:

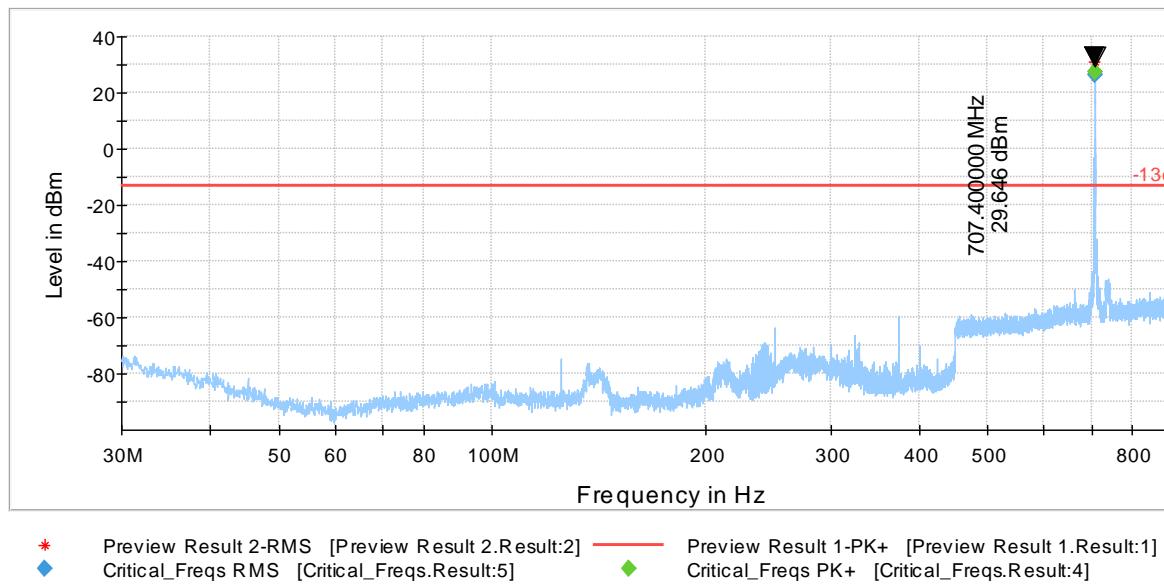
10.12.1 9 KHz – 30MHz, Ch. Mid



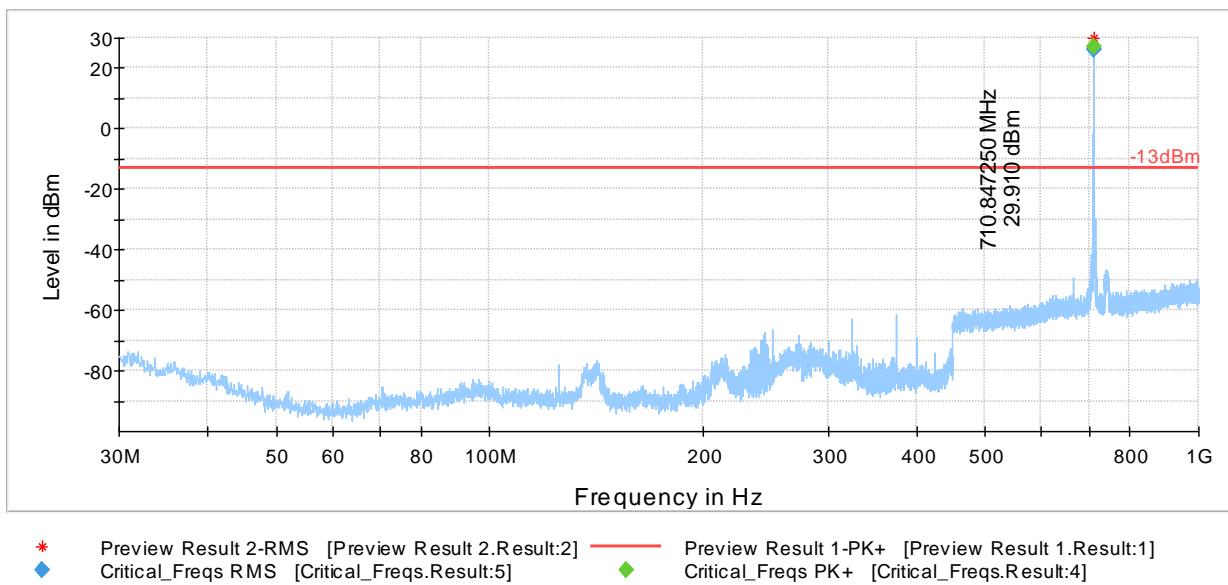
10.12.2 30MHz – 1GHz, Ch. Low



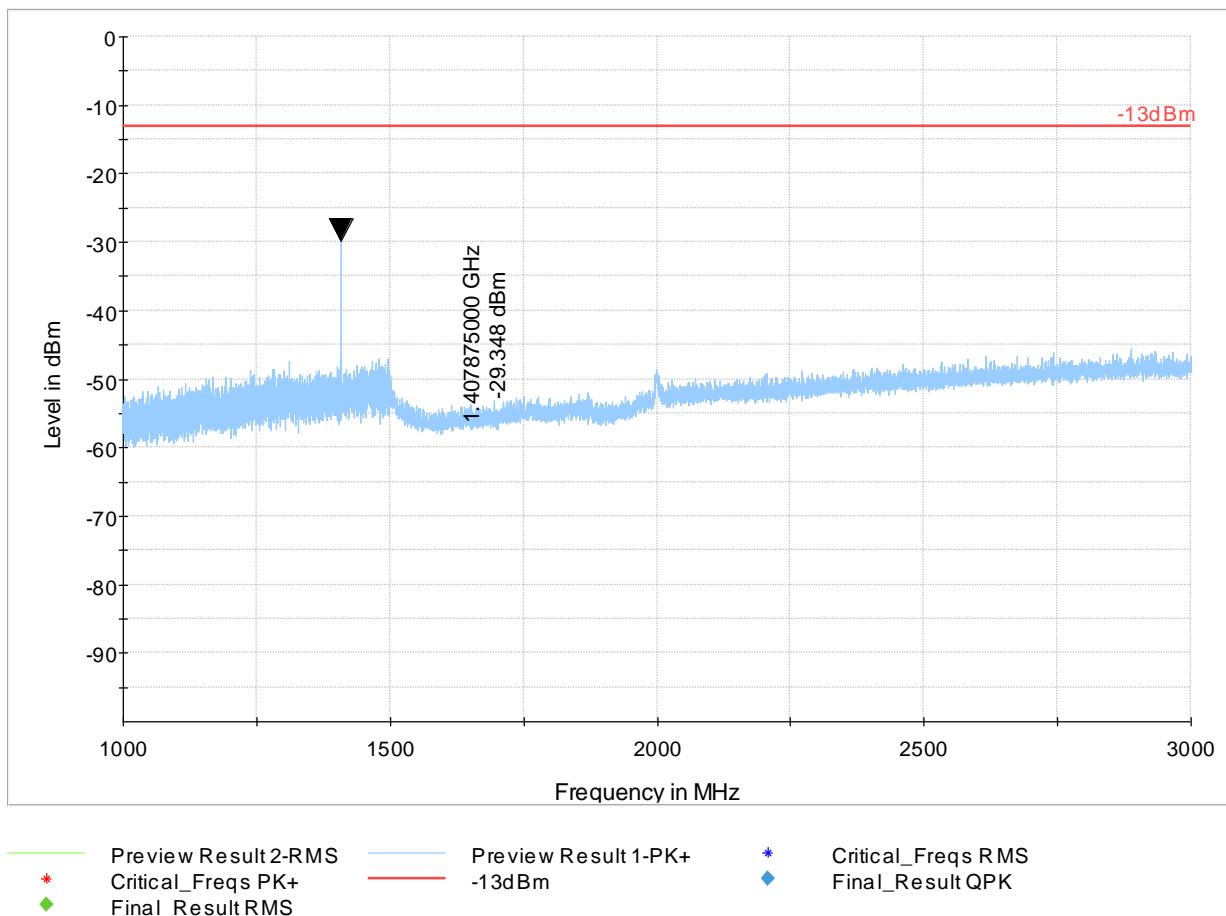
10.12.3 30MHz – 1GHz, Ch. Mid



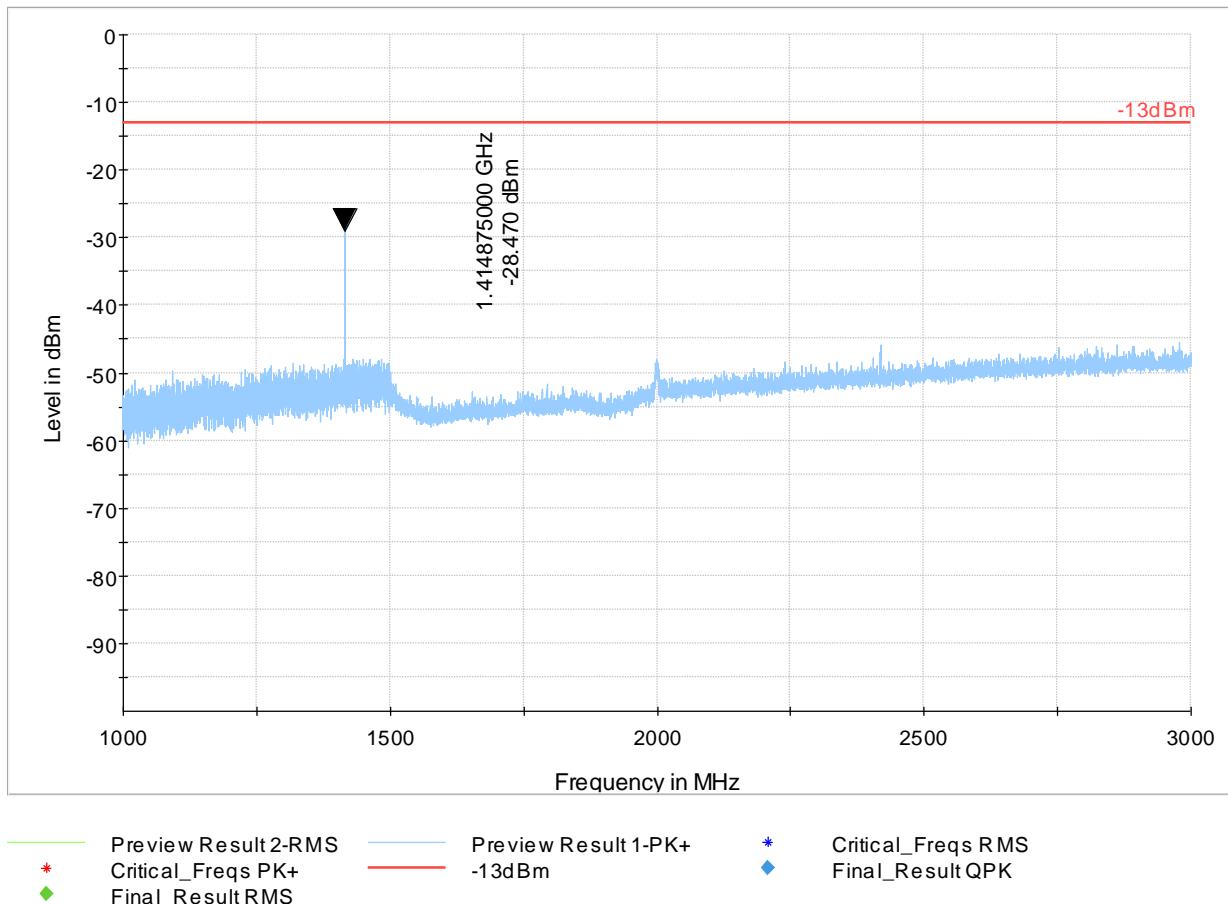
10.12.4 30MHz – 1GHz, Ch. High



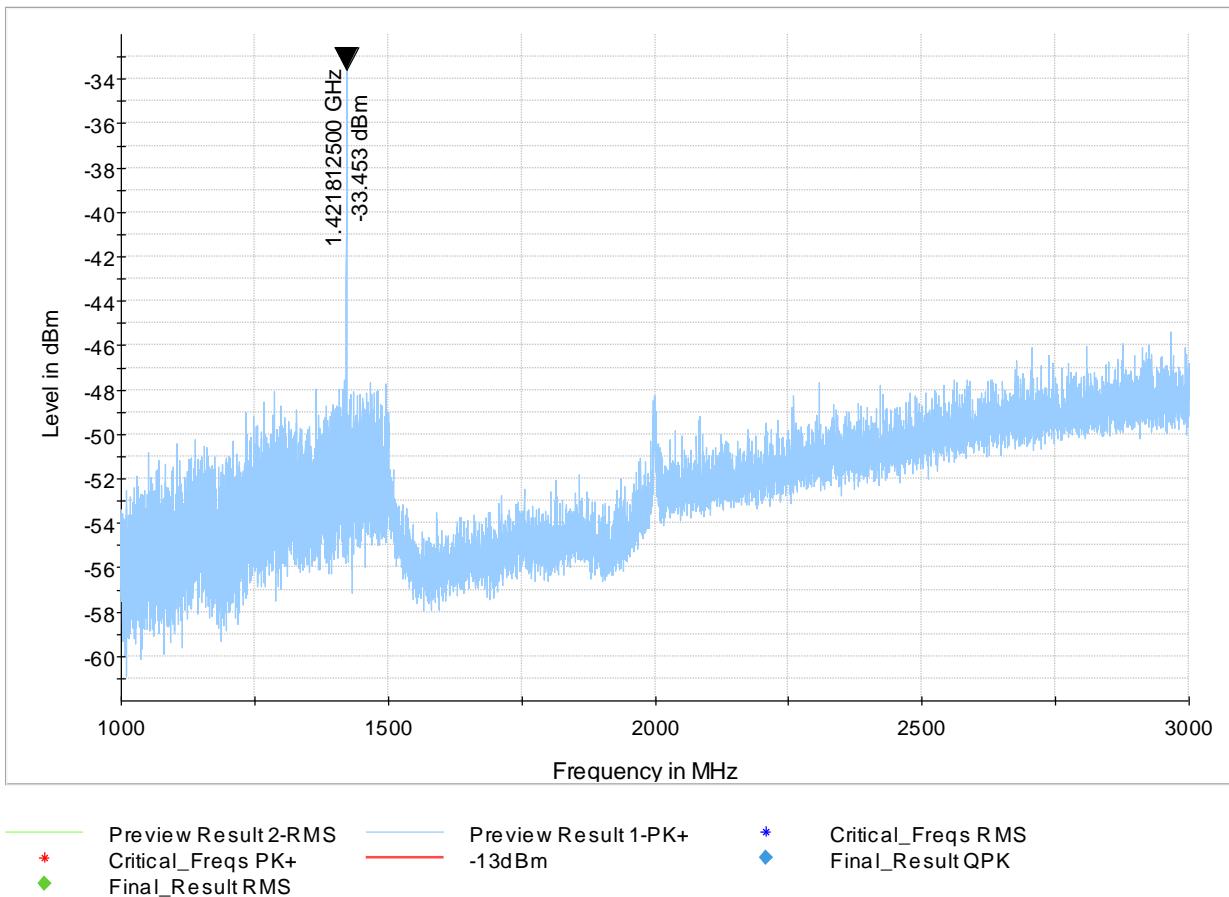
10.12.5 1GHz – 3GHz, Ch. Low



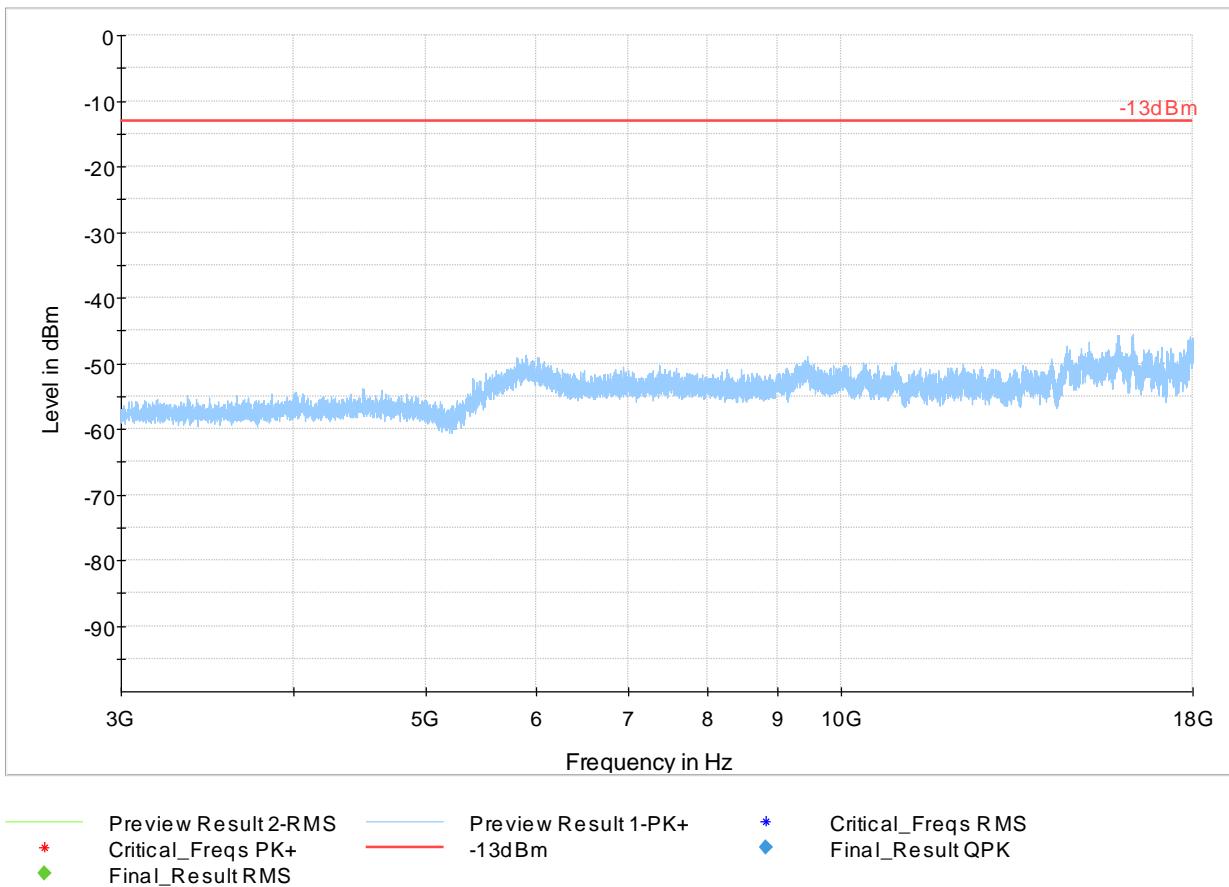
10.12.6 1GHz – 3GHz, Ch. Mid



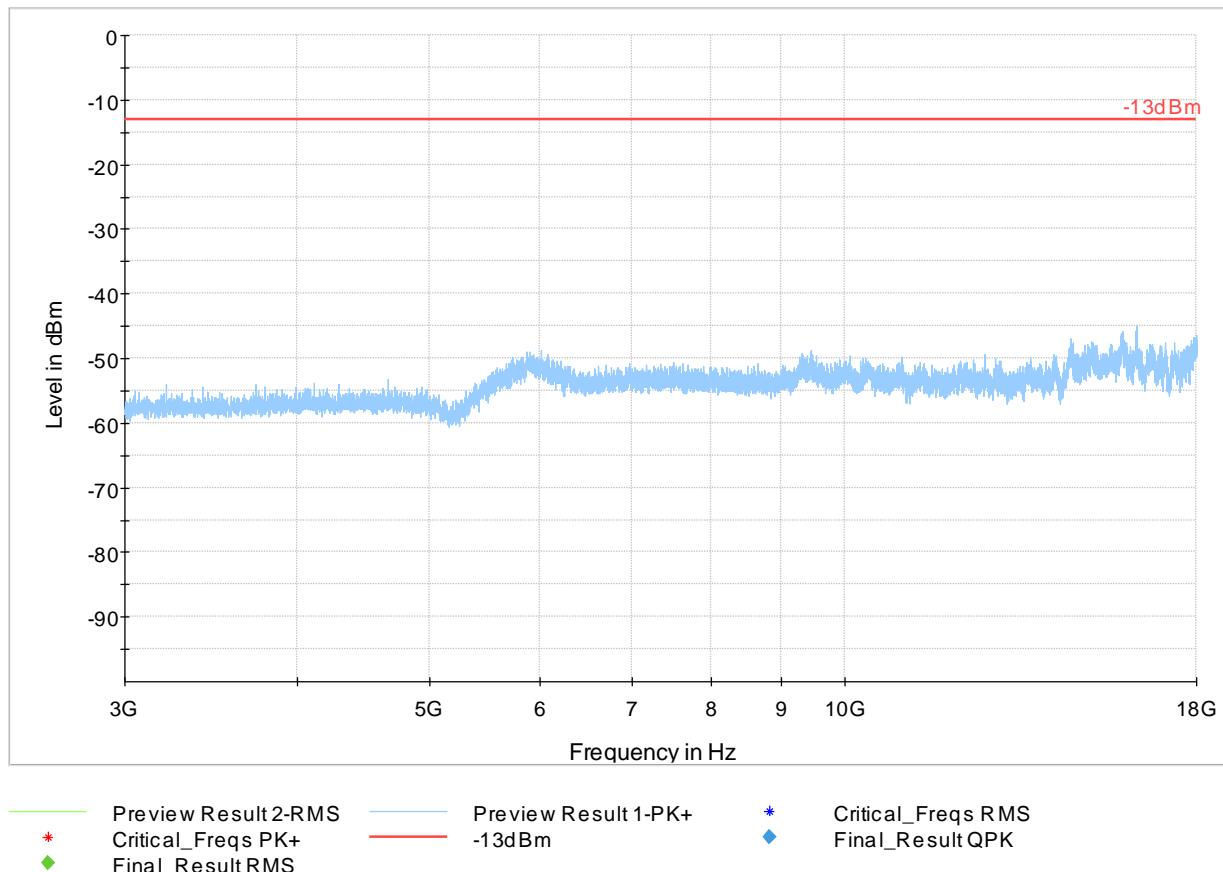
10.12.7 1GHz – 3GHz, Ch. High



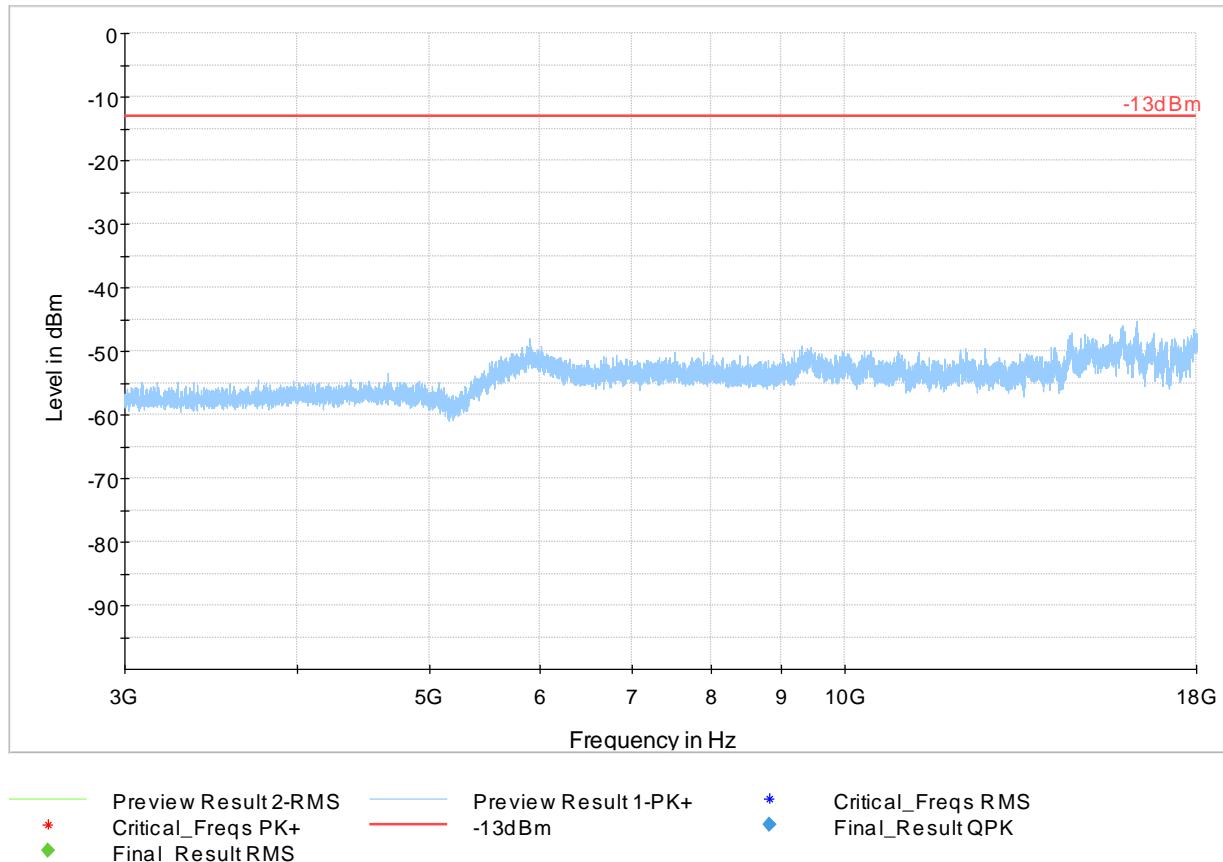
10.12.8 3GHz – 18GHz, Ch. Low



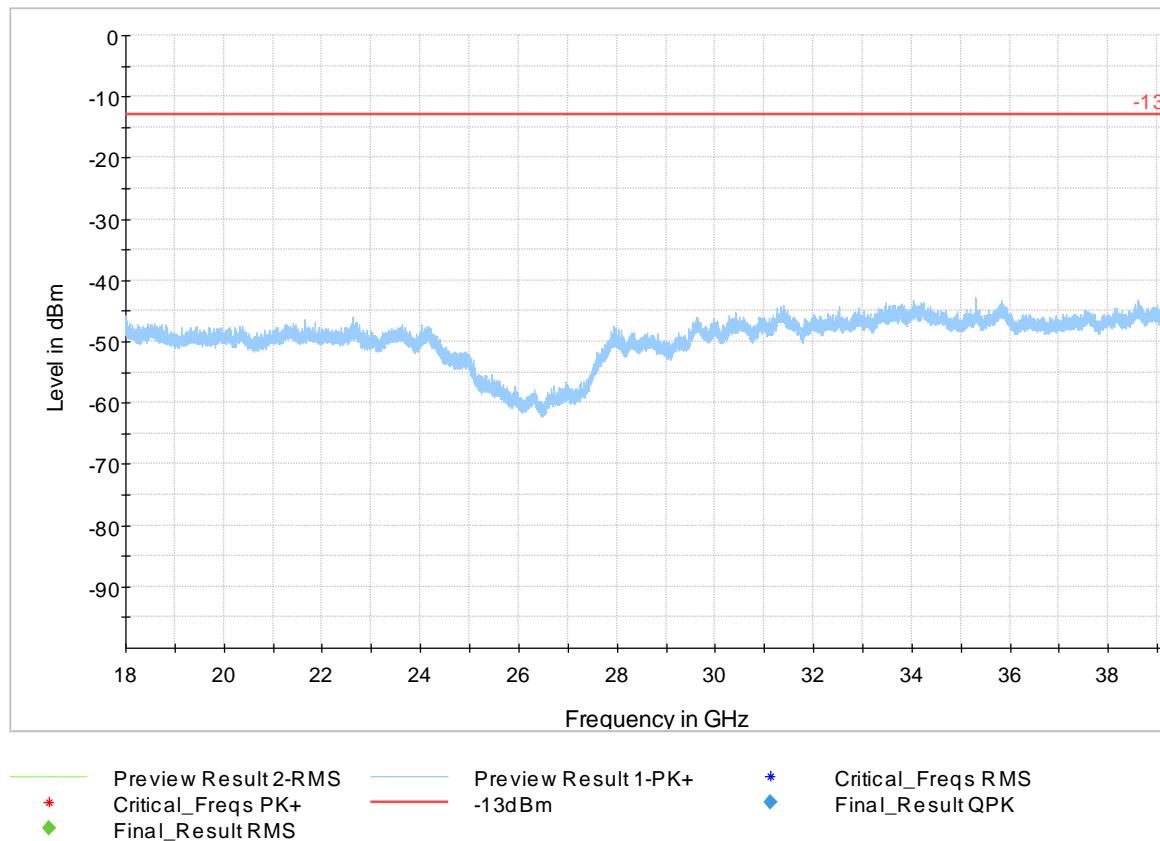
10.12.9 3GHz – 18GHz, Ch. Low



10.12.10 3GHz – 18GHz, Ch. High

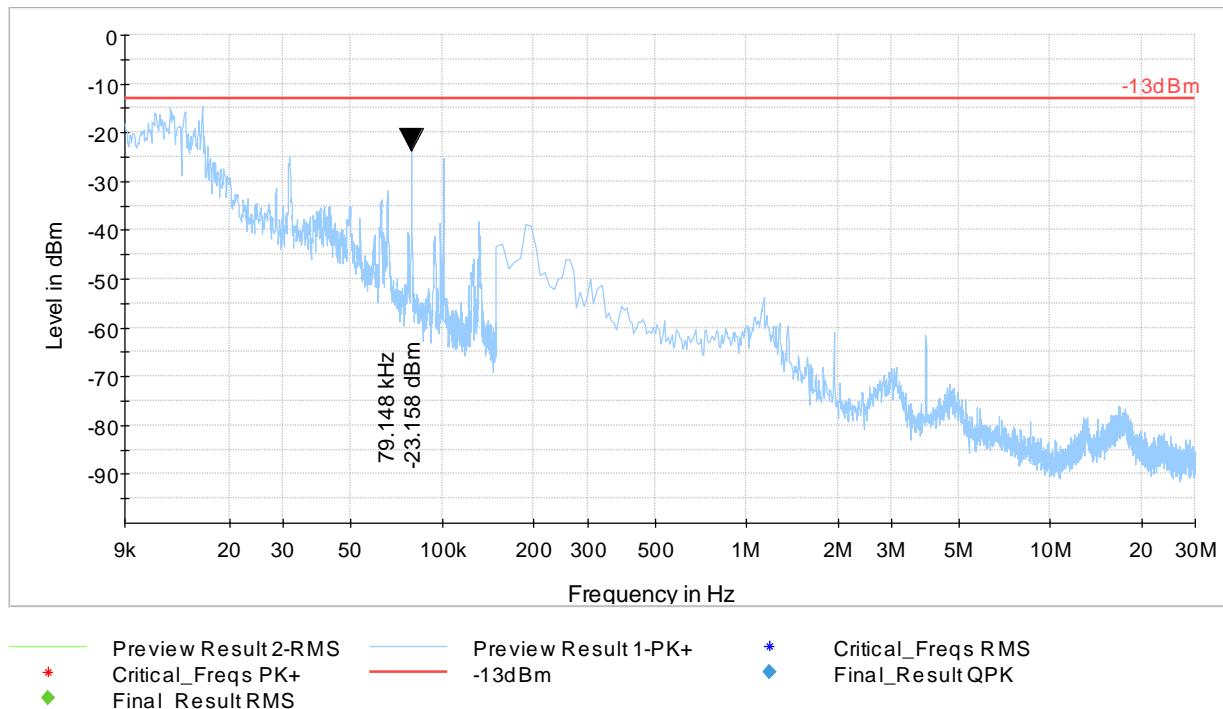


10.12.11 18GHz – 40GHz, Ch. Mid

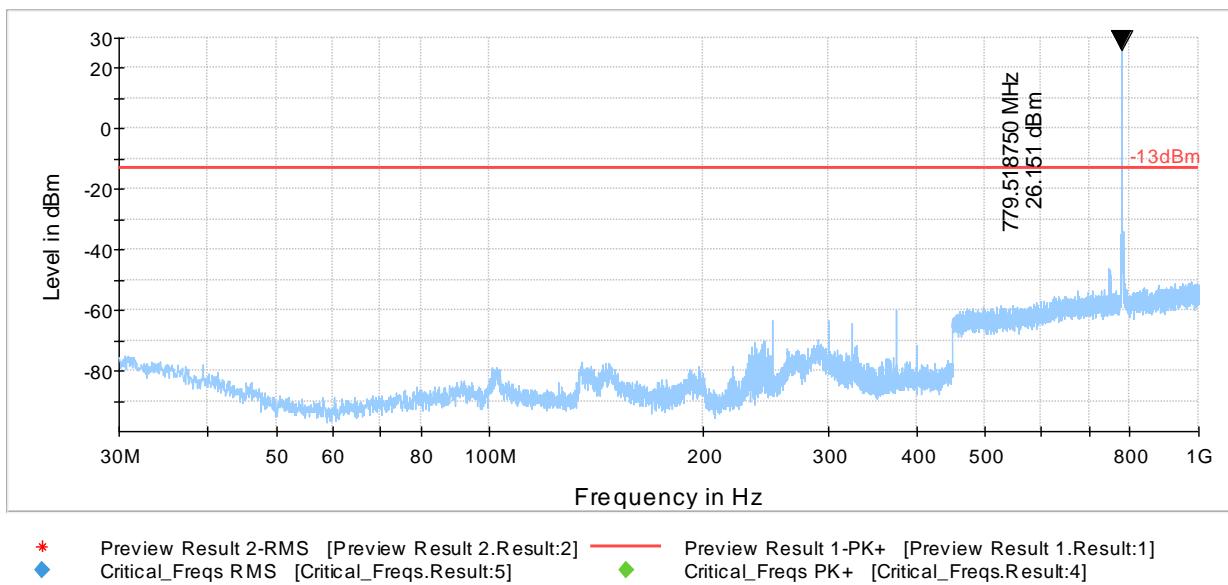


10.13 Measurement Plots LTE Band 13:

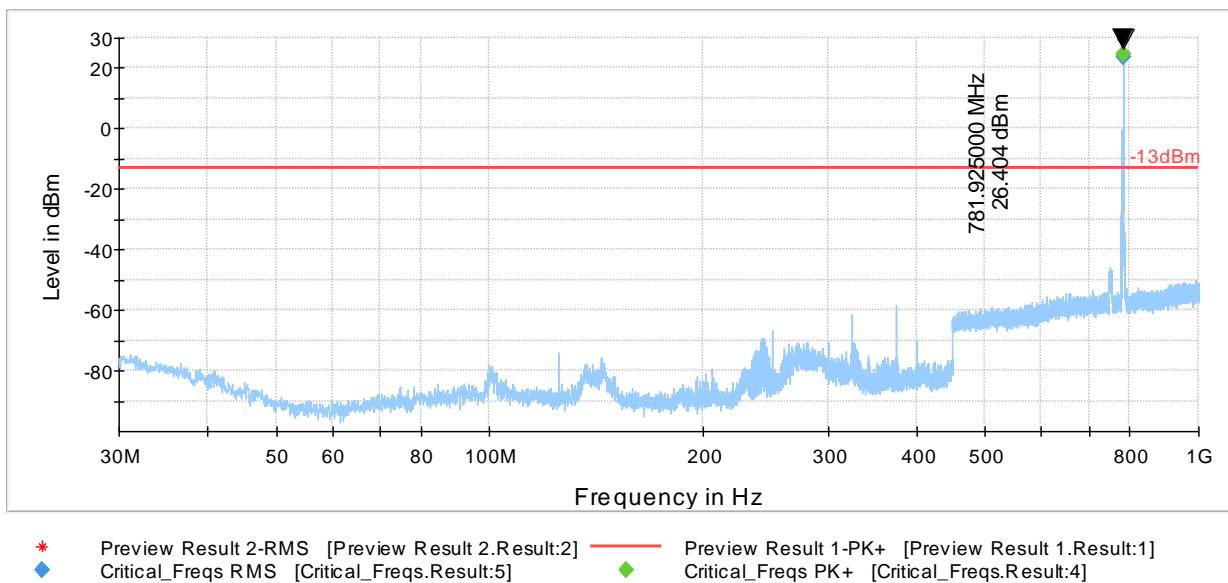
10.13.1 9 KHz – 30MHz, Ch. Mid



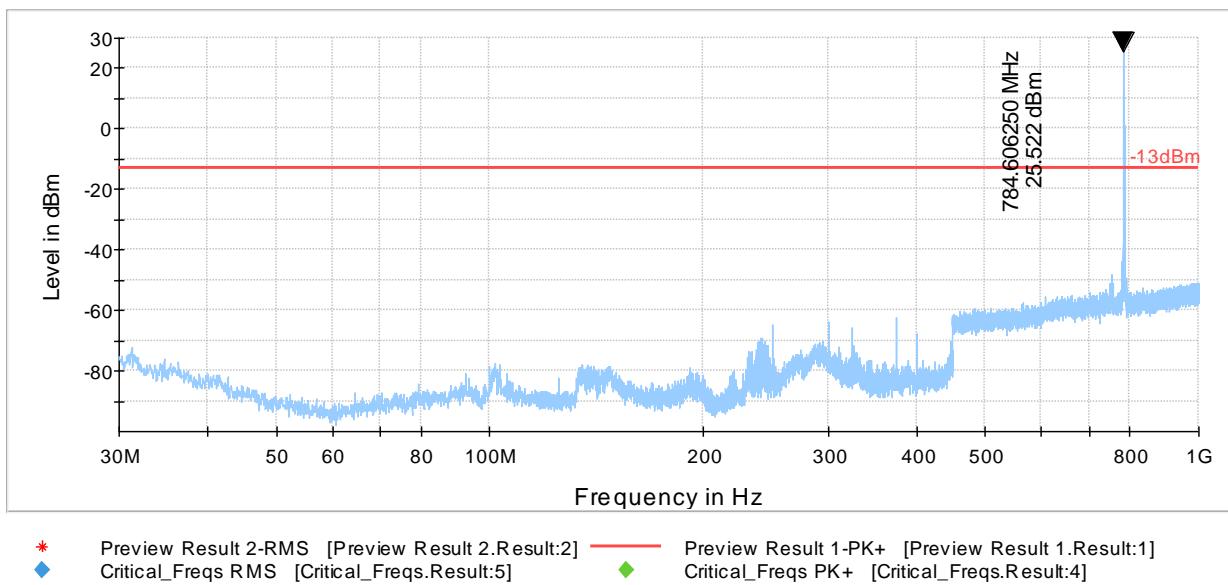
10.13.2 30MHz – 1GHz, Ch. Low



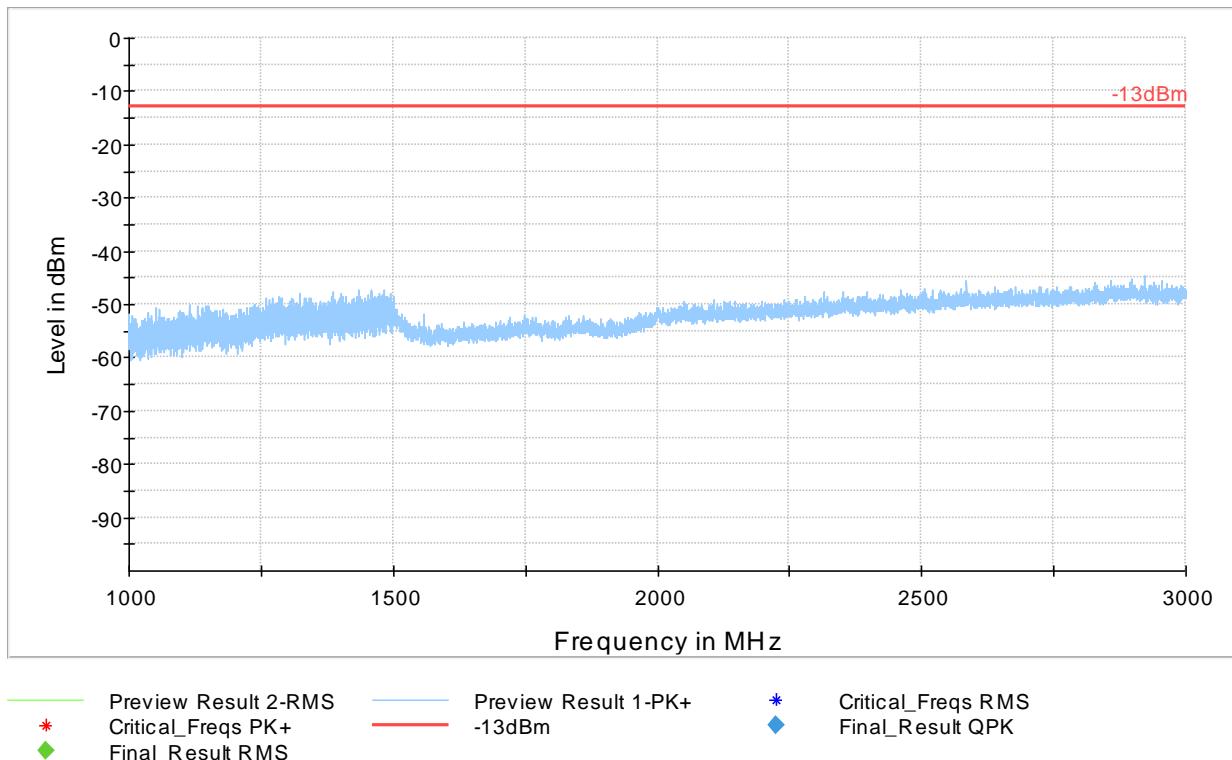
10.13.3 30MHz – 1GHz, Ch. Mid



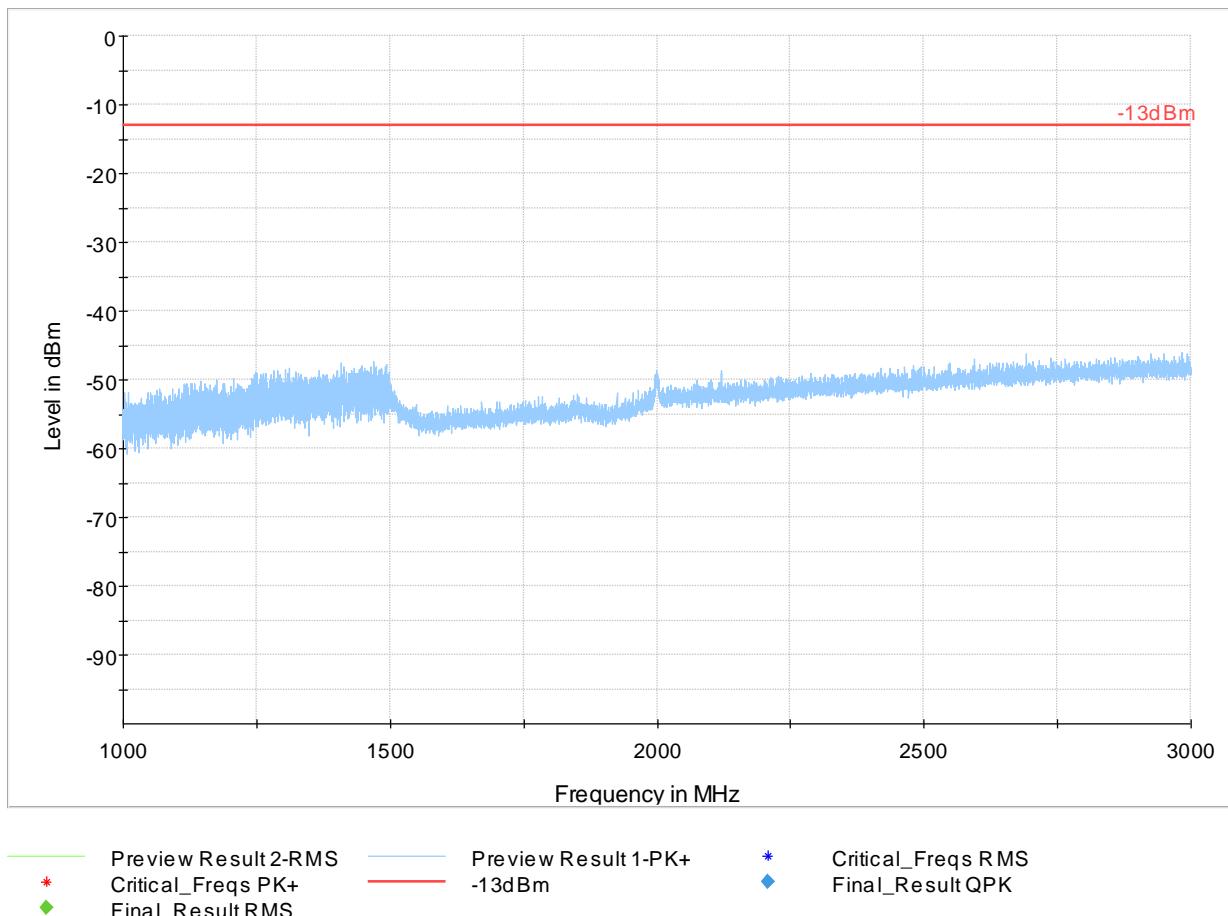
10.13.4 30MHz – 1GHz, Ch. High



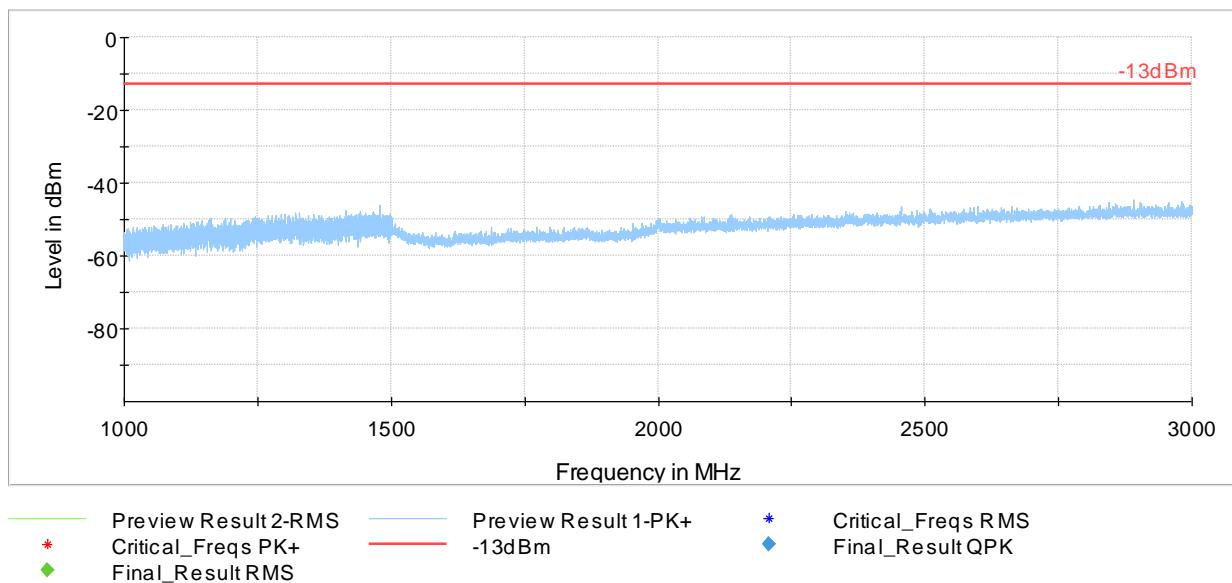
10.13.5 1GHz – 3GHz, Ch. Low



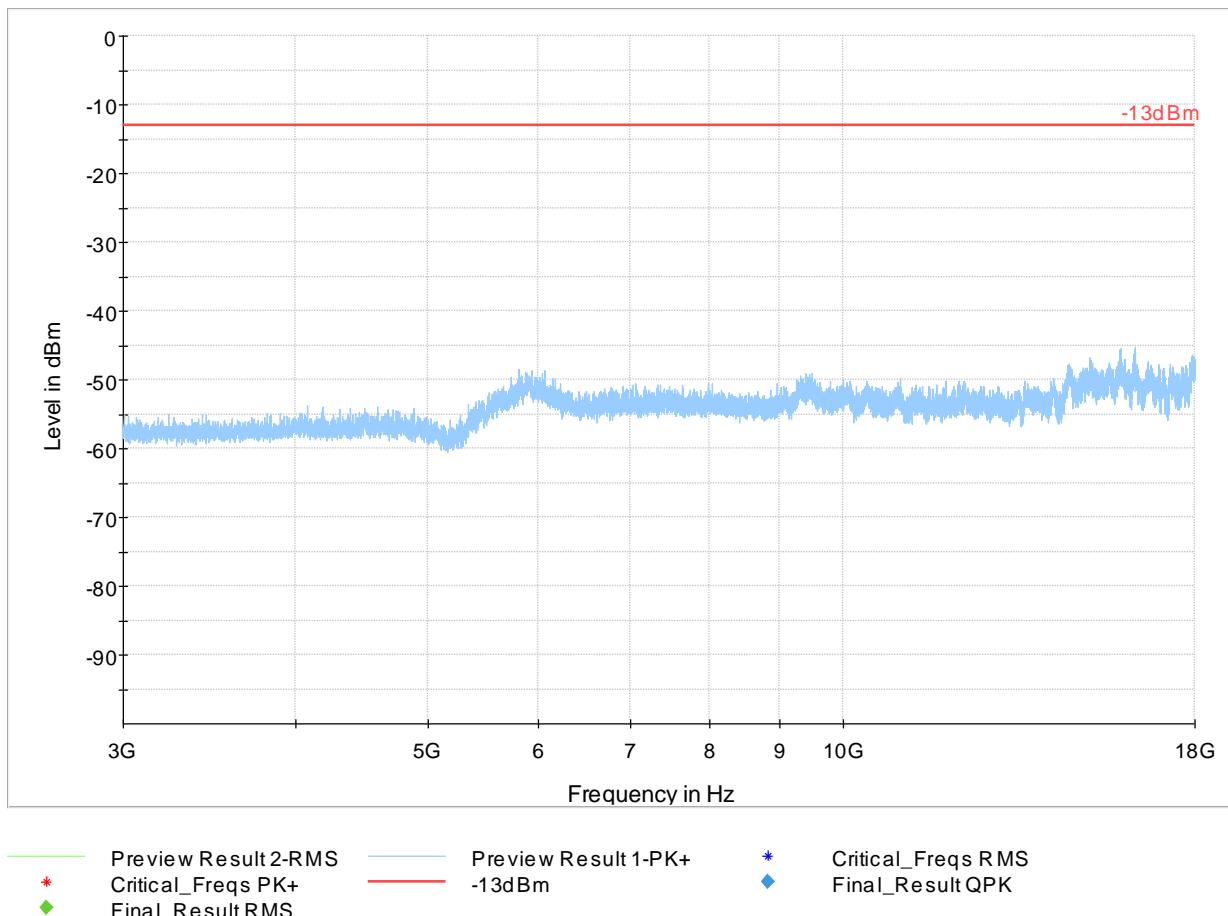
10.13.6 1GHz – 3GHz, Ch. Mid



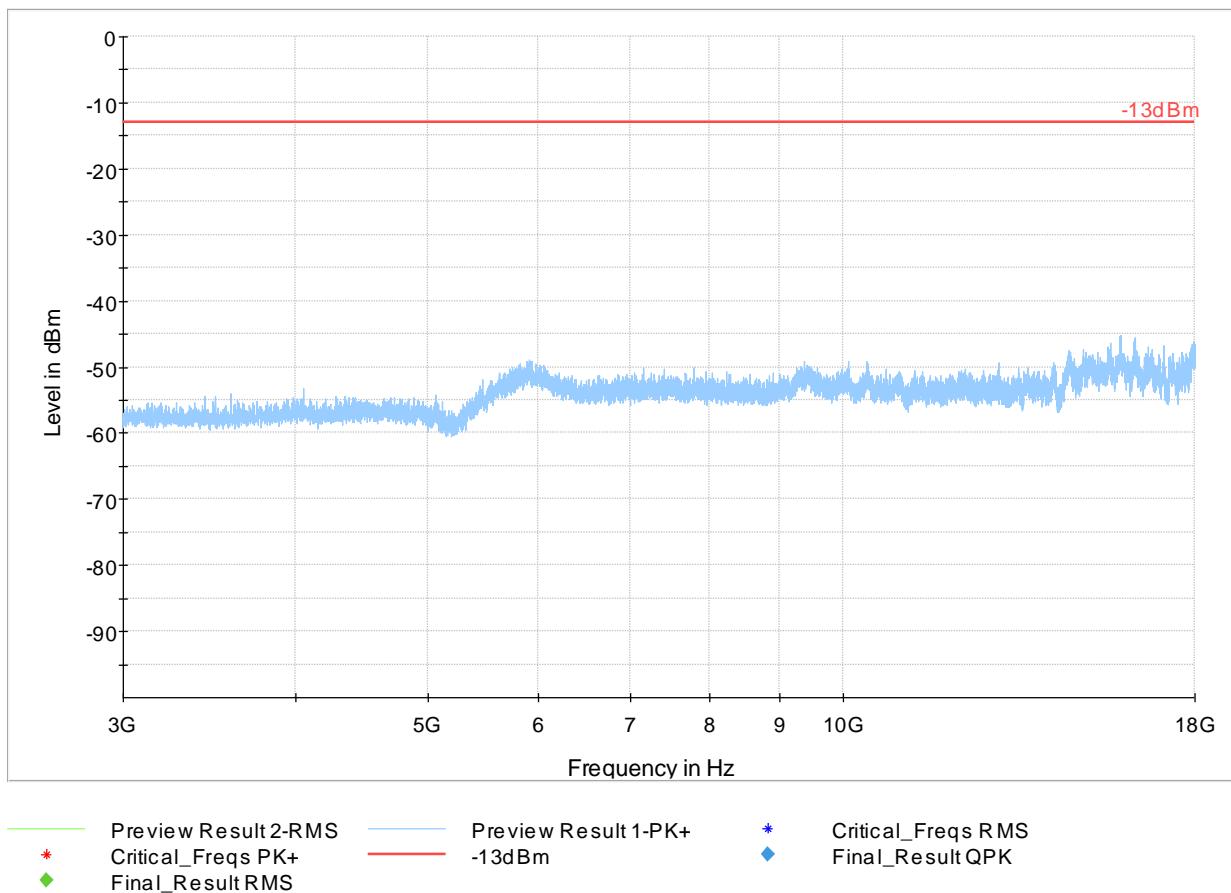
10.13.7 1GHz – 3GHz, Ch. High



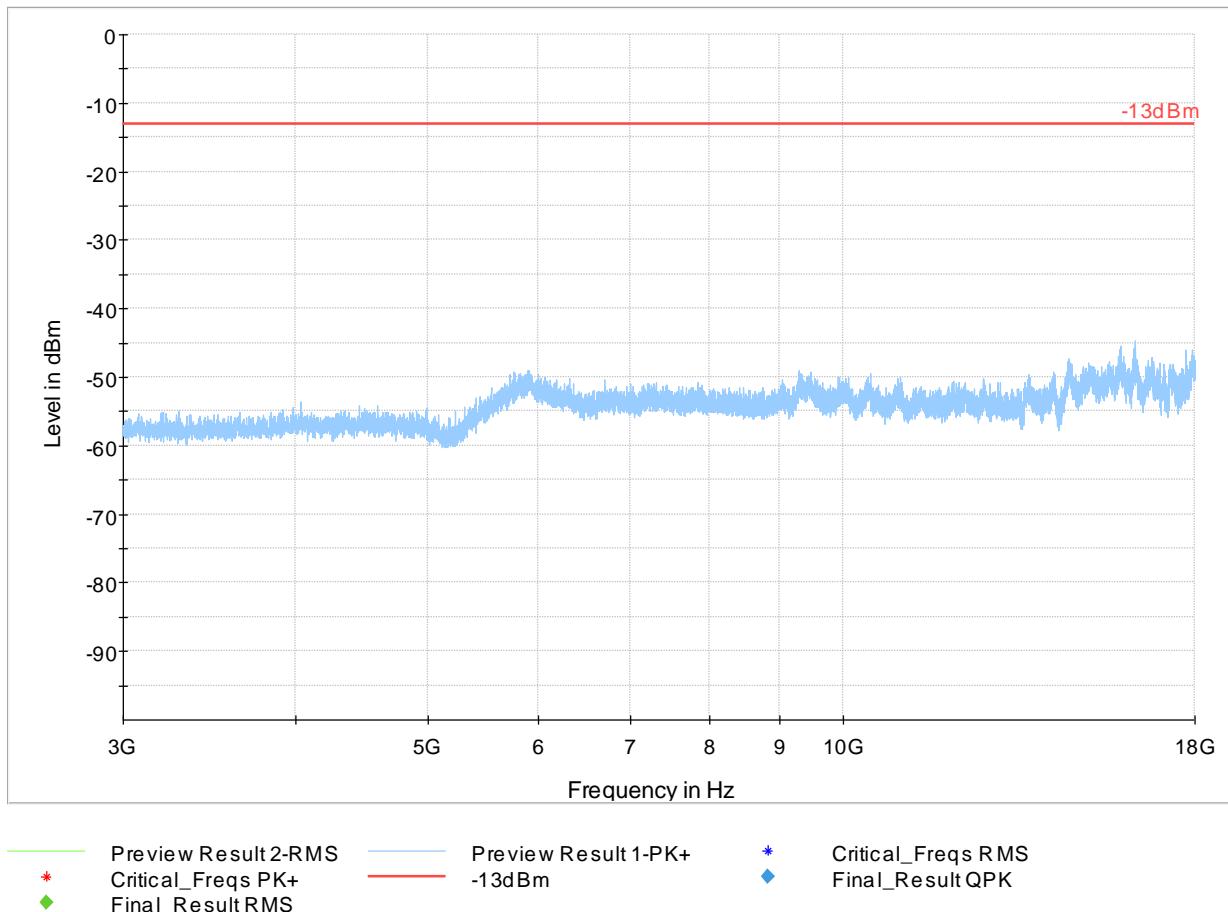
10.13.8 3GHz – 18GHz, Ch. Low



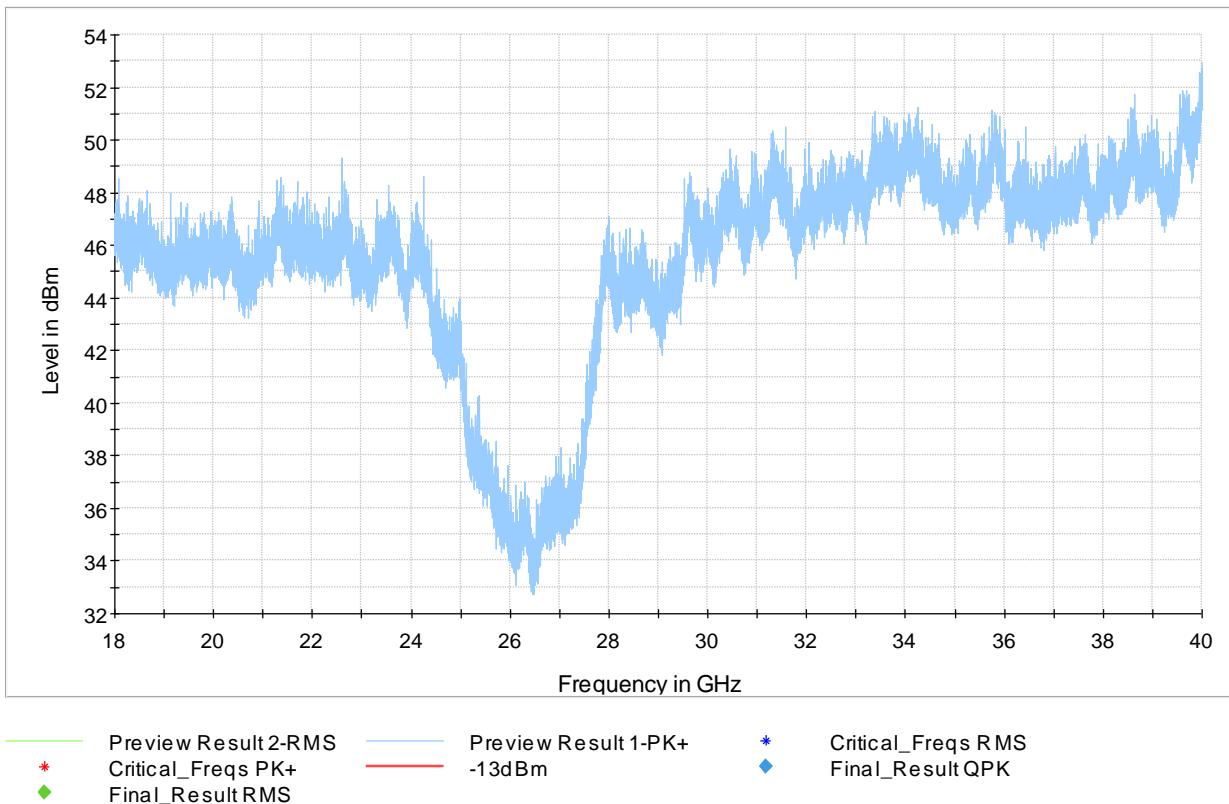
10.13.9 3GHz – 18GHz, Ch. Mid



10.13.10 3GHz – 18GHz, Ch. High

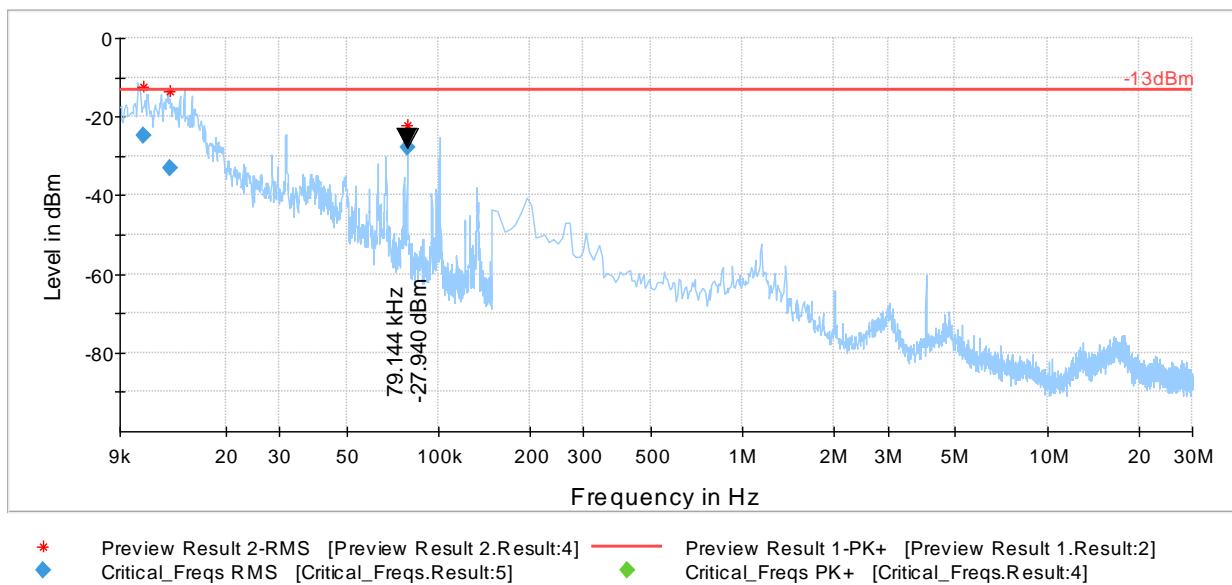


10.13.11 18GHz – 40GHz, Ch. Mid

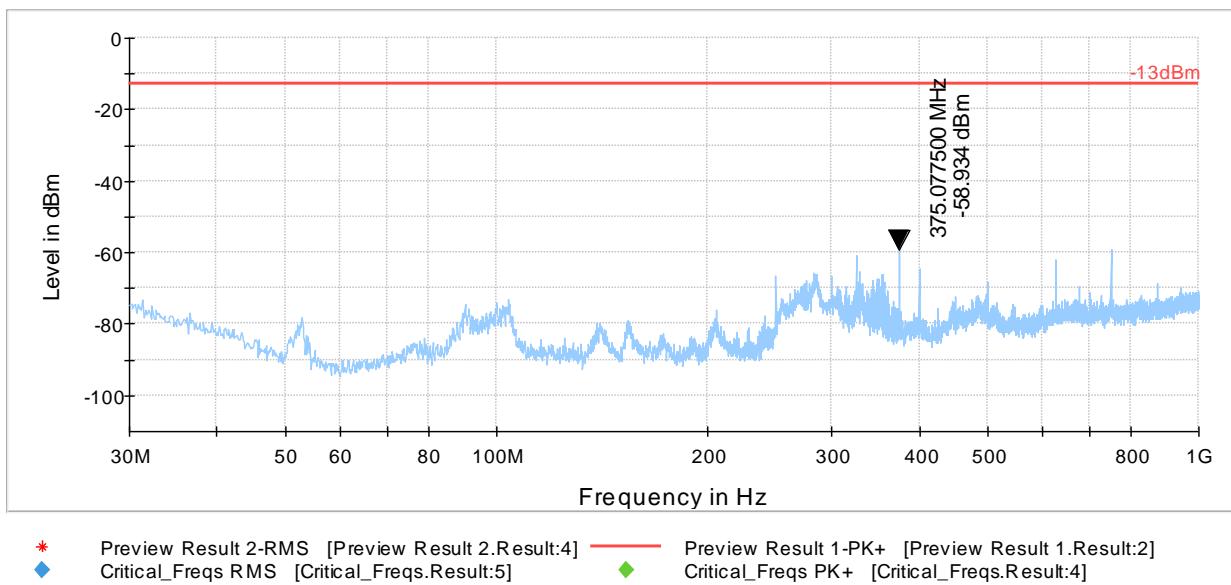


10.14 Measurement Plots LTE Band 30:

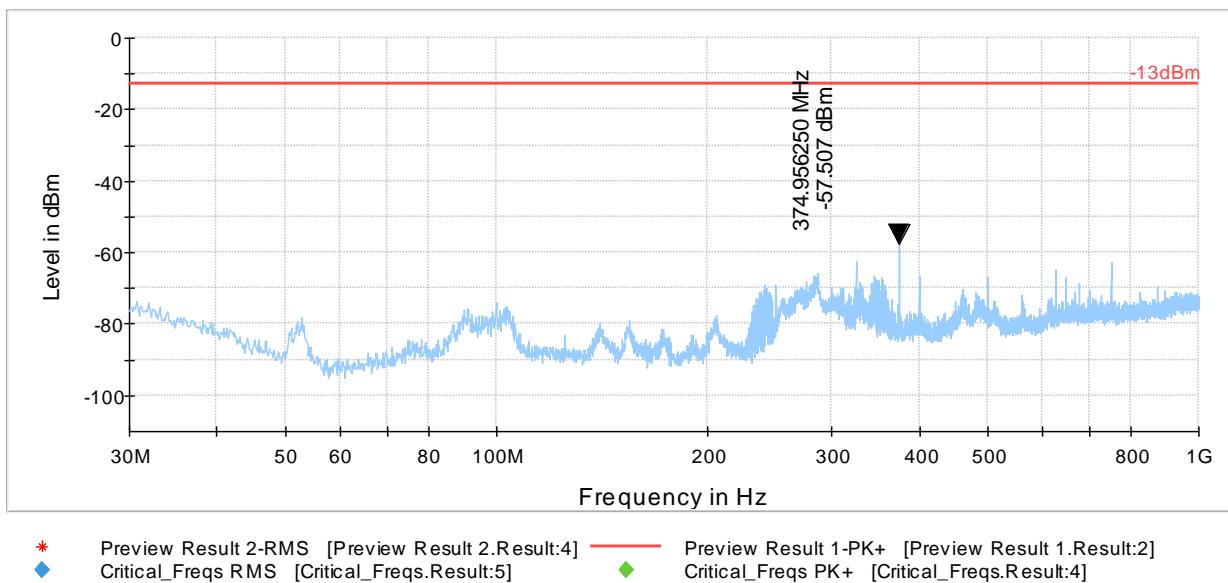
10.14.1 9 KHz – 30MHz, Ch. Mid



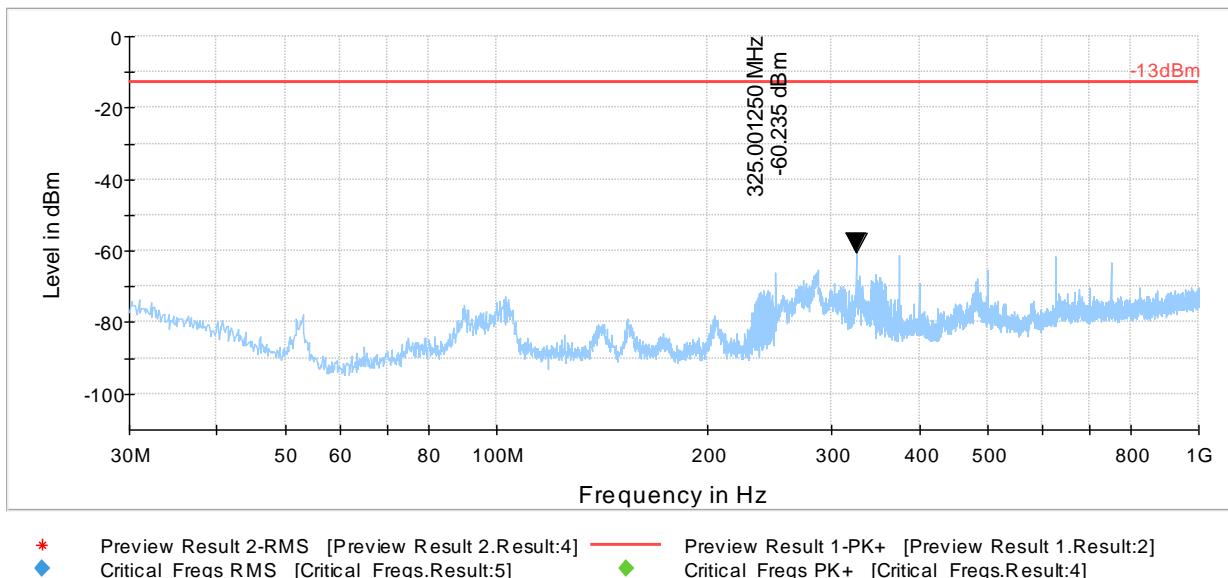
10.14.2 30MHz – 1GHz, Ch. Low



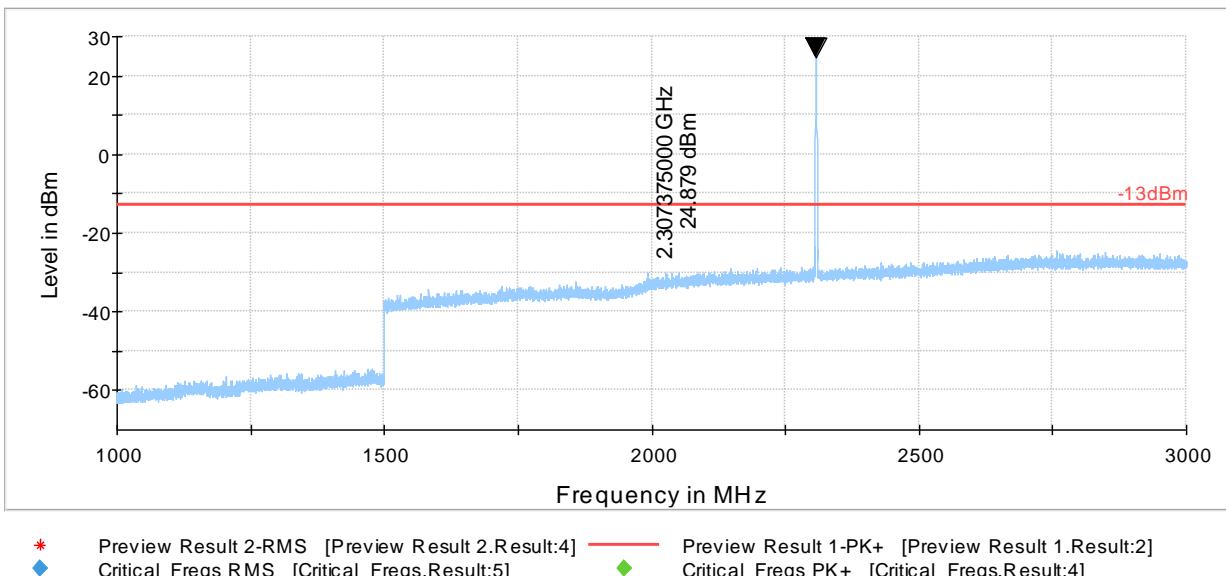
10.14.3 30MHz – 1GHz, Ch. Mid



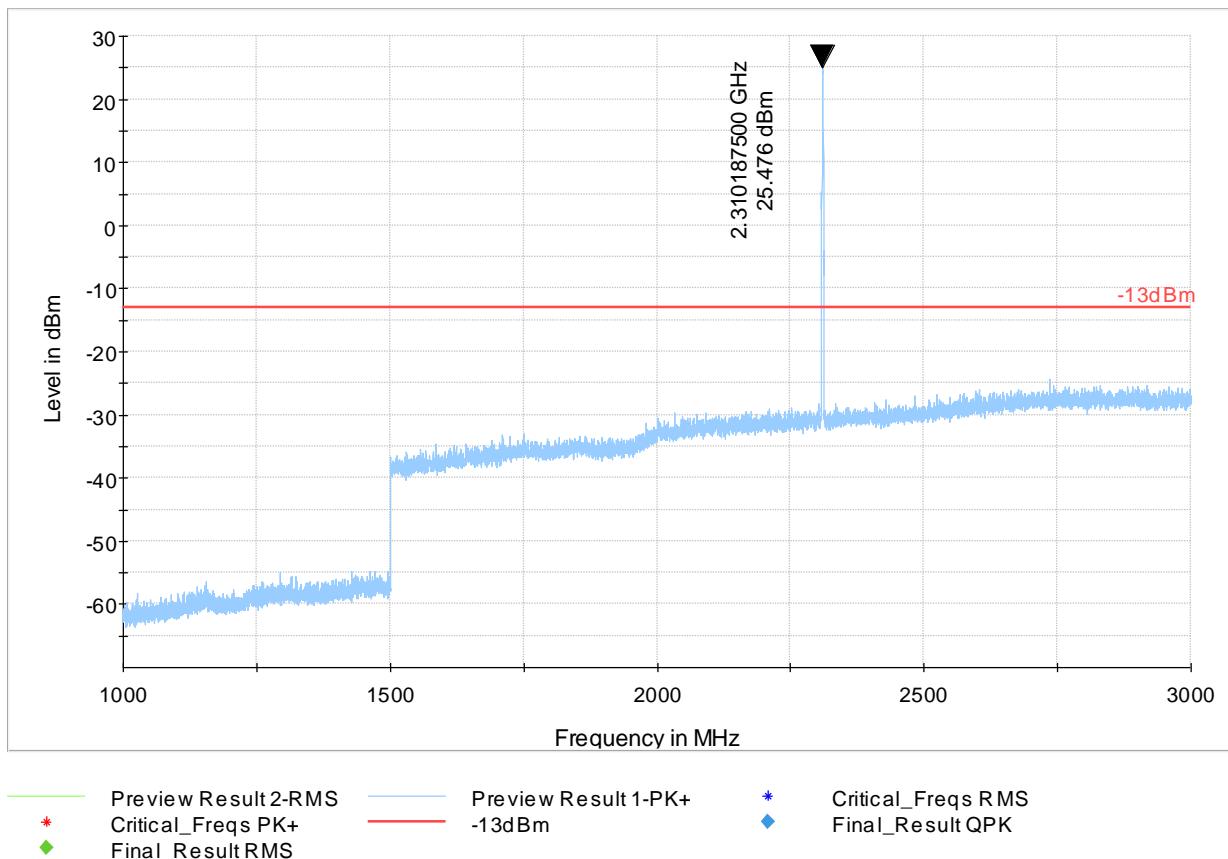
10.14.4 30MHz – 1GHz, Ch. High



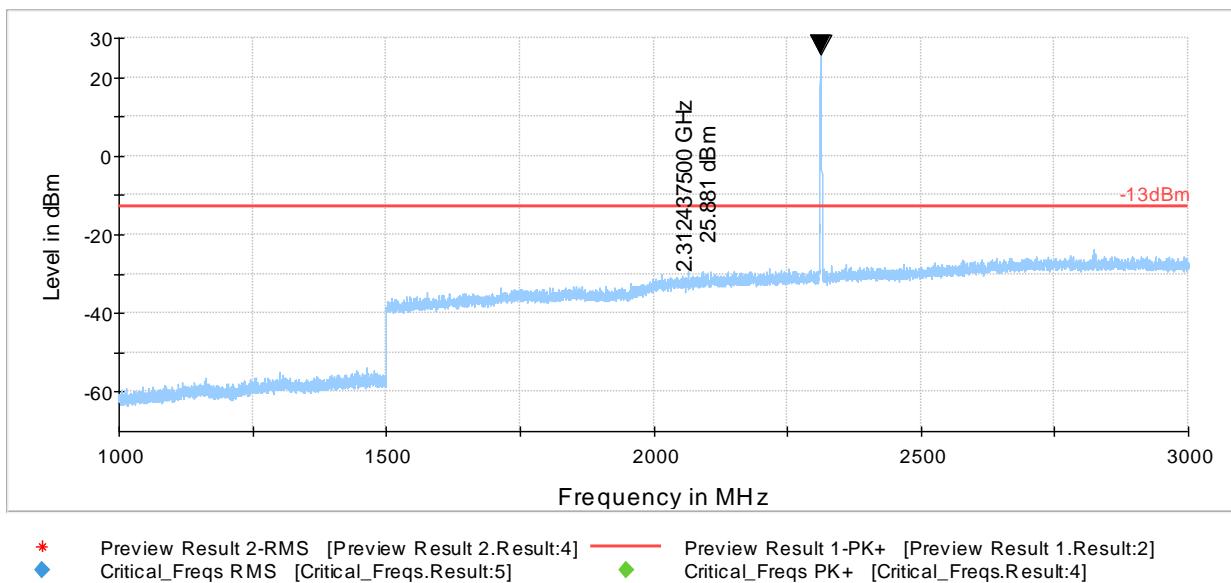
10.14.5 1GHz – 3GHz, Ch. Low



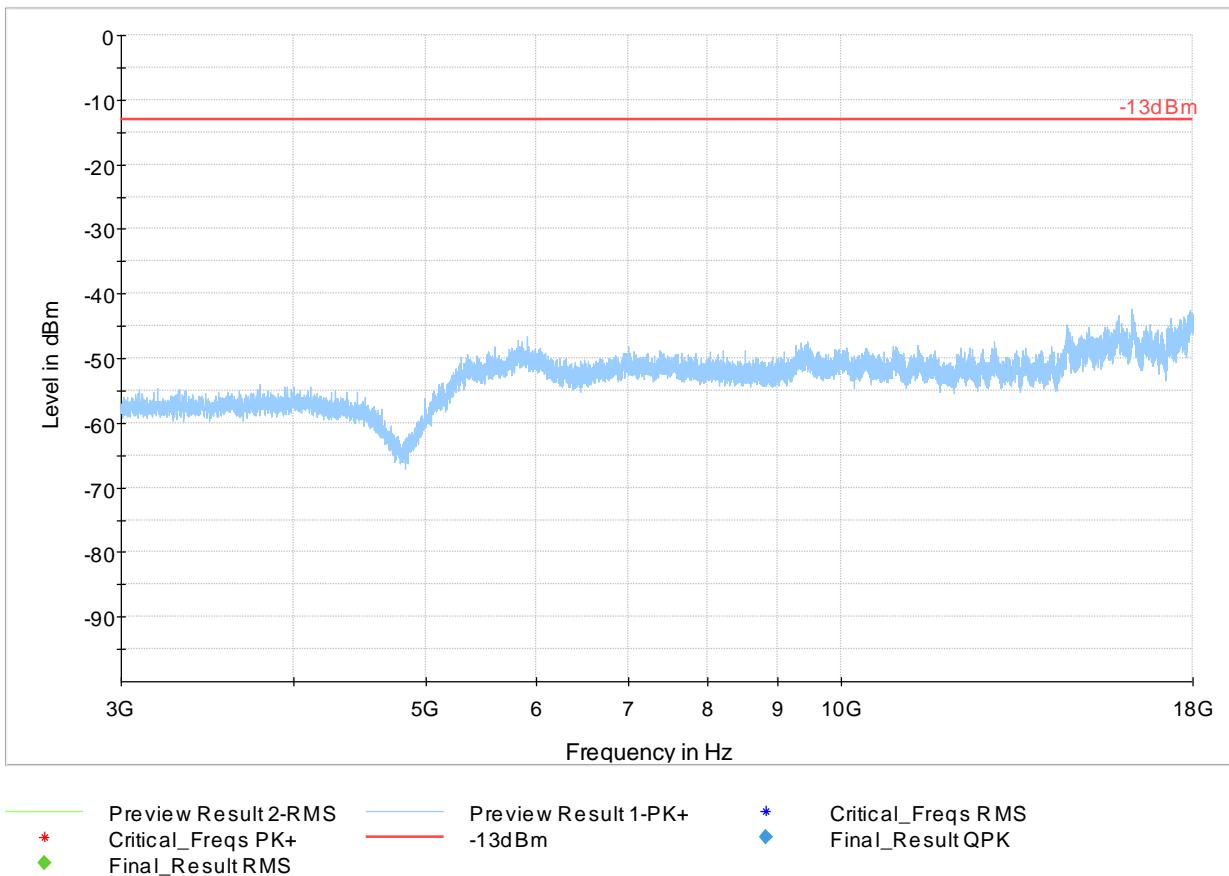
10.14.6 1GHz – 3GHz, Ch. Mid



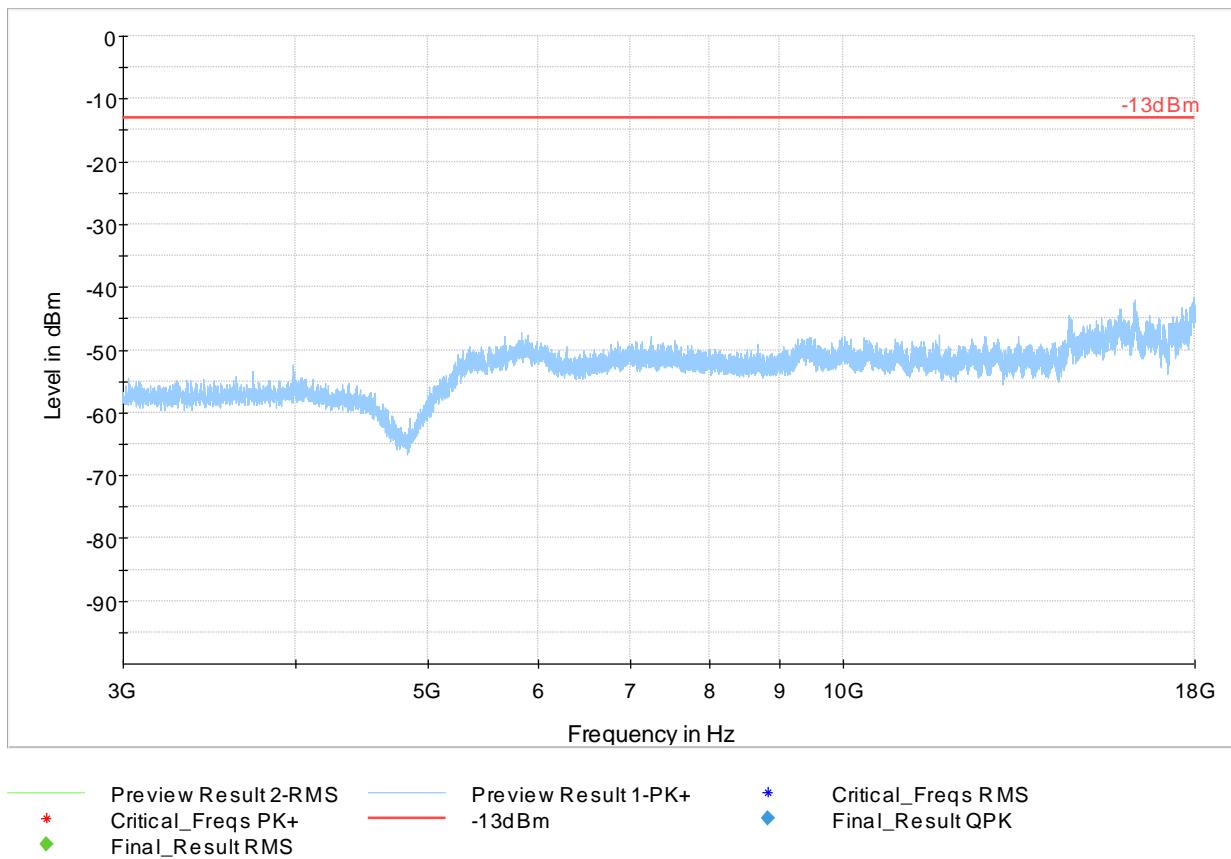
10.14.7 1GHz – 3GHz, Ch. High



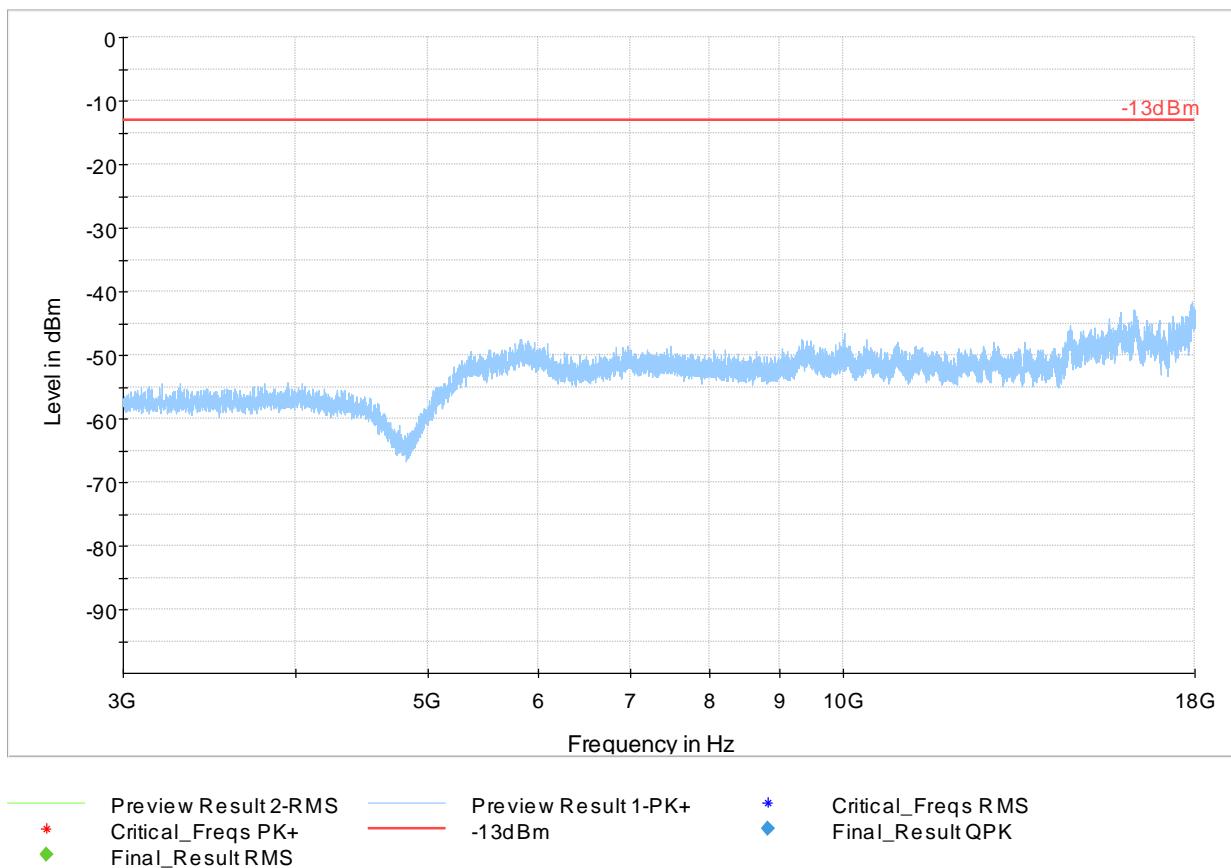
10.14.8 3GHz – 18GHz, Ch. Low



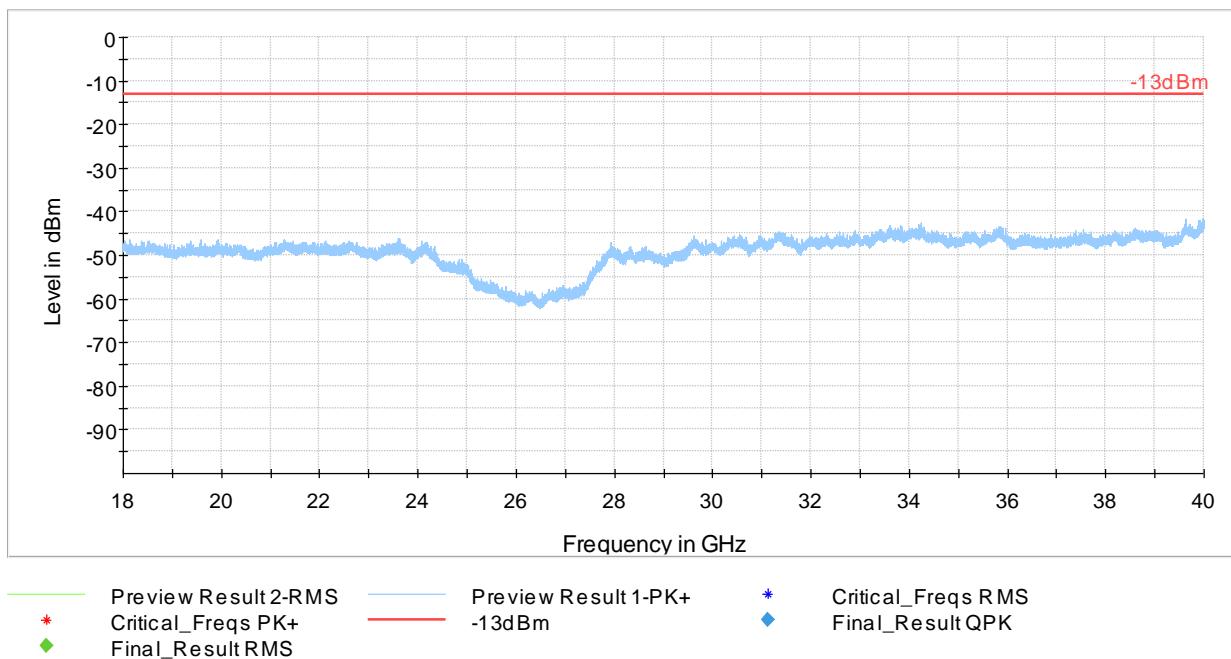
10.14.9 3GHz – 18GHz, Ch. Mid



10.14.10 3GHz – 18GHz, Ch. High

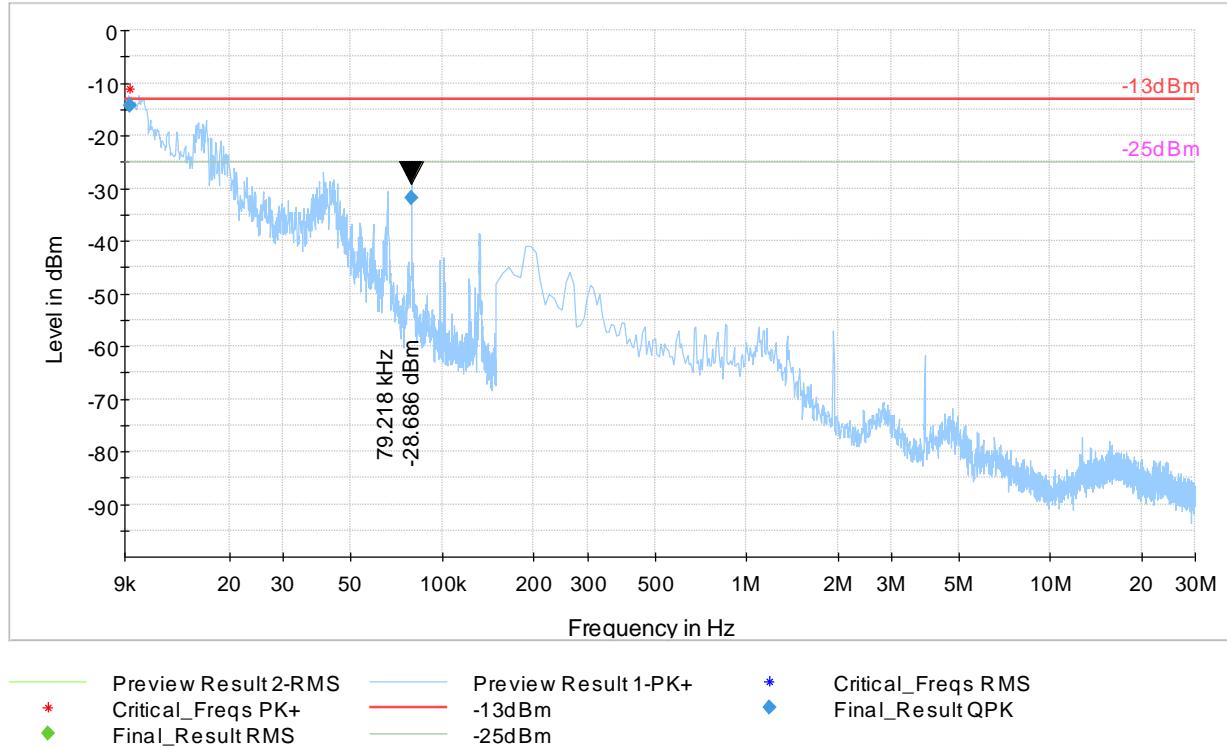


10.14.11 18GHz – 40GHz, Ch. Mid

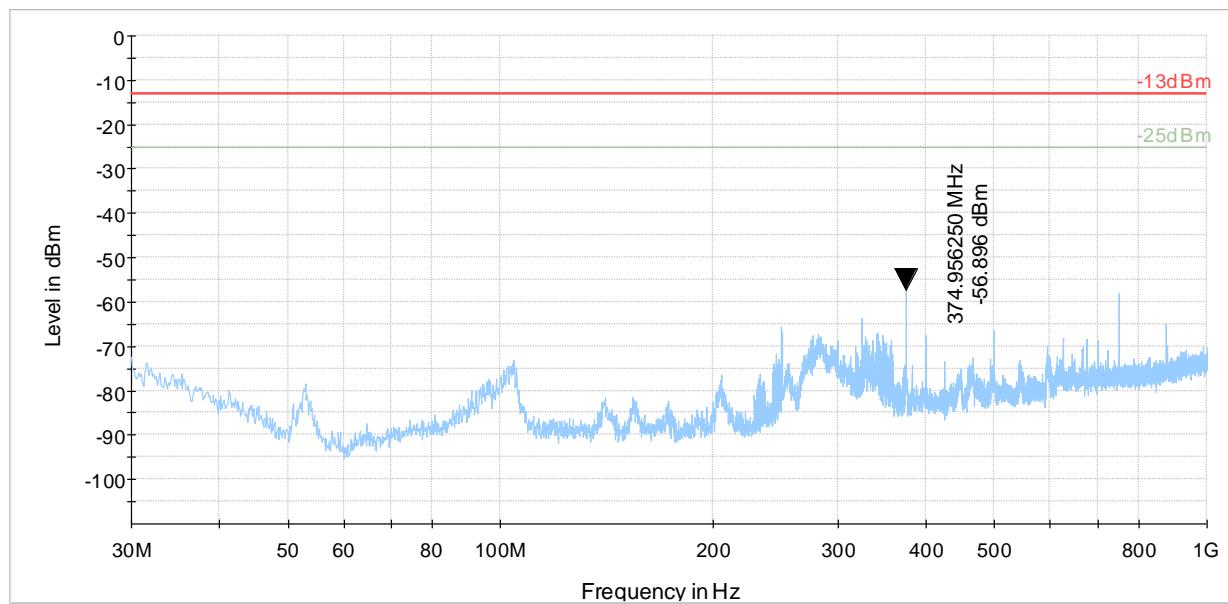


10.15 Measurement Plots LTE Band 41:

10.15.1 9 KHz – 30MHz, Ch. Mid

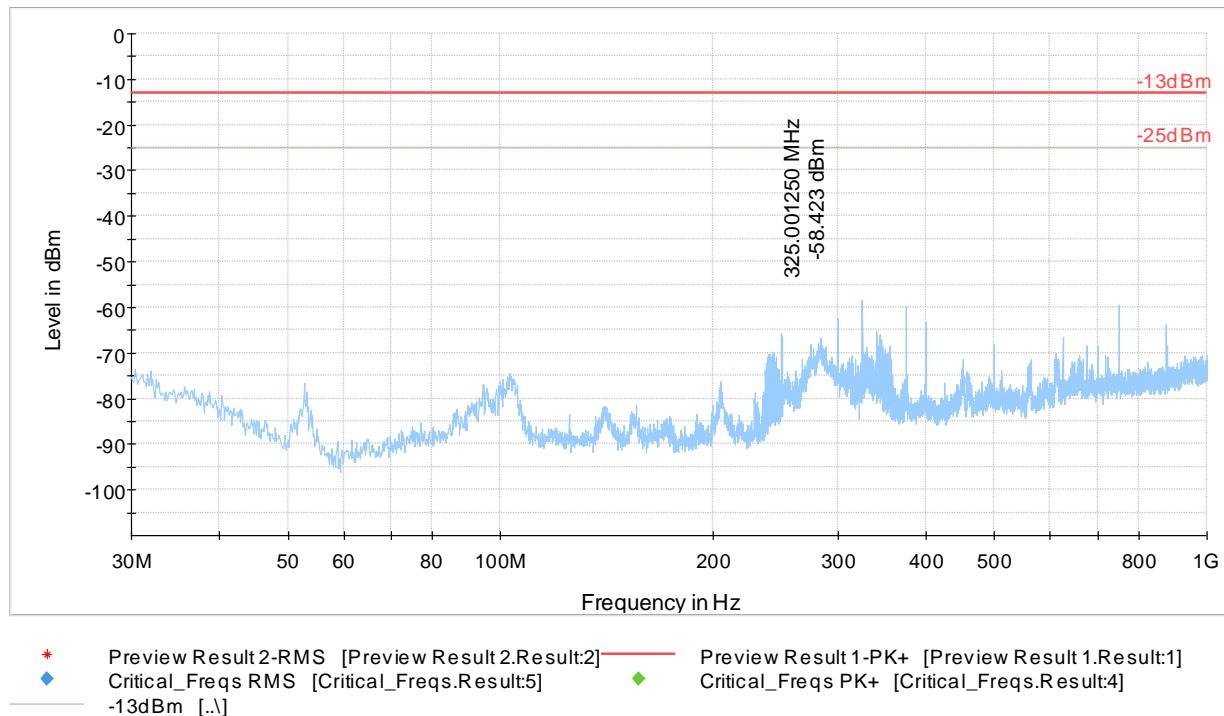


10.15.2 30MHz – 1GHz, Ch. Low

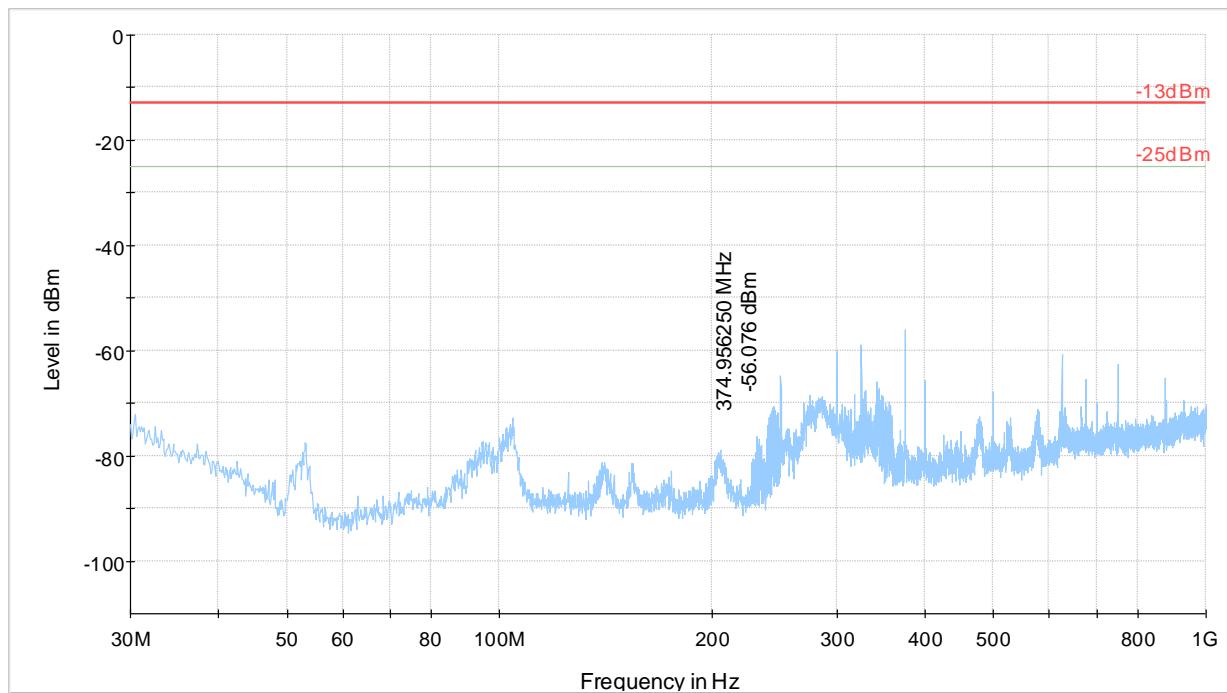


◆ Preview Result 2-RMS [Preview Result 2.Result:2] — Preview Result 1-PK+ [Preview Result 1.Result:1]

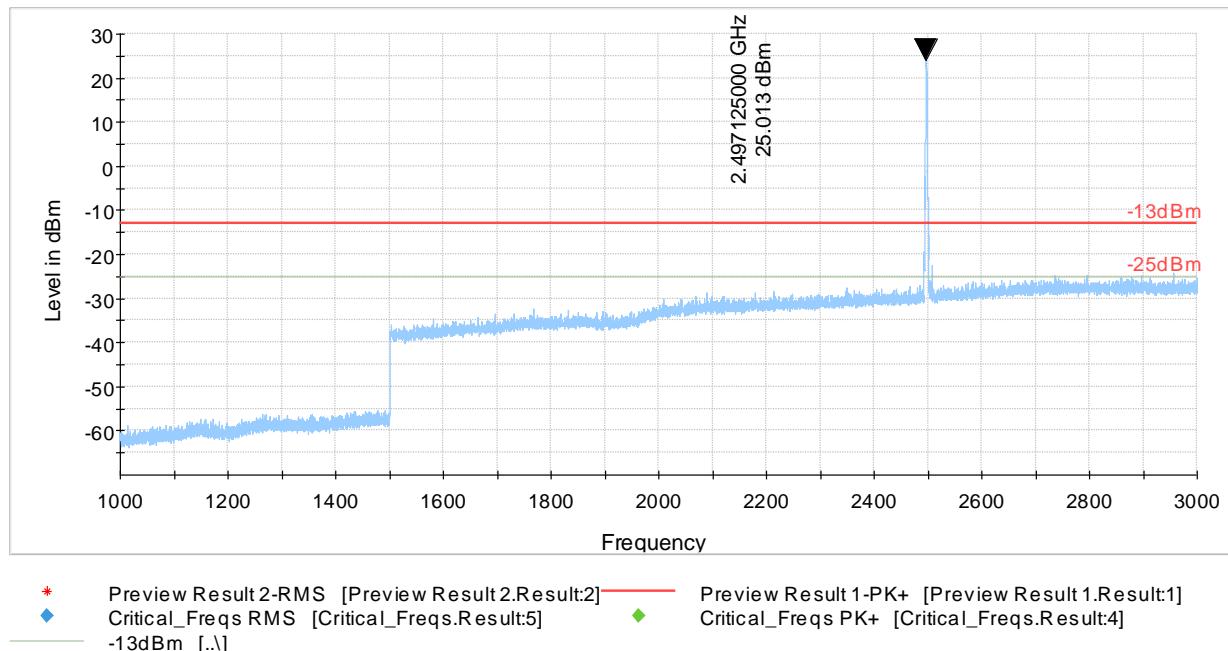
10.15.3 30MHz – 1GHz, Ch. Mid



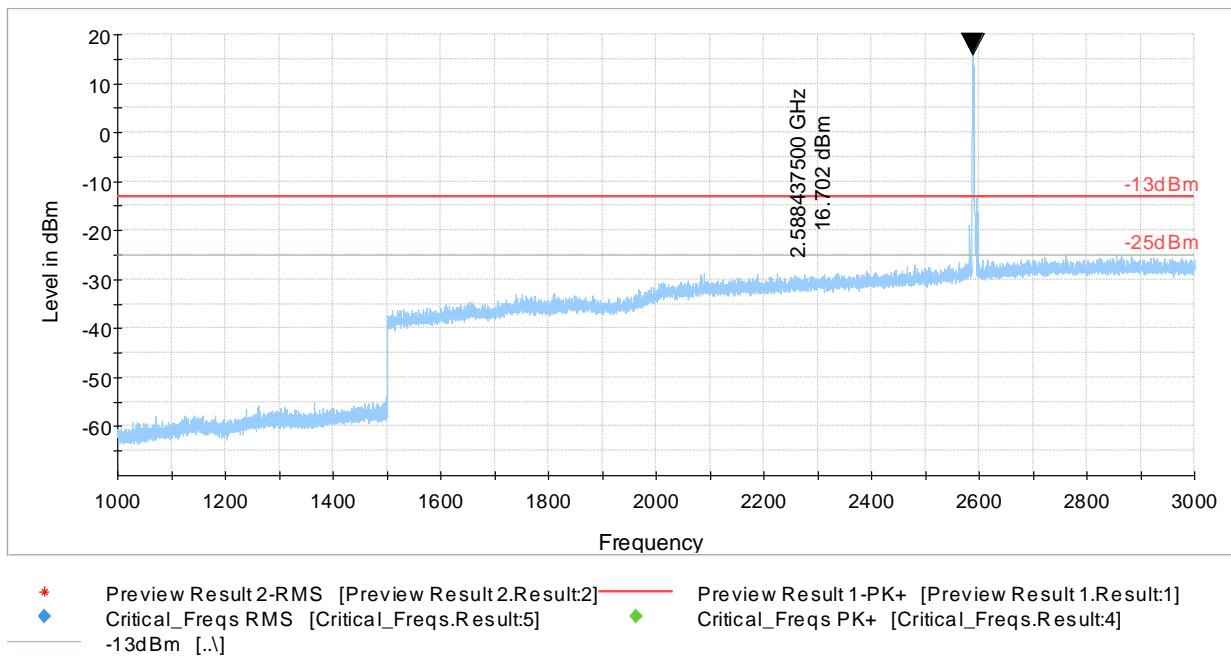
10.15.4 30MHz – 1GHz, Ch. High



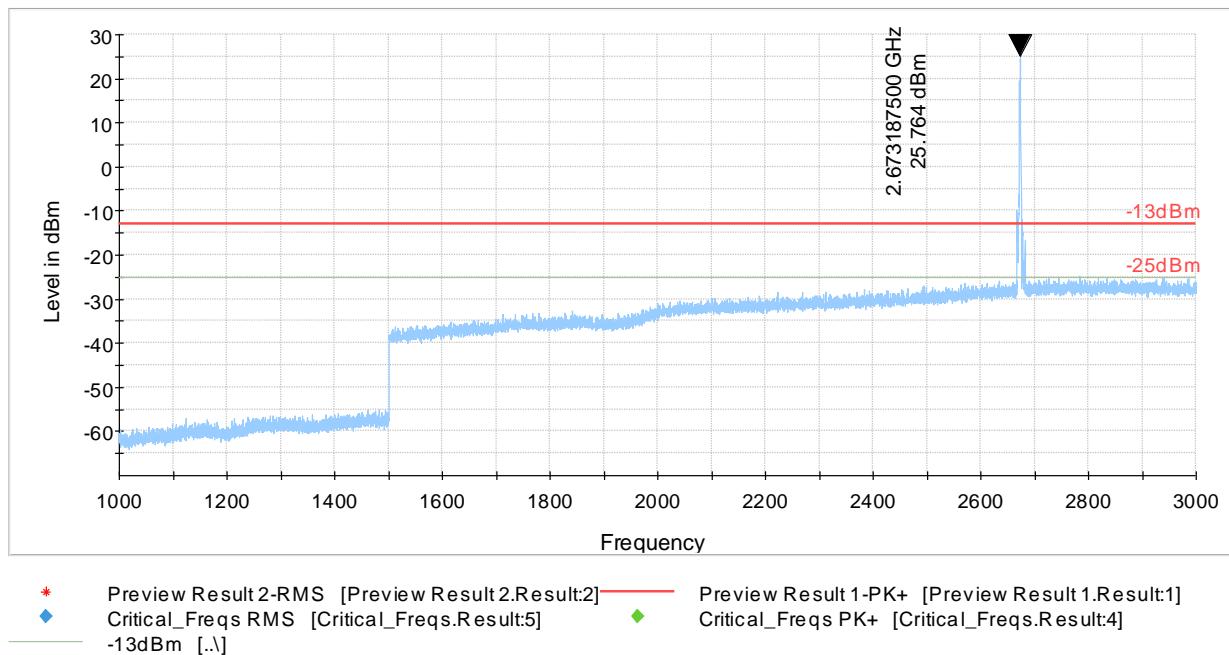
10.15.5 1GHz – 3GHz, Ch. Low



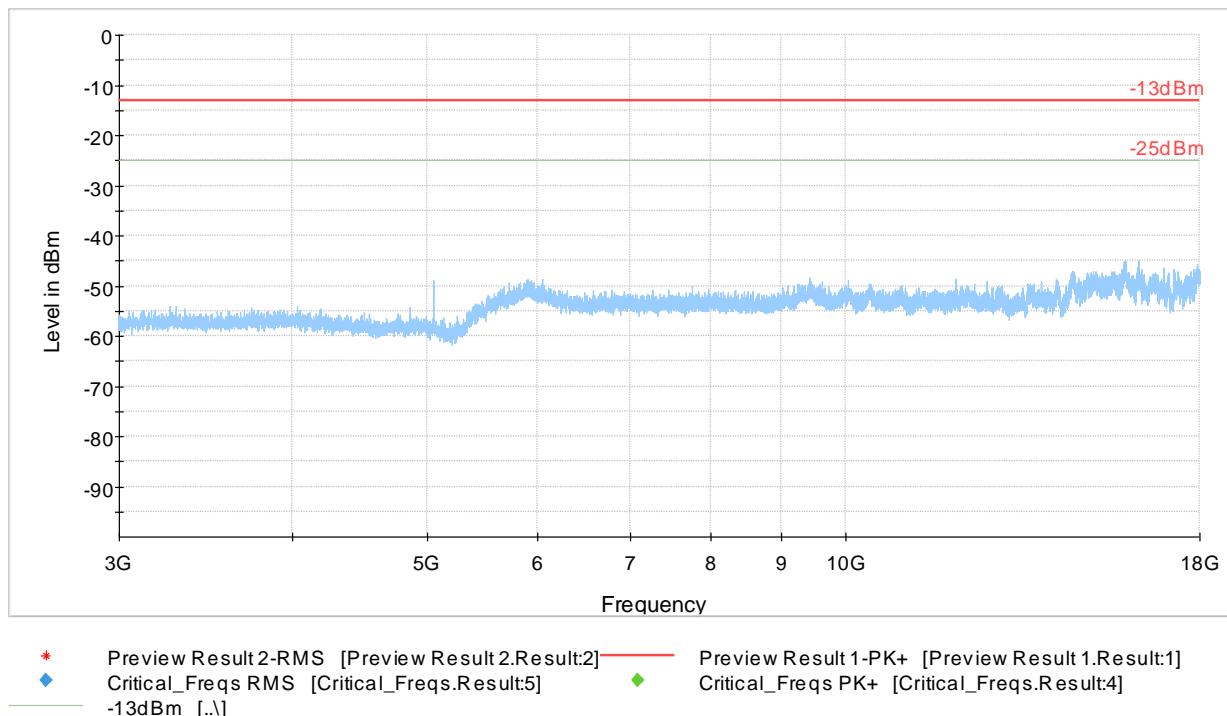
10.15.6 1GHz – 3GHz, Ch. Mid



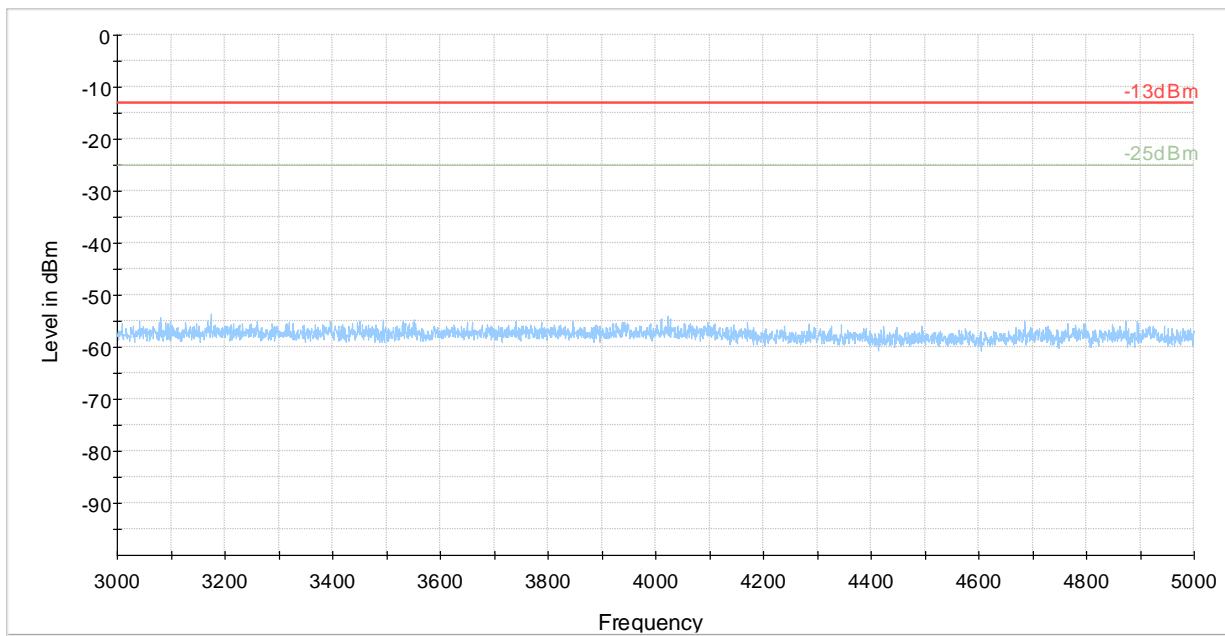
10.15.7 1GHz – 3GHz, Ch. High



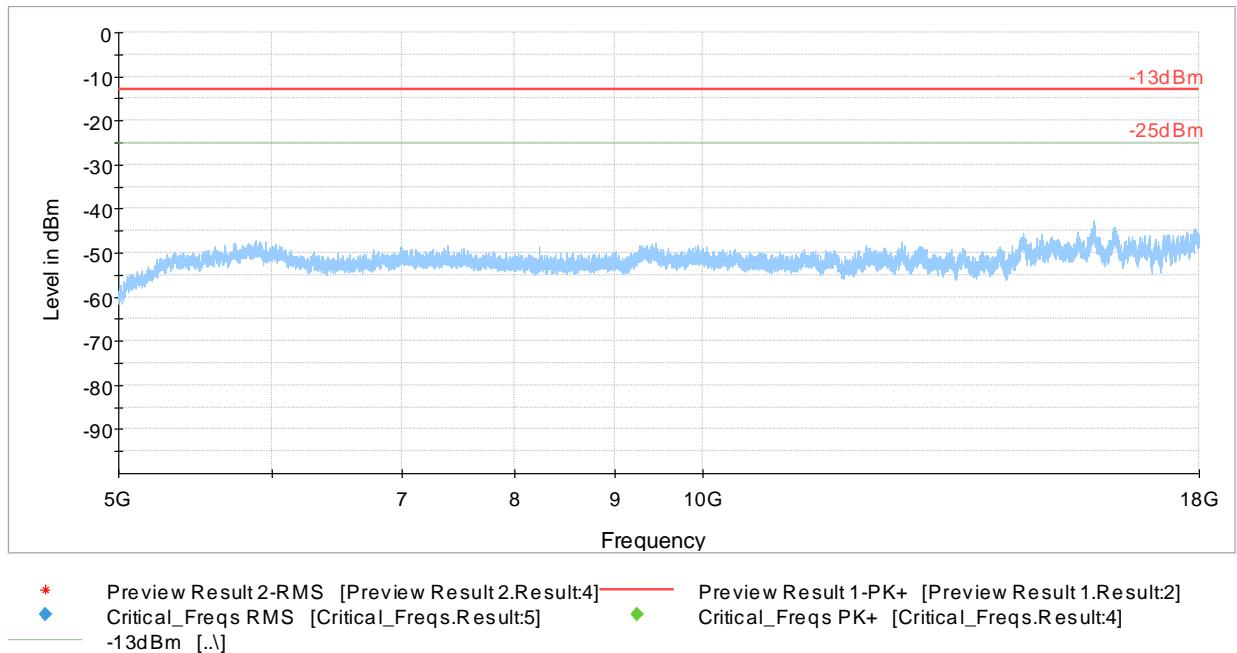
10.15.8 3GHz – 18GHz, Ch. Low



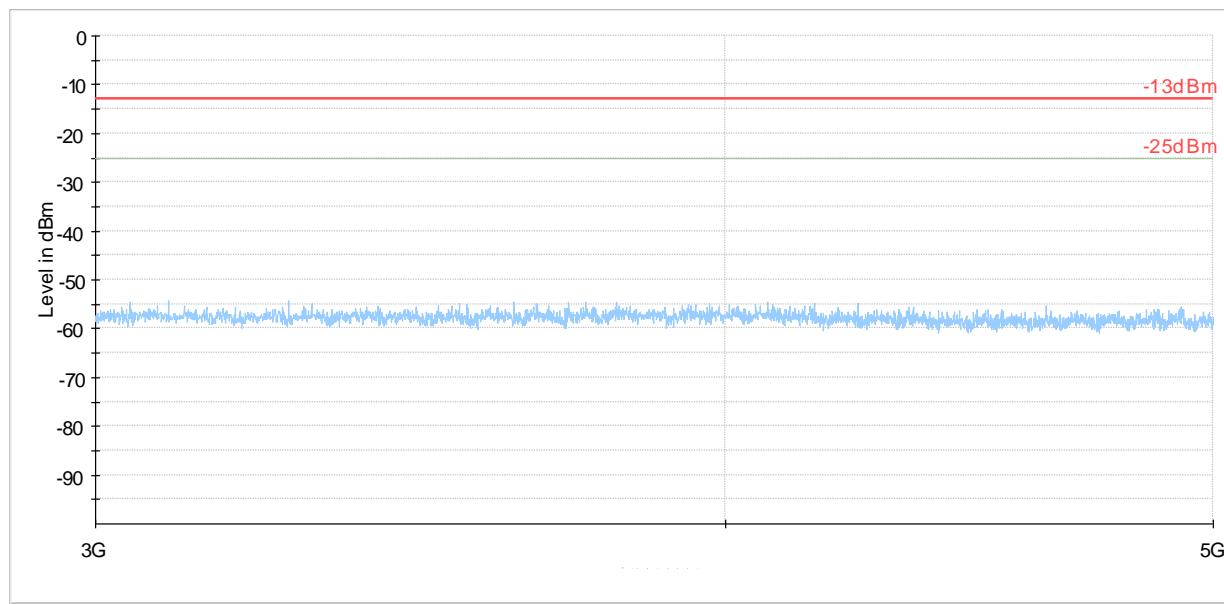
10.15.9 3GHz – 5GHz, Ch. Mid



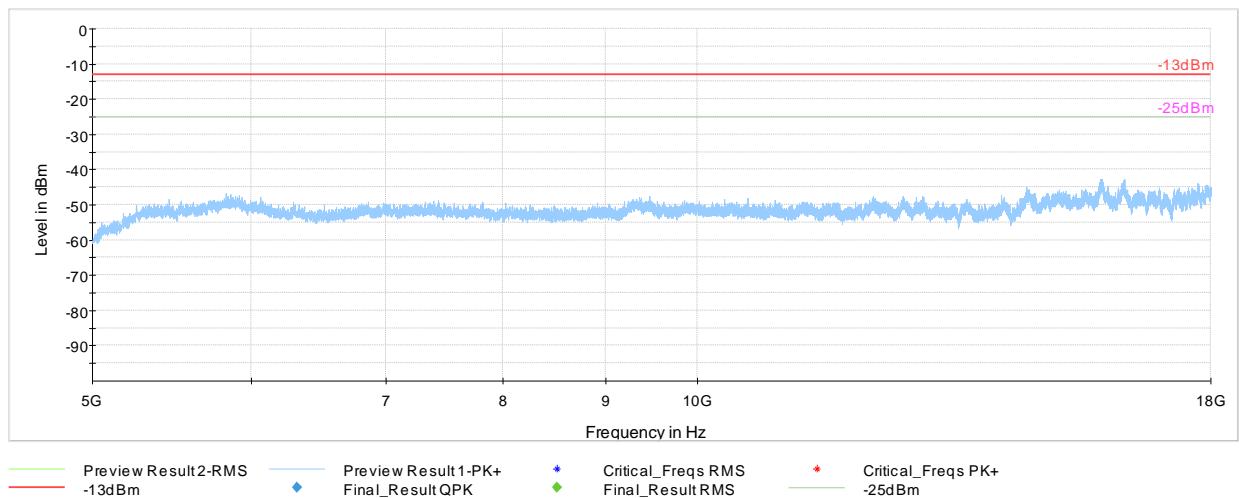
10.15.10 5GHz – 18GHz, Ch. Mid



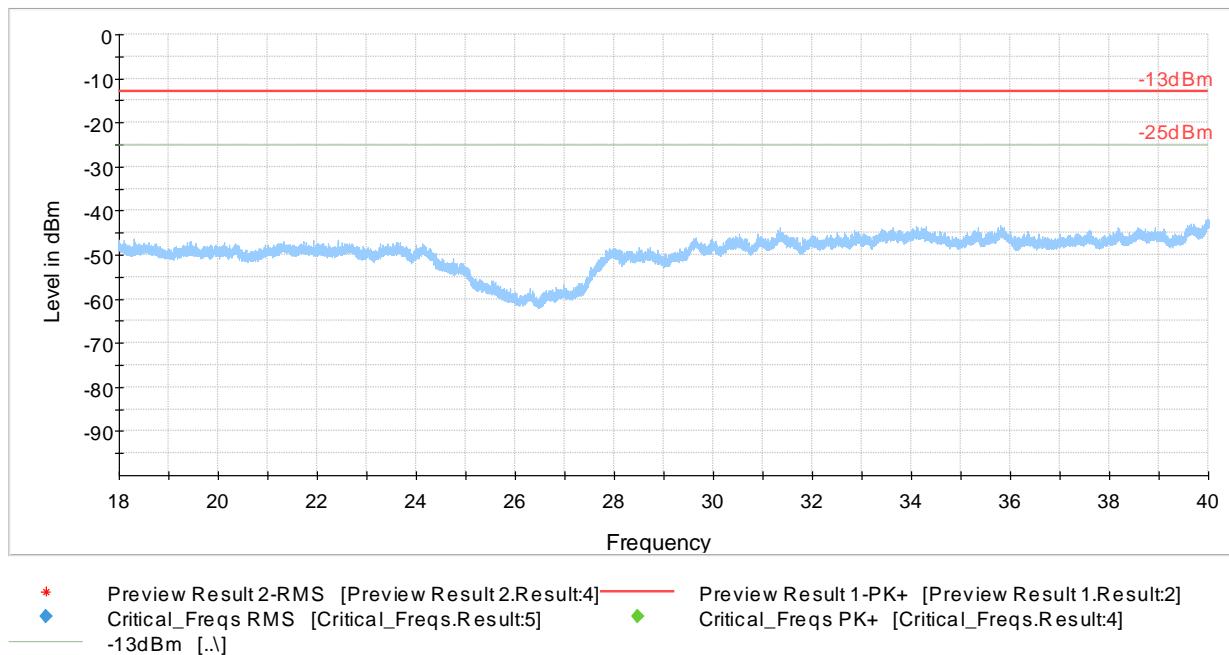
10.15.11 3GHz – 5GHz, Ch. High



10.15.13 5GHz – 18GHz, Ch. High



10.15.14 18GHz – 40GHz, Ch. Mid



Test Report #:

EMC-UTCAE-018-16501_FCC_22_24_27_90

FCC ID: 2AEAK870L1-5

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11 Test Setup Photos

Setup photos are included in supporting file name: "EMC-UTCAE-018-16501_TestSetupPhotos.pdf"

12 Test Equipment and Ancillaries Used For Testing

| Item Name | Equipment Type | Manufacturer | Model | Serial # | Calibration Cycle | Last Calibration Date |
|---------------------------------------|------------------------------|-----------------|------------|------------|-------------------|-----------------------|
| Antenna Loop 6512 | Loop (Passive) | ETS Lindgren | 6512 | 00164698 | 3 years | 7/22/2014 |
| Antenna Biconilog | Biconilog (Type 3) | Rohde & Schwarz | HL652 | 100495 | 3 years | 6/24/2015 |
| Antenna Horn 3116 | DTG Horn(Small 1) | ETS Lindgren | 3116C-PA | 00169535 | 3 years | 8/14/2014 |
| Antenna Horn 3117 | DTG Horn(Medium) | ETS Lindgren | 3117-PA | 00167061 | 3 years | 8/13/2014 |
| Digital Barometer | Compact Digital Barometer | Control Company | 35519-055 | 91119547 | 3 Years | 4/7/2015 |
| Digital Radio Comm. Tester CMU 200 #1 | Digital Radio Comm. Tester | R&S | CMU 200 #1 | 101821 | 2 Years | 7/4/2015 |
| Signal Analyzer | Receiver/FSV 40 | R&S | ESU 40 | 101022 | 3 years | 7/28/2014 |
| MT8820C | Radio communication analyzer | Anritsu | MT8820C | 6201381652 | 3 years | 4/29/2016 |
| Thermometer Humidity TM320 | Thermometer Humidity | Dickson | TM320 | 5280063 | 3 Year | 7/29/2016 |

Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels. Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

13 Revision History

| Date | Report Name | Changes to report | Report prepared by |
|------------------|-------------------------------------|-------------------|--------------------|
| October 19, 2016 | EMC-UTCAE-018-16501_FCC_22_24_27_90 | Initial Version | James Donnellan |