



## FCC/IC Test Report

For:  
CalAmp

Model:  
LMU3640LAB

Product Description:  
Vehicle tracking and telemetry device

FCC ID: APV-3640LAB  
IC ID: 5843A-3640LAB

Per:  
47 CFR: Part 22, Part 24, Part 27  
RSS-130; RSS-132 Issue 3; RSS-133 Issue 6; RSS-139 Issue 3

REPORT #: EMC\_CALAM-063-17001\_FCC\_22\_24\_27-IC\_NA1\_REV1

DATE: 10/10/2017



A2LA Accredited

IC recognized #  
3462B-1

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## 1 **Assessment**

The following device as further described in section 3 of this report was evaluated against selected applicable criteria specified in the Code of Federal Regulations Title 47 parts 22, 24, 27 and Industry Canada Radio Standard Specifications RSS:130, 132 Issue 3, 133 Issue 6, and 139 Issue 3.

No deficiencies were ascertained.

| Company Name | Product Description                   | Model      |
|--------------|---------------------------------------|------------|
| CalAmp       | Vehicle tracking and telemetry device | LMU3640LAB |

### **Responsible for Testing Laboratory:**

Peter Nevermann

10/10/2017 Compliance (Director Radio Communications and EMC)

| Date | Section | Name | Signature |
|------|---------|------|-----------|
|------|---------|------|-----------|

### **Responsible for the Report:**

Issa Ghanma

10/10/2017 Compliance (EMC Engineer)

| Date | Section | Name | Signature |
|------|---------|------|-----------|
|------|---------|------|-----------|

The test results of this test report relate exclusively to the test item specified in Section3.

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      |
| Director Radio Com. and EMC: | Peter Nevermann        |
| Responsible Project Leader:  | Issa Ghanma            |

### 2.2 Identification of the Client

|                   |                                                        |
|-------------------|--------------------------------------------------------|
| Applicant's Name: | CalAmp                                                 |
| Street Address:   | 2177 Salk Ave, Suite 200                               |
| City/Zip Code     | Carlsbad, CA 90228                                     |
| Country           | USA                                                    |
| Contact Person:   | Imad Rizk                                              |
| Phone No.         | 760 814 9697                                           |
| e-mail:           | <a href="mailto:lrizk@calamp.com">lrizk@calamp.com</a> |

### 2.3 Identification of the Manufacturer

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

### 3 Equipment Under Test (EUT)

#### 3.1 EUT Specifications

|                              |       |                                                                                                                                                                                                                                                            |                    |                    |             |
|------------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|-------------|
| Model No                     |       | LMU3640LAB                                                                                                                                                                                                                                                 |                    |                    |             |
| HW Version                   |       | REV A                                                                                                                                                                                                                                                      |                    |                    |             |
| SW Version                   |       | 6.1                                                                                                                                                                                                                                                        |                    |                    |             |
| FCC-ID                       |       | APV-3640LAB                                                                                                                                                                                                                                                |                    |                    |             |
| IC-ID:                       |       | 5843A-3640LAB                                                                                                                                                                                                                                              |                    |                    |             |
| FWIN:                        |       | N/A                                                                                                                                                                                                                                                        |                    |                    |             |
| HVIN:                        |       | LMU3640LAB                                                                                                                                                                                                                                                 |                    |                    |             |
| PMN:                         |       | LMU-3640                                                                                                                                                                                                                                                   |                    |                    |             |
| Product Description          |       | Vehicle tracking and telemetry device                                                                                                                                                                                                                      |                    |                    |             |
| Module Information           |       | Module: LE910-NA1                                                                                                                                                                                                                                          |                    |                    |             |
| Mode                         | LTE   | Band                                                                                                                                                                                                                                                       | UL Frequency (MHz) | DL Frequency (MHz) | Modulation  |
|                              |       | 2                                                                                                                                                                                                                                                          | 1850.7 ~ 1909.3    | 1930.7 ~ 1989.3    | QPSK, 16QAM |
|                              |       | 4                                                                                                                                                                                                                                                          | 1710.7 ~ 1754.3    | 2110.7 ~ 2154.3    | QPSK, 16QAM |
|                              |       | 5                                                                                                                                                                                                                                                          | 824.7 ~ 848.3      | 869.7 ~ 893.3      | QPSK, 16QAM |
|                              |       | 12                                                                                                                                                                                                                                                         | 699 ~ 716          | 729 ~ 746          | QPSK, 16QAM |
|                              |       | 13                                                                                                                                                                                                                                                         | 777 ~ 787          | 746 ~ 756          | QPSK, 16QAM |
|                              | WCDMA | II                                                                                                                                                                                                                                                         | 1852.4 ~ 1907.6    | 1932.4 ~ 1987.6    | QPSK        |
|                              |       | V                                                                                                                                                                                                                                                          | 826.4 ~ 846.6      | 871.4 ~ 891.6      | QPSK        |
| BT/EDR                       |       | 2.4GHz<br>8DPSK                                                                                                                                                                                                                                            |                    |                    |             |
| Max. documented antenna gain |       | EIRP measurements from OTA testing used because antenna gain is unknown.<br><br>WCDMA Band II: 4.81 dBi<br>WCDMA Band V: 1.94 dBi<br>LTE Band 2: 3.98 dBi<br>LTE Band 4: 3.48 dBi<br>LTE Band 5: 3.3 dBi<br>LTE Band 12: 1.36 dBi<br>LTE Band 13: 5.22 dBi |                    |                    |             |

|                                                                         |                                                                                                                                                                                  |
|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Max. documented average conducted output power including tune up</b> | WCDMA Band II: 23.66 dBm<br>WCDMA Band V: 23.59 dBm<br>LTE Band 2: 23.4 dBm<br>LTE Band 4: 23.11 dBm<br>LTE Band 5: 22.9 dBm<br>LTE Band 12: 22.85 dBm<br>LTE Band 13: 22.87 dBm |
| <b>Operating Voltage Range</b>                                          | 8 VDC – 32 VDC                                                                                                                                                                   |
| <b>Operating Temperature Range</b>                                      | -10 <sup>0</sup> to 60 <sup>0</sup> C                                                                                                                                            |
| <b>Other Radios included in the device</b>                              | BT/EDR, BLE                                                                                                                                                                      |
| <b>Sample Revision</b>                                                  | <input type="checkbox"/> Prototype Unit; <input checked="" type="checkbox"/> Production Unit; <input type="checkbox"/> Pre-Production                                            |
| <b>EUT Dimensions</b>                                                   | 144X54X30mm                                                                                                                                                                      |
| <b>EUT Diameter</b>                                                     | <input checked="" type="checkbox"/> < 60 cm <input type="checkbox"/> Other _____                                                                                                 |

### 3.2 EUT Sample details

| EUT # | Serial Number | HW Version | SW Version | Comments              |
|-------|---------------|------------|------------|-----------------------|
| 1     | 00022         | REV A      | 6.1        | Radiated Measurements |

### 3.3 Test Sample Configuration

| Set-up # | EUT / AE used for set-up | Comments              |
|----------|--------------------------|-----------------------|
| 1        | EUT #1                   | Radiated Measurements |

### 3.4 Mode of Operation details

| Mode of Operation | Description of Operating modes     | Additional Information                                                                        |
|-------------------|------------------------------------|-----------------------------------------------------------------------------------------------|
| Op. 1             | Cellular and Bluetooth Co-location | Cellular was tested on Low, Mid and High Channels Co-Transmitting with Bluetooth Mid Channel. |

#### **4 Subject of Investigation**

The objective of the evaluation conducted by CETECOM Inc. is to support a request for new equipment authorization under FCC ID: APV-3640LAB/ IC ID: 5843A-3640LAB

According to the guidelines from FCC KDB 996369 for the product under evaluation, and the pre-certified module to be integrated (Telit LE910-NA1) as described in Section 3, the output power has been verified to be within the specified production tolerances and measurement uncertainties, and where relevant test procedures did not change the conducted test results from module certification are re-used. Full Radiated Spurious Emissions test was conducted, per Code of Federal Regulations Title 47 parts 22, 24, 27, and Industry Canada Radio Standard Specifications RSS:130, 132 Issue 3, 133 Issue 6, and 139 Issue 3.

The module test data can be obtained under the FCC Filing ID: R17LE910NAV2 / IC ID: 5131A-LE910NAV2.

##### **4.1 Dates of Testing:**

8/23/2017 – 9/22/2017

##### **4.2 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 1000 MHz | ±2.0 dB (Biconilog Antenna)     |
| 1 GHz to 40 GHz    | ±2.3 dB (Horn Antenna)          |

Conducted measurement

|                          |         |
|--------------------------|---------|
| RF conducted measurement | ±0.5 dB |
|--------------------------|---------|

##### **4.3 Environmental Conditions during Testing:**

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

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

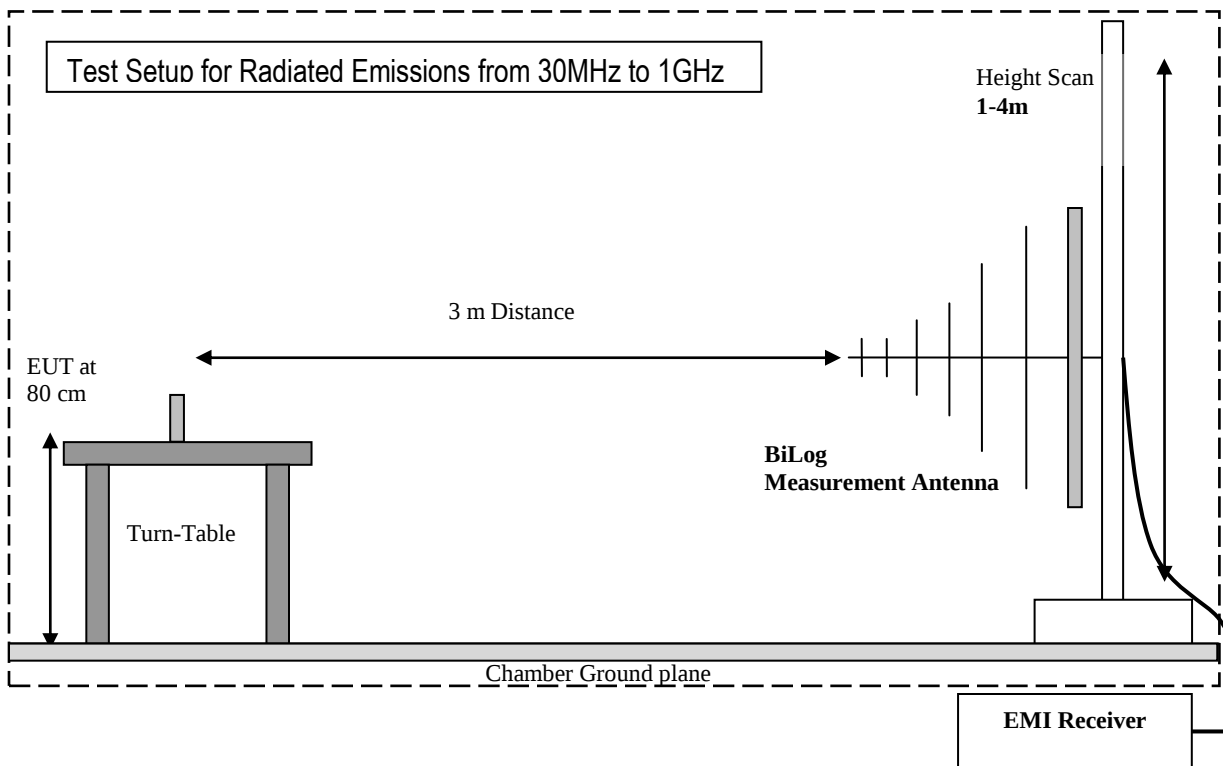
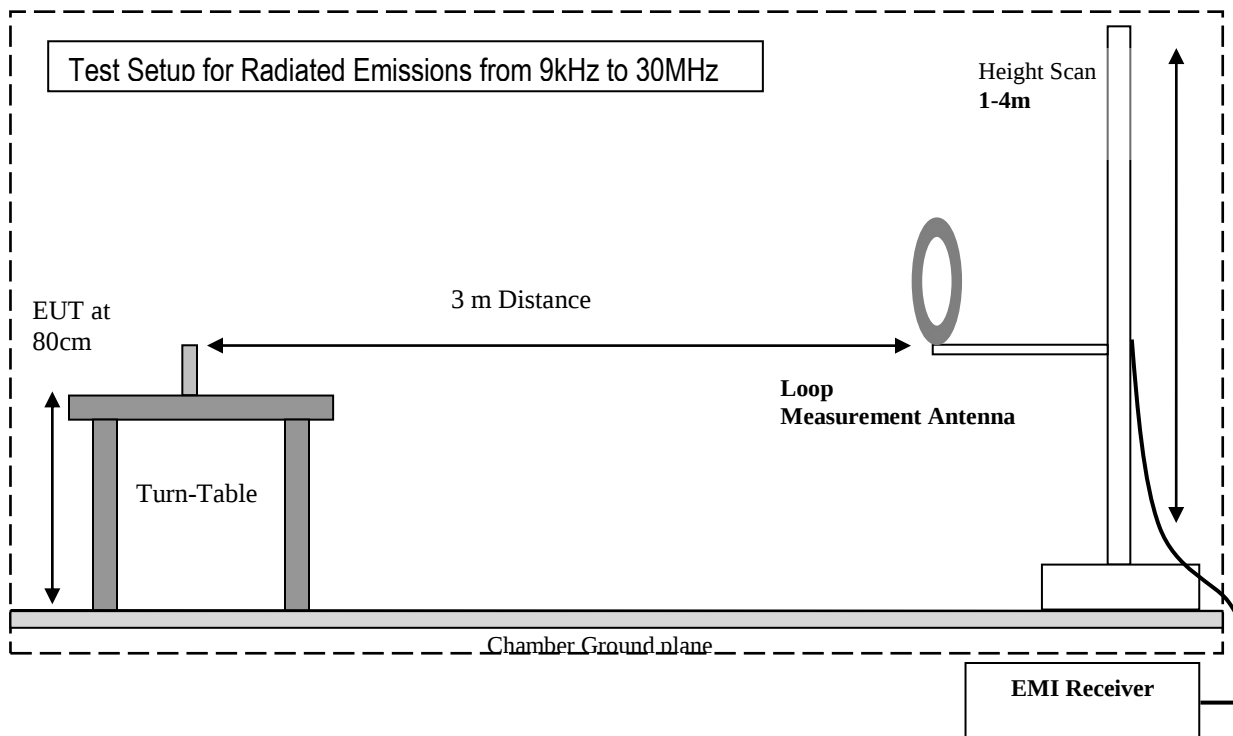
Deviating test conditions are indicated at individual test description where applicable.

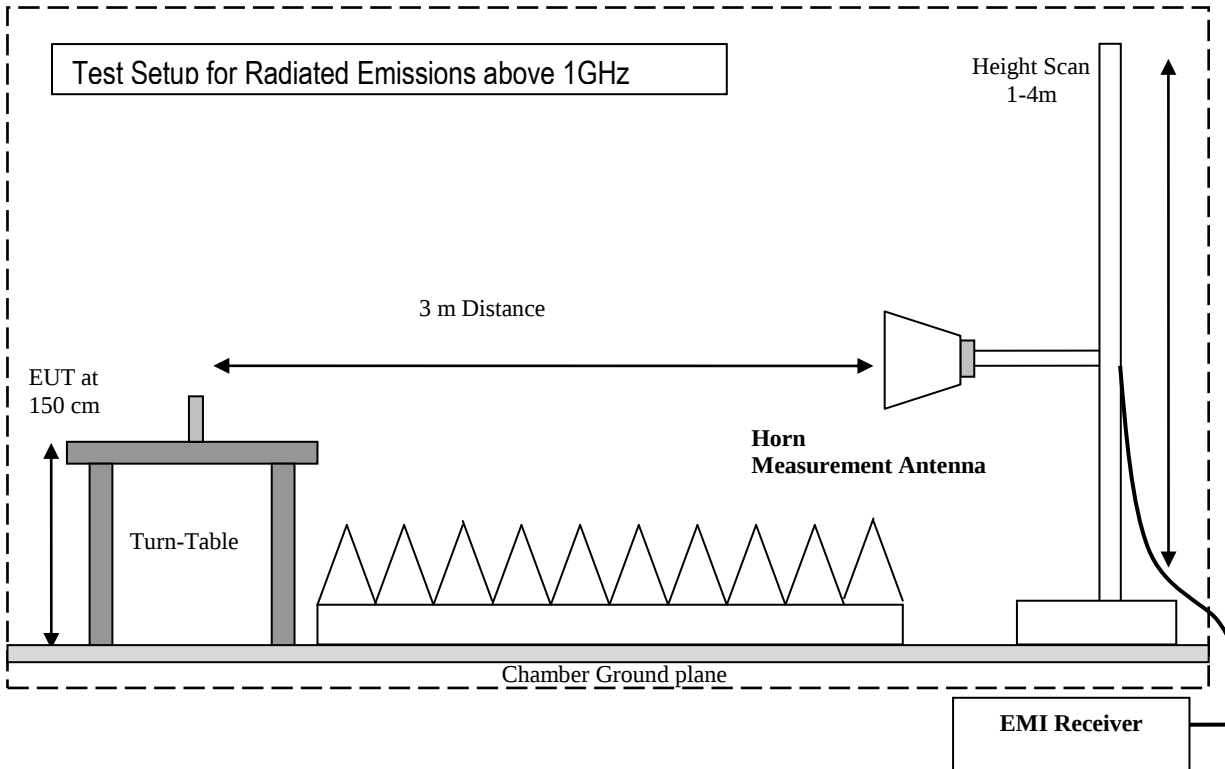
## **5 Measurement Procedures**

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.

### **5.1 Radiated Measurement**

- 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 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.





## 5.2 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 $\mu$ 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 $\mu$ V) | Cable Loss (dB) | Antenna Factor Correction (dB) | Field Strength Result (dB $\mu$ V/m) |
|-----------------|--------------------------|-----------------|--------------------------------|--------------------------------------|
| 1000            | 80.5                     | 3.5             | 14                             | 98.0                                 |

## 6 Measurement Results Summary

### 6.1 FCC 22, RSS-132:

| Test Specification                       | Test Case                    | Temperature and Voltage Conditions | Mode     | Pass                     | Fail                     | NA                       | NP                       | Result          |
|------------------------------------------|------------------------------|------------------------------------|----------|--------------------------|--------------------------|--------------------------|--------------------------|-----------------|
| §2.1046; §22.913 (a)                     | RF Output Power              | Nominal                            | UMTS LTE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies Note 2 |
| §2.1055; §22.355                         | Frequency Stability          | Nominal                            | UMTS LTE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies Note 2 |
| §2.1049; §22.917                         | Occupied Bandwidth           | Nominal                            | UMTS LTE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies Note 2 |
| §2.1051; §22.917                         | Band Edge Compliance         | Nominal                            | UMTS LTE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies Note 2 |
| §2.1051; §22.917                         | Conducted Spurious Emissions | Nominal                            | UMTS LTE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies Note 2 |
| §2.1053; §22.917(a); RSS-132 Issue 3-5.5 | Radiated Spurious Emissions  | Nominal                            | UMTS LTE | ■                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Complies        |

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

Note 2: Leveraged from module certification LE910-NA1 FCC ID: R17LE910NAV2 / IC ID: 5131A-LE910NAV2.

### 6.2 FCC 24, RSS-133:

| Test Specification                         | Test Case                    | Temperature and Voltage Conditions | Mode     | Pass                     | Fail                     | NA                       | NP                       | Result          |
|--------------------------------------------|------------------------------|------------------------------------|----------|--------------------------|--------------------------|--------------------------|--------------------------|-----------------|
| §2.1046; §24.232 (a)                       | RF Output Power              | Nominal                            | UMTS LTE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies Note 2 |
| §2.1055; §24.235                           | Frequency Stability          | Nominal                            | UMTS LTE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies Note 2 |
| §2.1049; §24.238                           | Occupied Bandwidth           | Nominal                            | UMTS LTE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies Note 2 |
| §2.1051; §24.238                           | Band Edge Compliance         | Nominal                            | UMTS LTE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies Note 2 |
| §2.1051; §24.238                           | Conducted Spurious Emissions | Nominal                            | UMTS LTE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies Note 2 |
| §2.1053; §24.238(a); RSS-133 Issue 6-6.5.1 | Radiated Spurious Emissions  | Nominal                            | UMTS LTE | ■                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Complies        |

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

Note 2: Leveraged from module certification LE910-NA1 FCC ID: R17LE910NAV2 / IC ID: 5131A-LE910NAV2.

### 6.3 FCC 27, RSS-130, RSS-139:

| Test Specification                                                                                 | Test Case                    | Temperature and Voltage Conditions | Mode        | Pass                     | Fail                     | NA                       | NP                       | Result             |
|----------------------------------------------------------------------------------------------------|------------------------------|------------------------------------|-------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------|
| §2.1046; §27.50 (d)                                                                                | RF Output Power              | Nominal                            | UMTS<br>LTE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies<br>Note 2 |
| §2.1055; §27.54                                                                                    | Frequency Stability          | Nominal                            | UMTS<br>LTE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies<br>Note 2 |
| §2.1049; §27.53                                                                                    | Occupied Bandwidth           | Nominal                            | UMTS<br>LTE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies<br>Note 2 |
| §2.1051; §27.53                                                                                    | Band Edge Compliance         | Nominal                            | UMTS<br>LTE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies<br>Note 2 |
| §2.1051; §27.53                                                                                    | Conducted Spurious Emissions | Nominal                            | UMTS<br>LTE | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies<br>Note 2 |
| §2.1053;<br>§27.53(c);<br>§27.53(g);<br>§27.53(h);<br>RSS-130 Issue 1-4.6;<br>RSS-139 Issue 3-6.6; | Radiated Spurious Emissions  | Nominal                            | UMTS<br>LTE | ■                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Complies           |

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

Note 2: Leveraged from module certification LE910-NA1 FCC ID: RI7LE910NAV2 / IC ID: 5131A-LE910NAV2.

## 7 Test Result Data

### 7.1 Radiated Spurious Emissions

7.1.1 Measurement according to FCC: CFR 47 Part 2.1053; CFR Part 22.917; Part 24.238; Part 27.53, utilizing KDB 971168 D01 Power Meas License Digital Systems v02r02, and according to TIA-603C 2004- 2.2.12

| Spectrum Analyzer Settings for FCC 22 |               |              |              |
|---------------------------------------|---------------|--------------|--------------|
| Frequency Range                       | 30MHz – 1 GHz | 1 – 1.58 GHz | 1.58 – 9 GHz |
| Resolution Bandwidth                  | 100 kHz       | 1 MHz        | 1 MHz        |
| Video Bandwidth                       | 100 kHz       | 1 MHz        | 1 MHz        |
| Detector                              | Peak          | Peak         | Peak         |
| Trace Mode                            | Max Hold      | Max Hold     | Max Hold     |
| Sweep Time                            | Auto          | Auto         | Auto         |

| Spectrum Analyzer Settings for FCC 24 and 27 |               |             |              |               |
|----------------------------------------------|---------------|-------------|--------------|---------------|
| Frequency Range                              | 30MHz – 1 GHz | 1 – 2.7 GHz | 2.7 – 18 GHz | 18 – 19.1 GHz |
| Resolution Bandwidth                         | 100 kHz       | 1 MHz       | 1 MHz        | 1 MHz         |
| Video Bandwidth                              | 100 kHz       | 1 MHz       | 1 MHz        | 1 MHz         |
| Detector                                     | Peak          | Peak        | Peak         | Peak          |
| Trace Mode                                   | Max Hold      | Max Hold    | Max Hold     | Max Hold      |
| Sweep Time                                   | Auto          | Auto        | Auto         | Auto          |

#### 7.1.2 Limits:

- FCC Part 22.917 (a), Part 24.238 (a), Part 27.53 (c), Part 27.53 (g), and Part 27.53 (h)
- RSS-130-4.6, RSS-132 Issue 3 5.5, RSS-133 Issue 6 6.5.1, RSS-139 Issue 3 6.6

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)

### 7.1.3 Test conditions and setup:

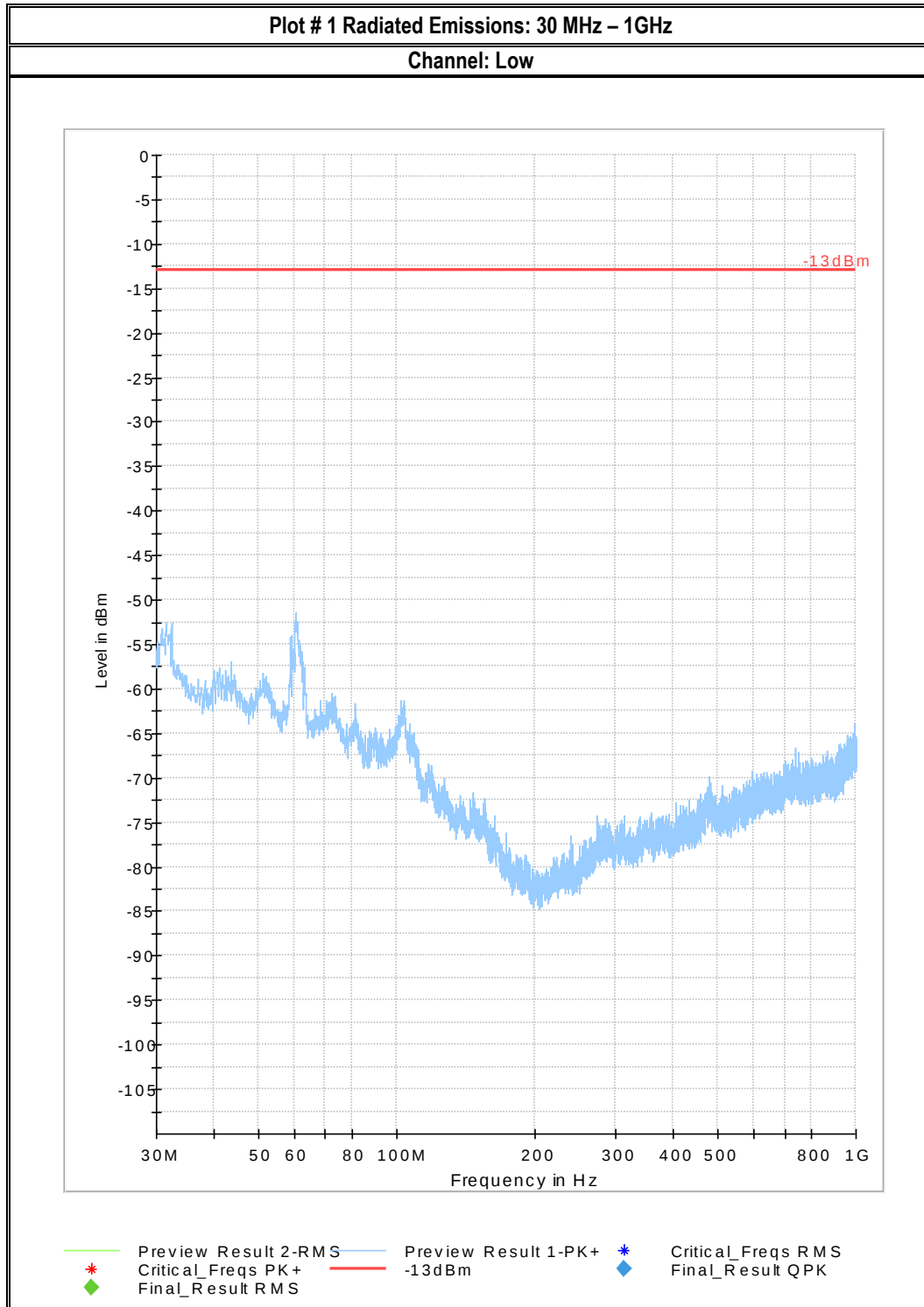
| Ambient Temperature (C) | EUT Set-Up # | EUT operating mode                     | Power Input |
|-------------------------|--------------|----------------------------------------|-------------|
| 22                      | 1            | LTE,FDD co-transmitting with Bluetooth | 12 VDC      |

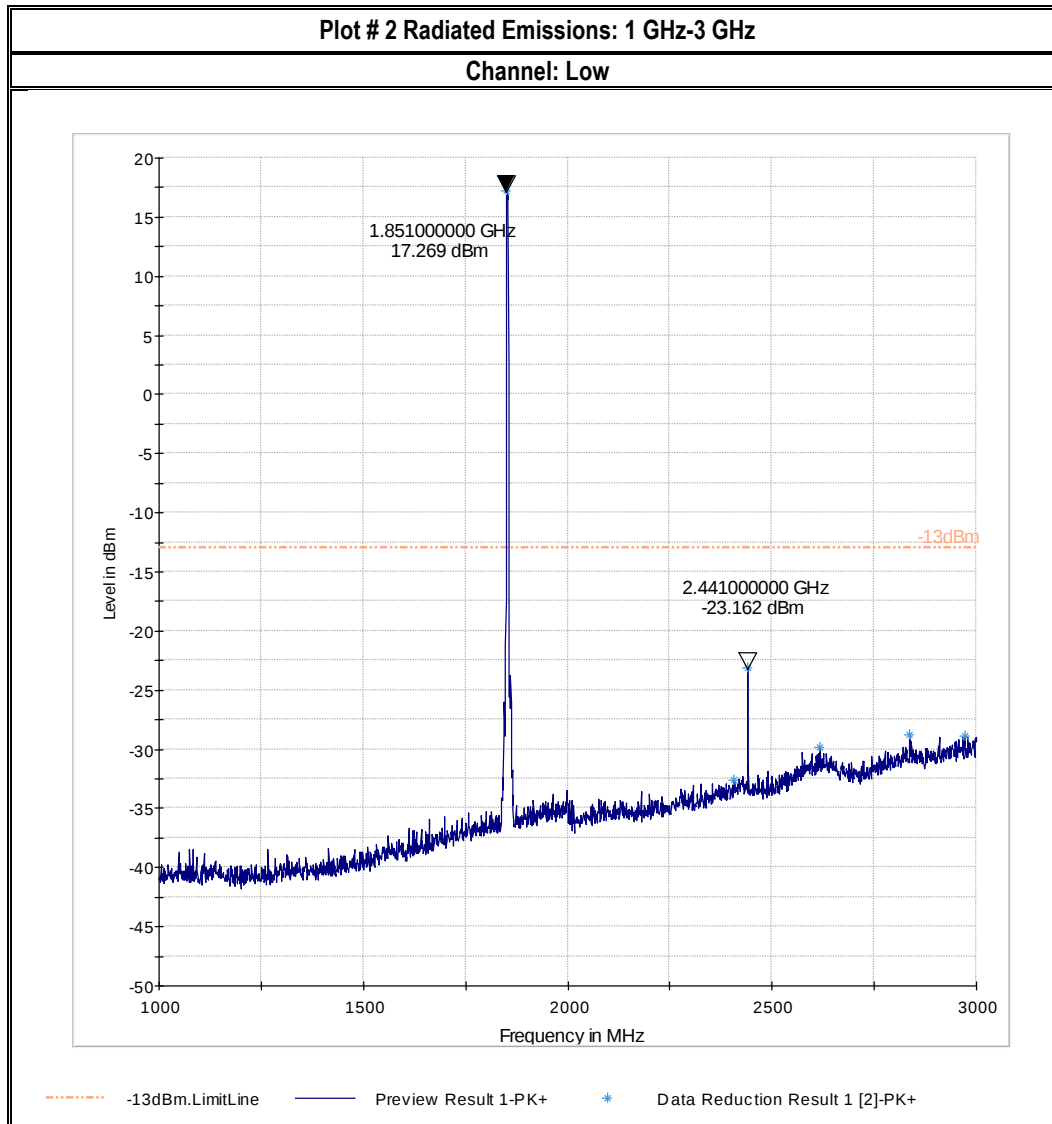
### 7.1.4 Measurement result:

| Plot #  | Cellular Channel | BT Channel | EUT operating mode               | Scan Frequency  | Limit (dBm) | Result |
|---------|------------------|------------|----------------------------------|-----------------|-------------|--------|
| 1 - 3   | Low              | Mid        | FDD II co-transmitting Bluetooth | 30 MHz – 18 GHz | -13         | Pass   |
| 4 - 8   | Mid              | Mid        | FDD II                           | 9 kHz – 22 GHz  | -13         | Pass   |
| 9 - 11  | High             | Mid        | FDD II                           | 30 MHz – 18 GHz | -13         | Pass   |
| 12 - 13 | Low              | Mid        | FDD V                            | 30 MHz – 9 GHz  | -13         | Pass   |
| 14 - 16 | Mid              | Mid        | FDD V                            | 9 kHz – 9 GHz   | -13         | Pass   |
| 17 – 18 | High             | Mid        | FDD V                            | 30 MHz – 9 GHz  | -13         | Pass   |
| 19 – 21 | Low              | Mid        | LTE 2                            | 30 MHz – 18 GHz | -13         | Pass   |
| 22 – 26 | Mid              | Mid        | LTE 2                            | 9 kHz – 22 GHz  | -13         | Pass   |
| 27 – 29 | High             | Mid        | LTE 2                            | 30 MHz – 18 GHz | -13         | Pass   |
| 30 – 32 | Low              | Mid        | LTE 4                            | 30 MHz – 18 GHz | -13         | Pass   |
| 33 – 36 | Mid              | Mid        | LTE 4                            | 9 kHz – 18 GHz  | -13         | Pass   |
| 37 – 39 | High             | Mid        | LTE 4                            | 30 MHz – 18 GHz | -13         | Pass   |
| 40 – 41 | Low              | Mid        | LTE 5                            | 30 MHz – 9 GHz  | -13         | Pass   |
| 42 – 44 | Mid              | Mid        | LTE 5                            | 9 kHz – 9 GHz   | -13         | Pass   |
| 45 – 46 | High             | Mid        | LTE 5                            | 30 MHz – 9 GHz  | -13         | Pass   |
| 47 – 48 | Low              | Mid        | LTE 12                           | 30 MHz – 9 GHz  | -13         | Pass   |
| 49 – 51 | Mid              | Mid        | LTE 12                           | 9 kHz – 9 GHz   | -13         | Pass   |
| 52 – 53 | High             | Mid        | LTE 12                           | 30 MHz – 9 GHz  | -13         | Pass   |
| 54 – 55 | Low              | Mid        | LTE 13                           | 30 MHz – 9 GHz  | -13         | Pass   |
| 56 – 58 | Mid              | Mid        | LTE 13                           | 9 kHz – 9 GHz   | -13         | Pass   |
| 59 – 60 | High             | Mid        | LTE 13                           | 30 MHz – 9 GHz  | -13         | Pass   |

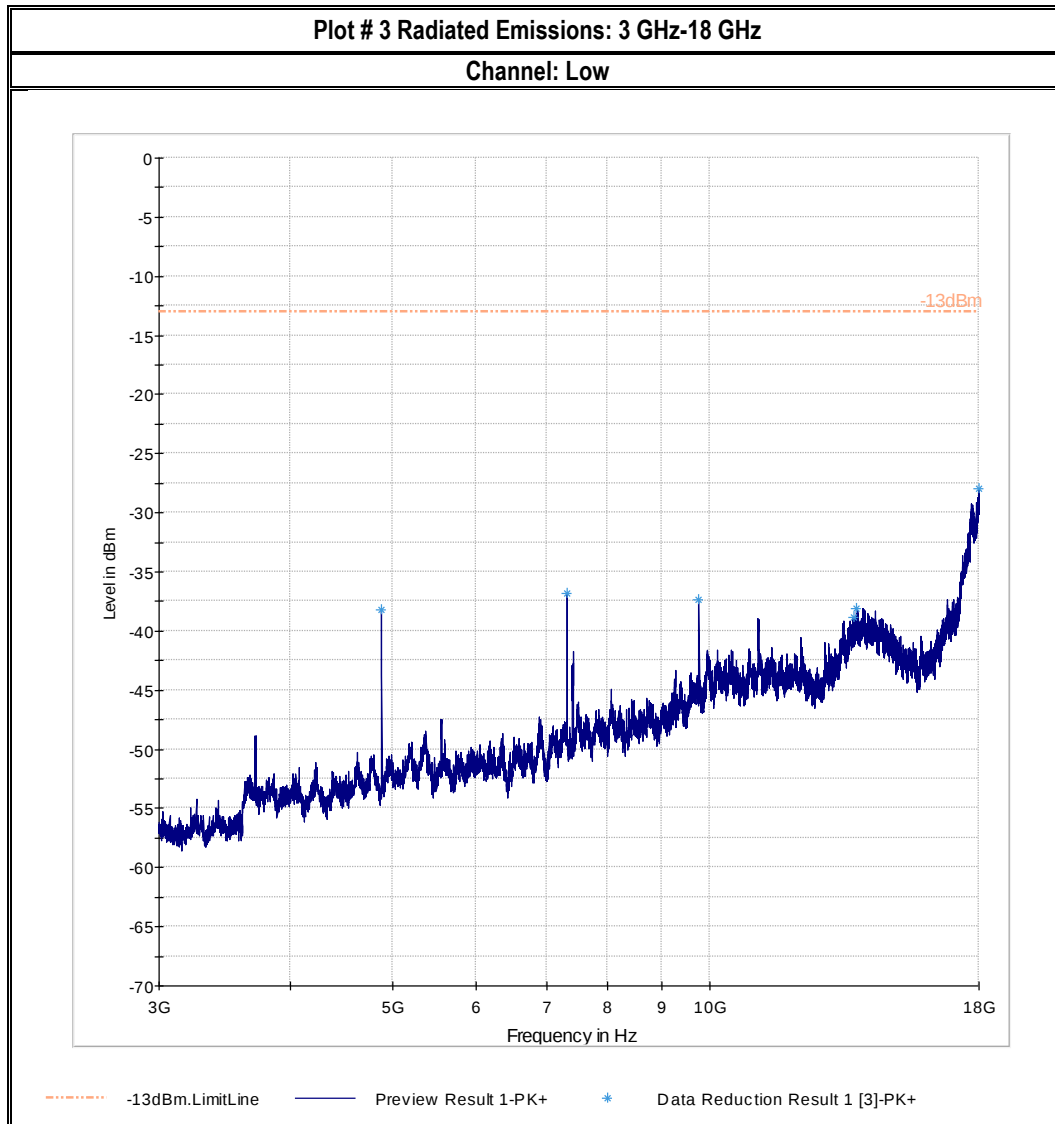
## 7.1.5 Measurement Plots:

### FDD II



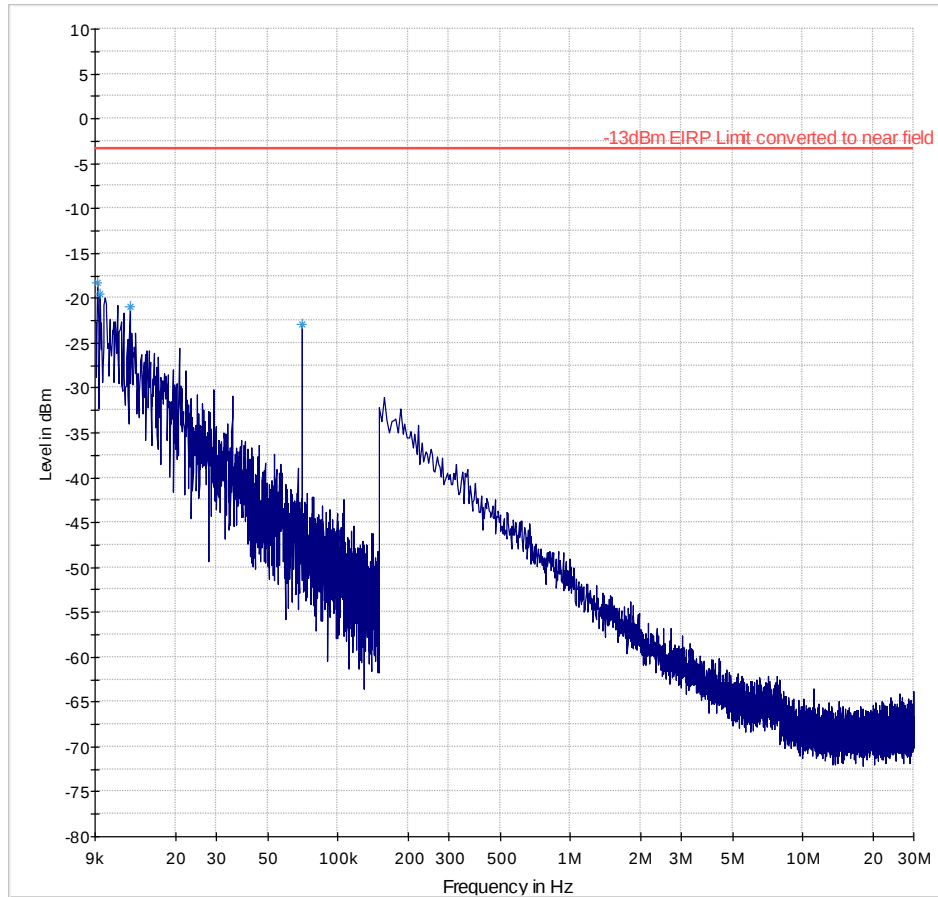


Note: The peak signal above is the transmit channel.



Plot # 4 Radiated Emissions: 9 kHz-30 MHz

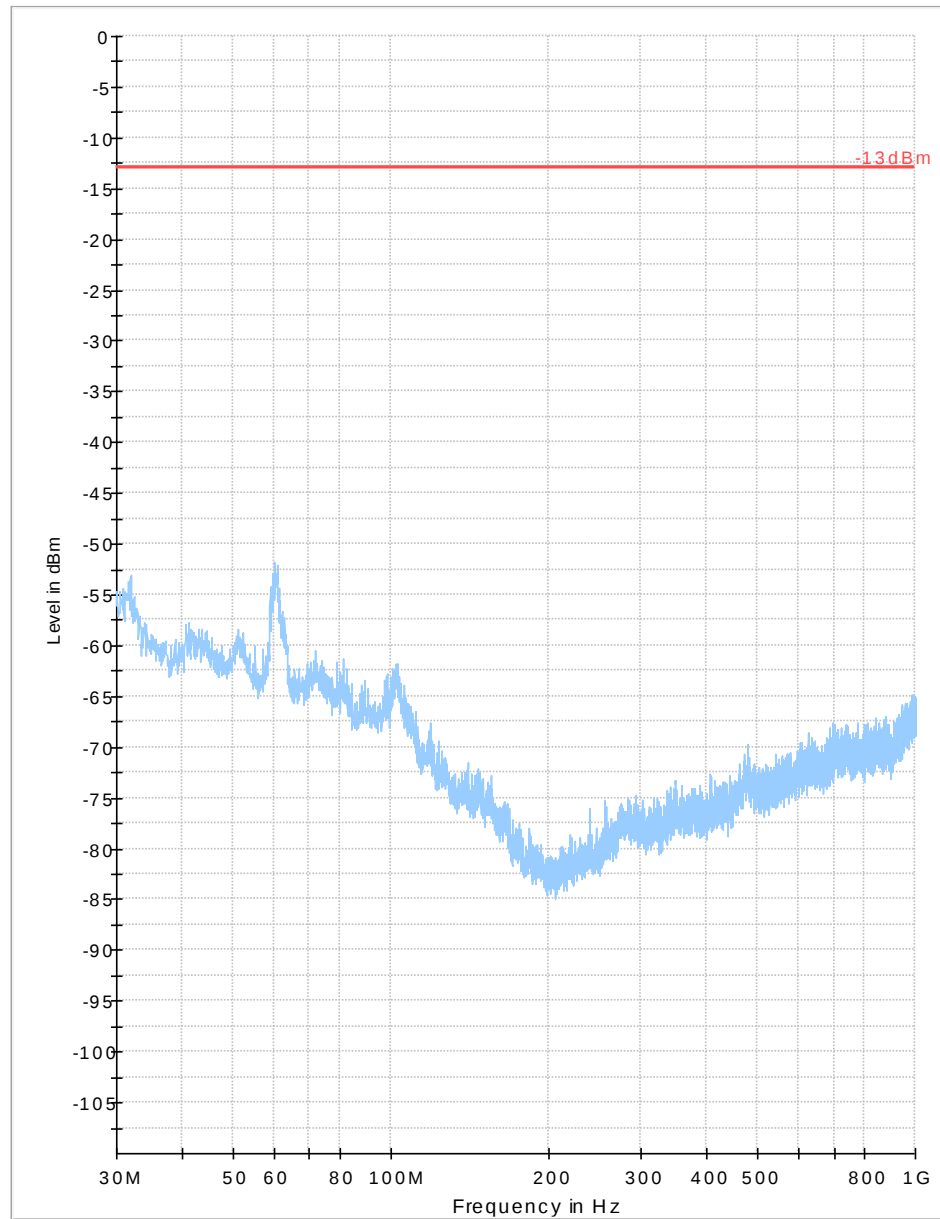
Channel: Mid



— -13dBm EIRP Limit converted to near field      — Preview Result 1-PK+  
\* Data Reduction Result 1 [1]-PK+

Plot # 5 Radiated Emissions: 30 MHz – 1GHz

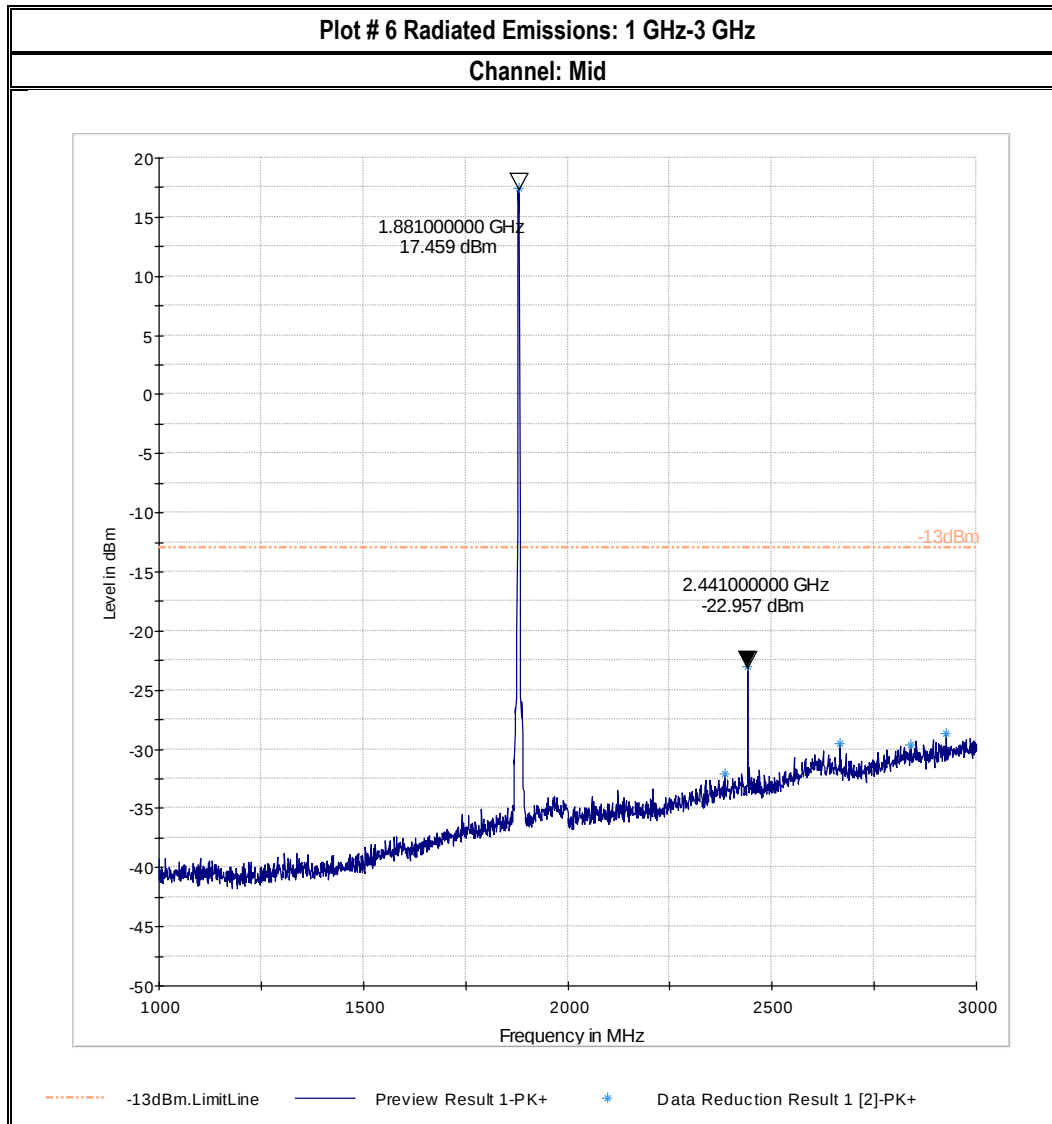
Channel: Mid



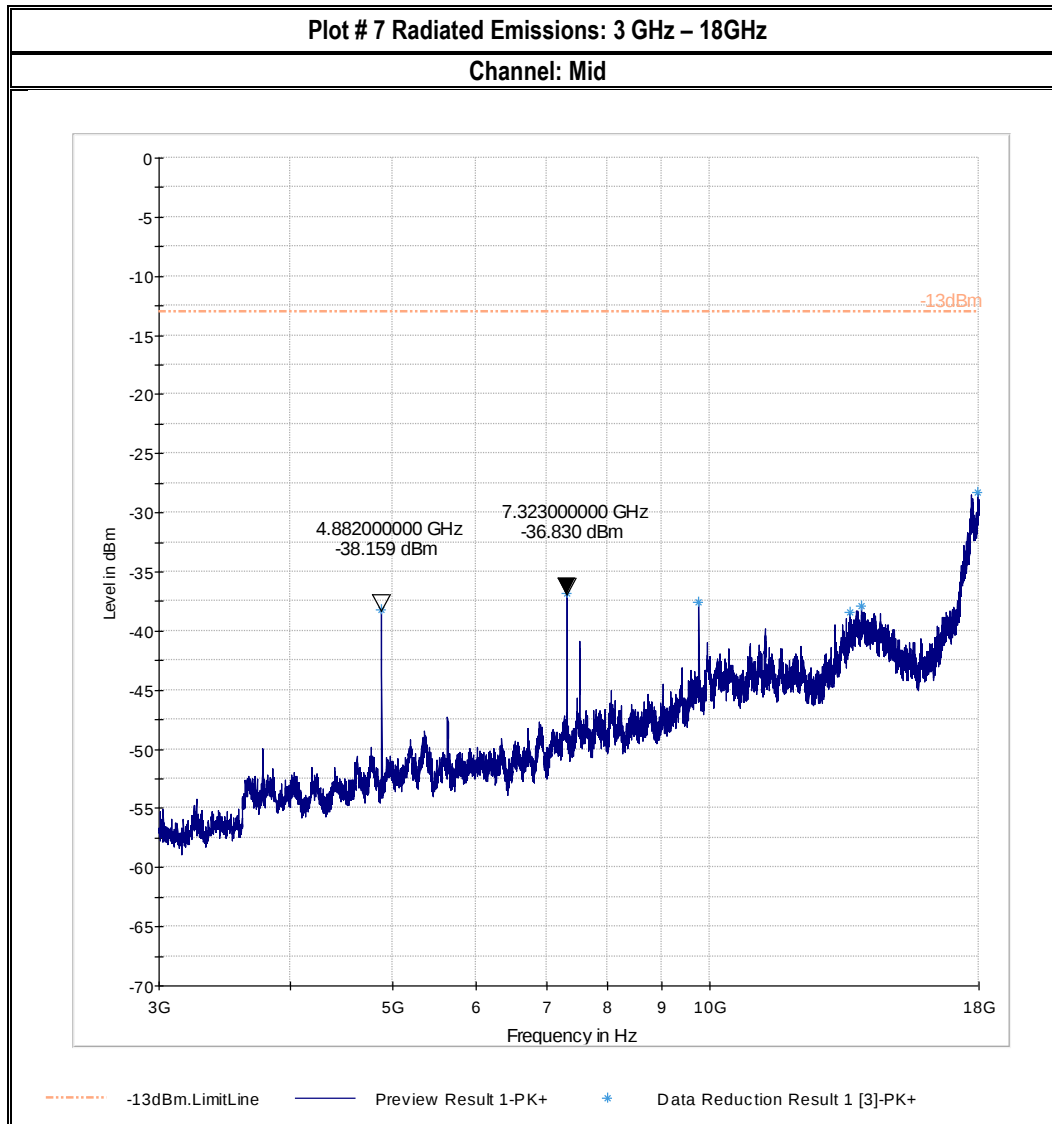
Preview Result 2-RMS  
Critical\_Freqs PK+  
Final\_Result RMS

Preview Result 1-PK+  
-13dBm

\* Critical\_Freqs RMS  
◆ Final\_Result QPK



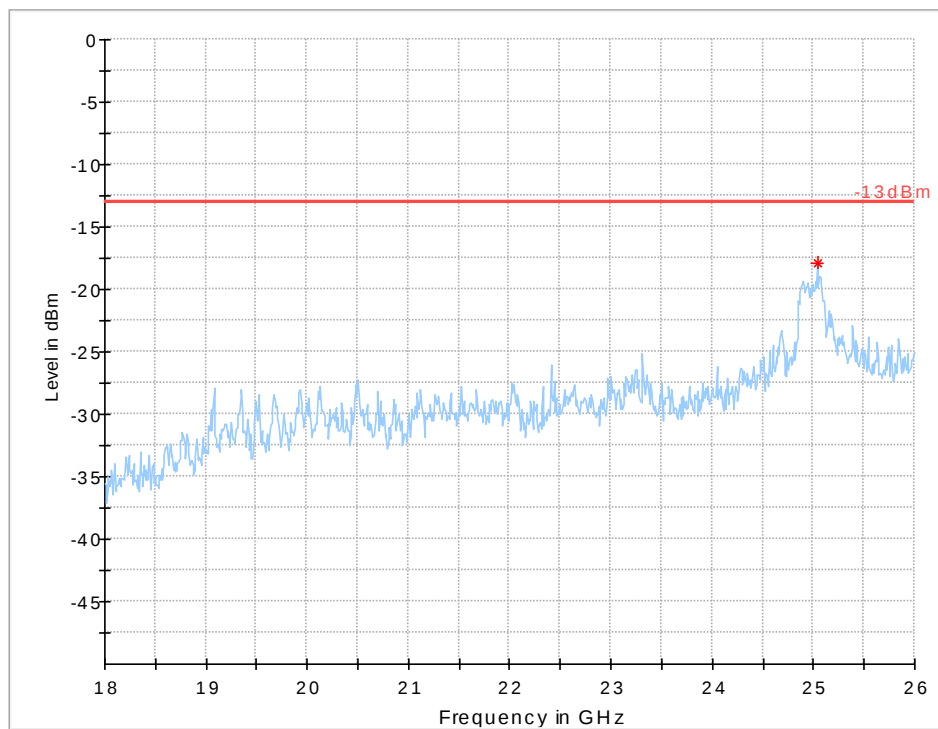
Note: The peak signal above is the transmit channel.



**Plot # 8 Radiated Emissions: 18 GHz – 26GHz**

**Channel: Mid**

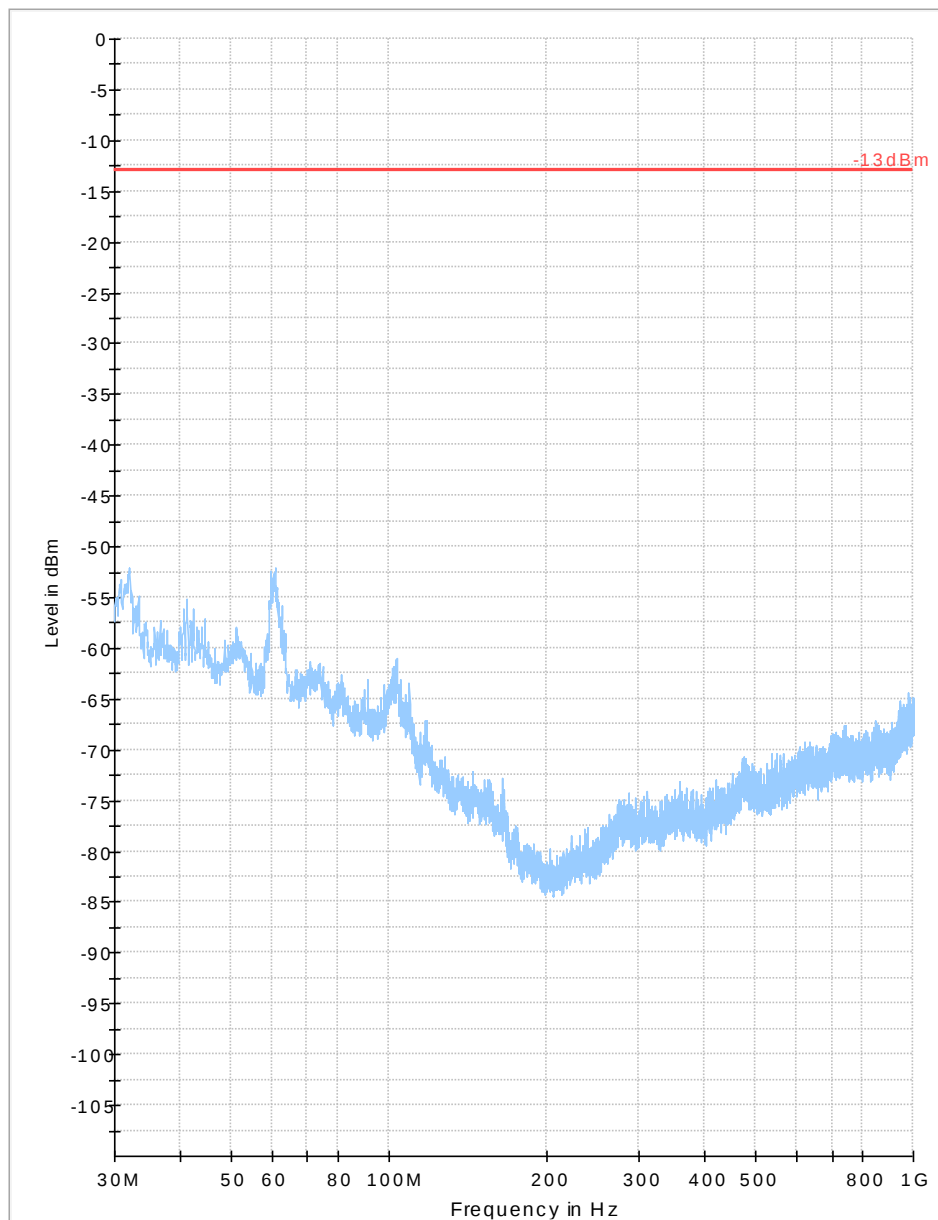
Full Spectrum



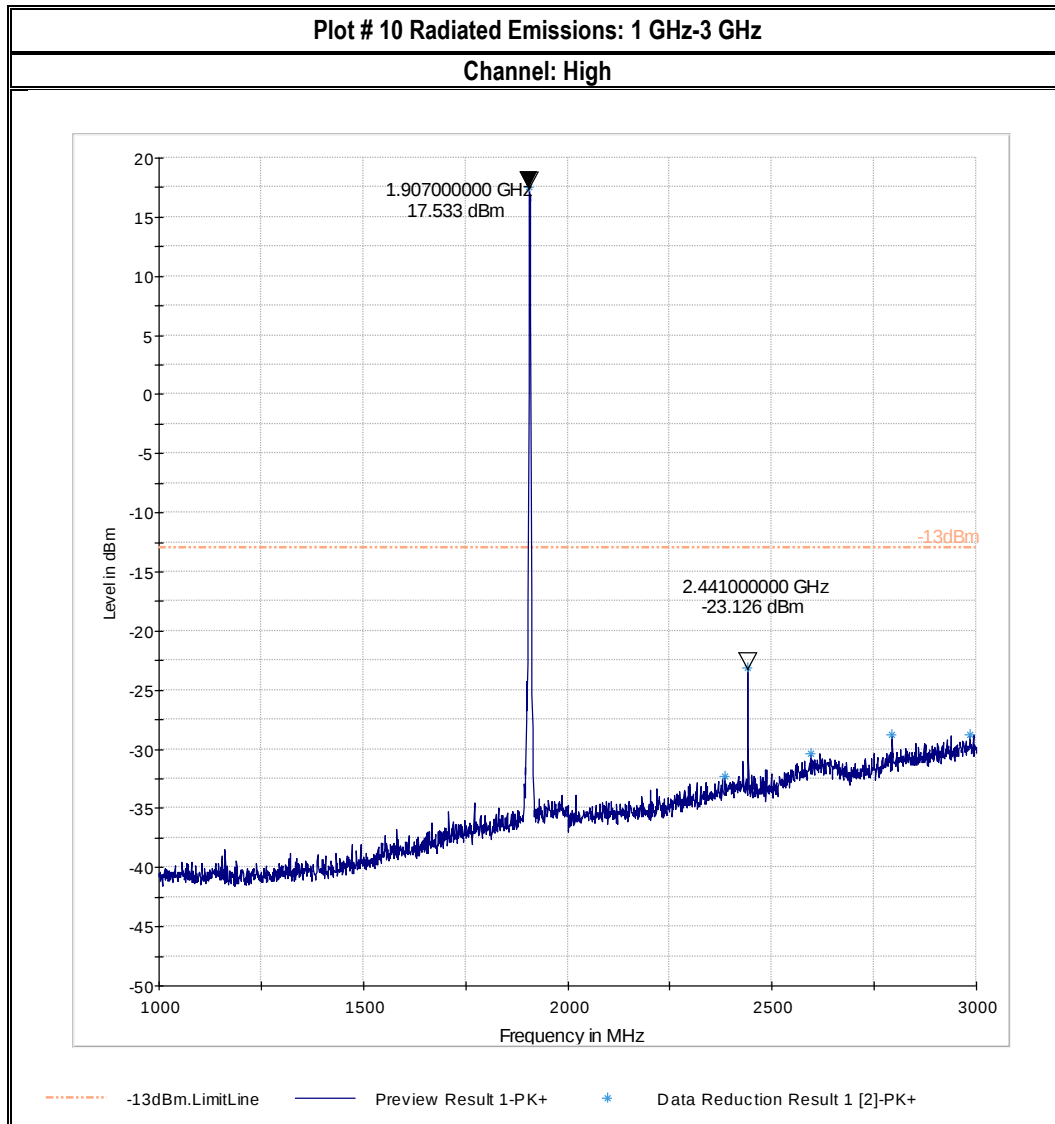
— Preview Result 1-PK+ \* Critical\_Freqs PK+ — -13dBm ◆ Final\_Result P

**Plot # 9 Radiated Emissions: 30 MHz – 1GHz**

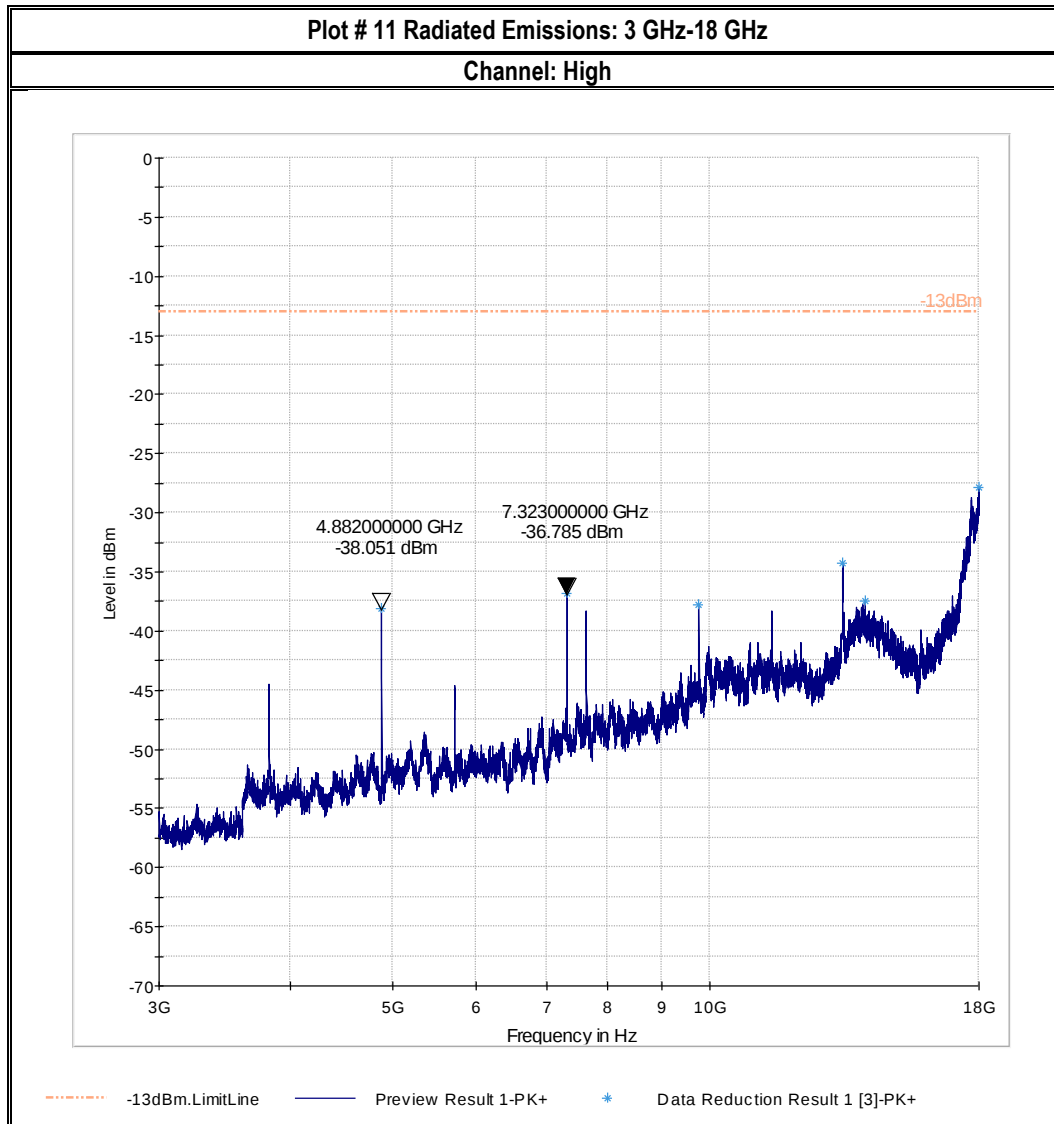
**Channel: High**



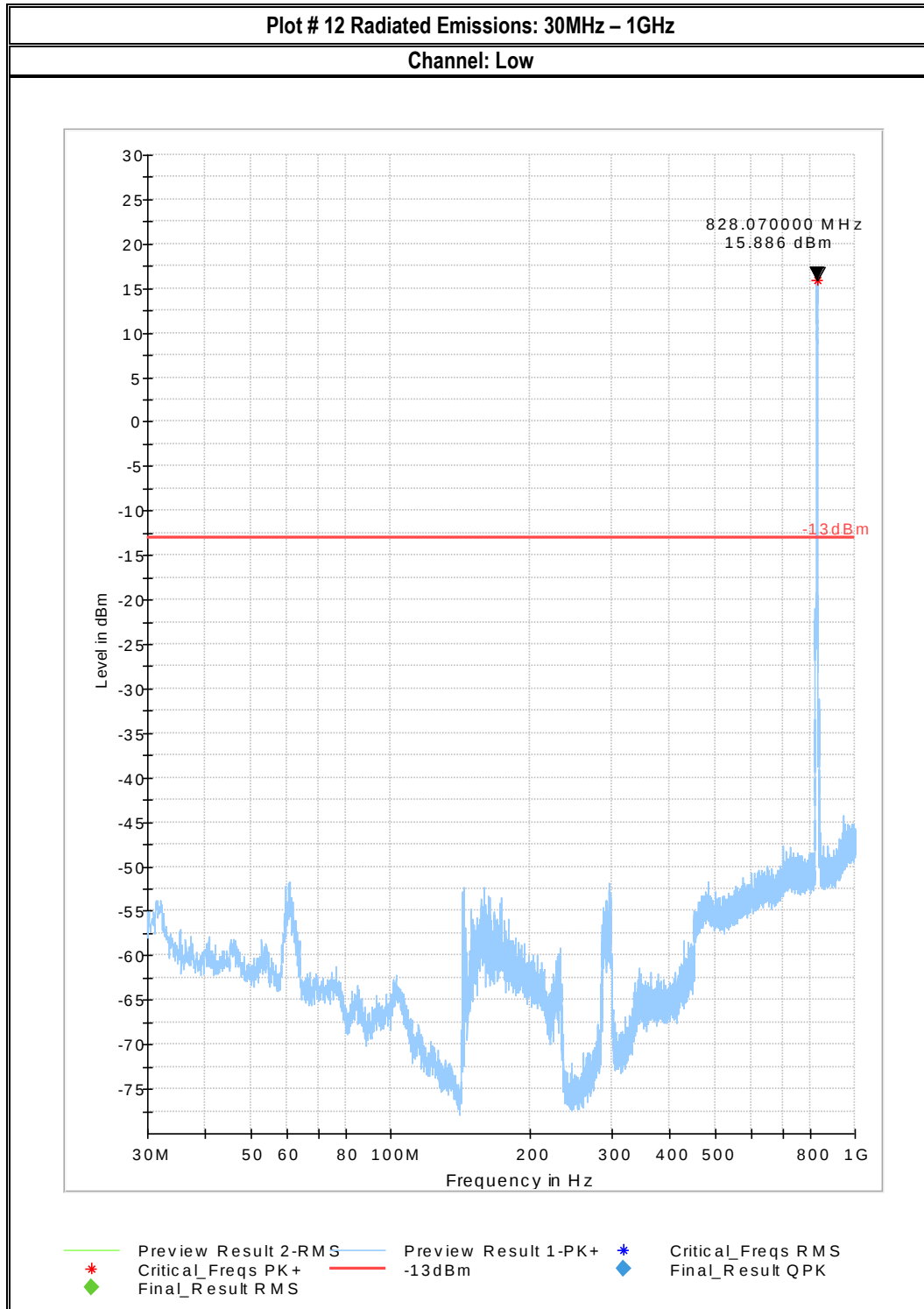
— Preview Result 2-RMS    — Preview Result 1-PK+    \* Critical\_Freqs RMS  
— Critical\_Freqs PK+    -13dBm    ◆ Final\_Result QPK  
◆ Final\_Result RMS



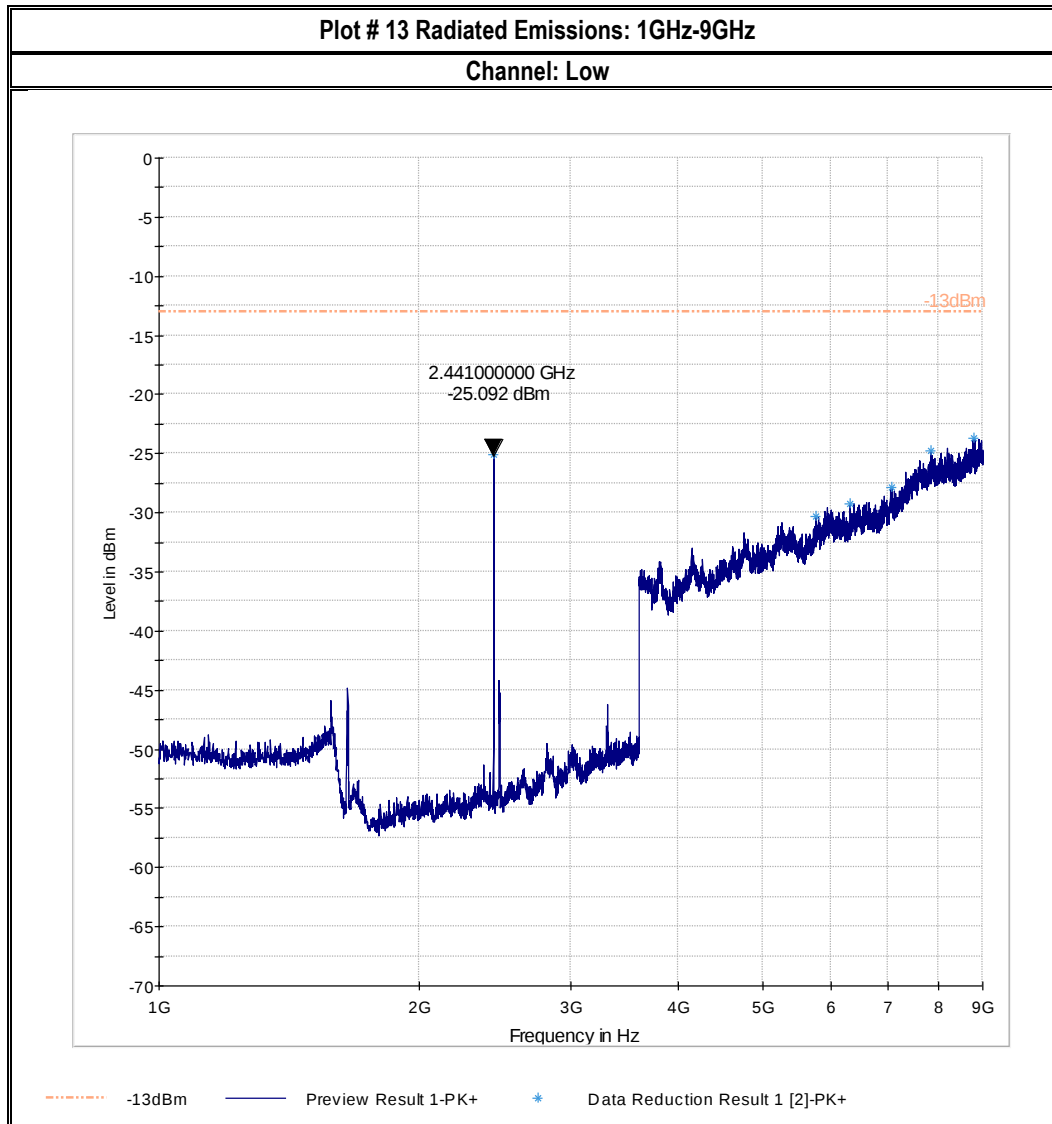
Note: The peak signal above is the transmit channel.



**FDD V**

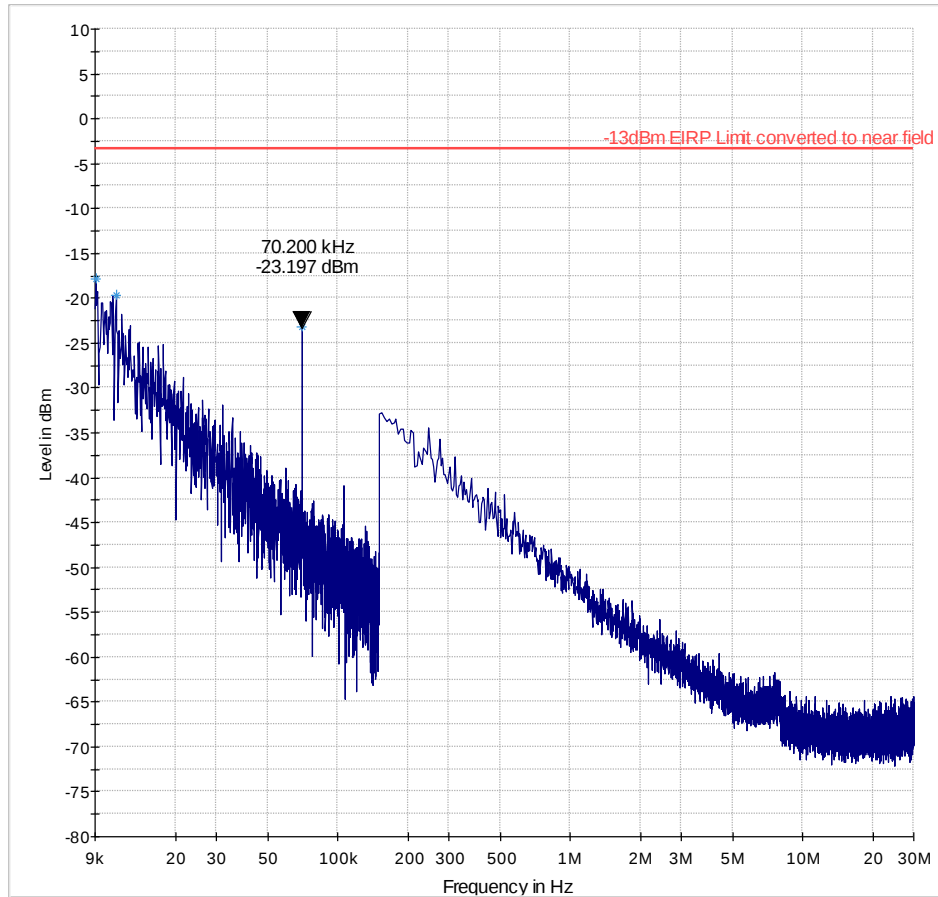


Note: The peak signal above is the transmit channel.

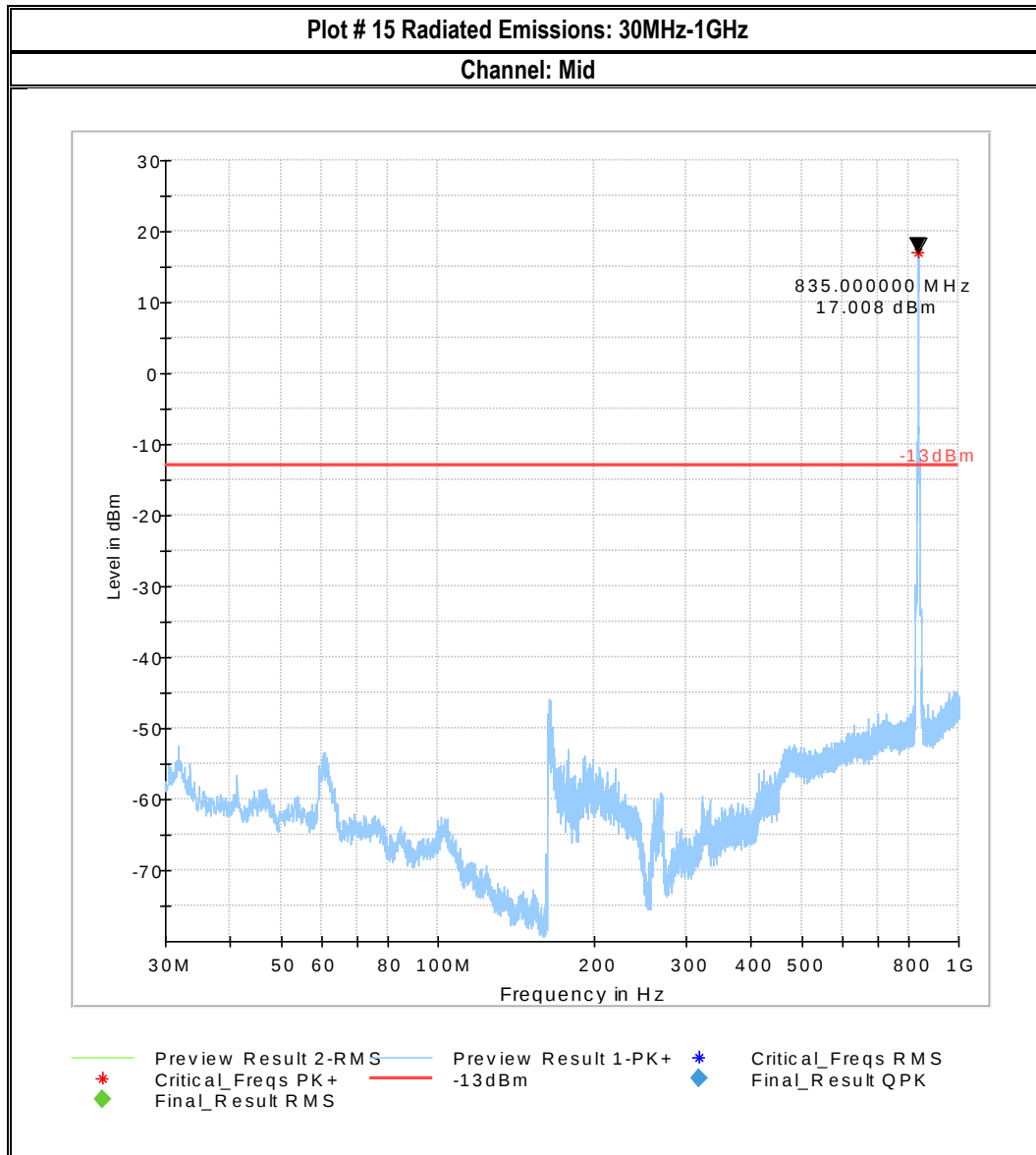


Plot # 14 Radiated Emissions: 9KHz-30MHz

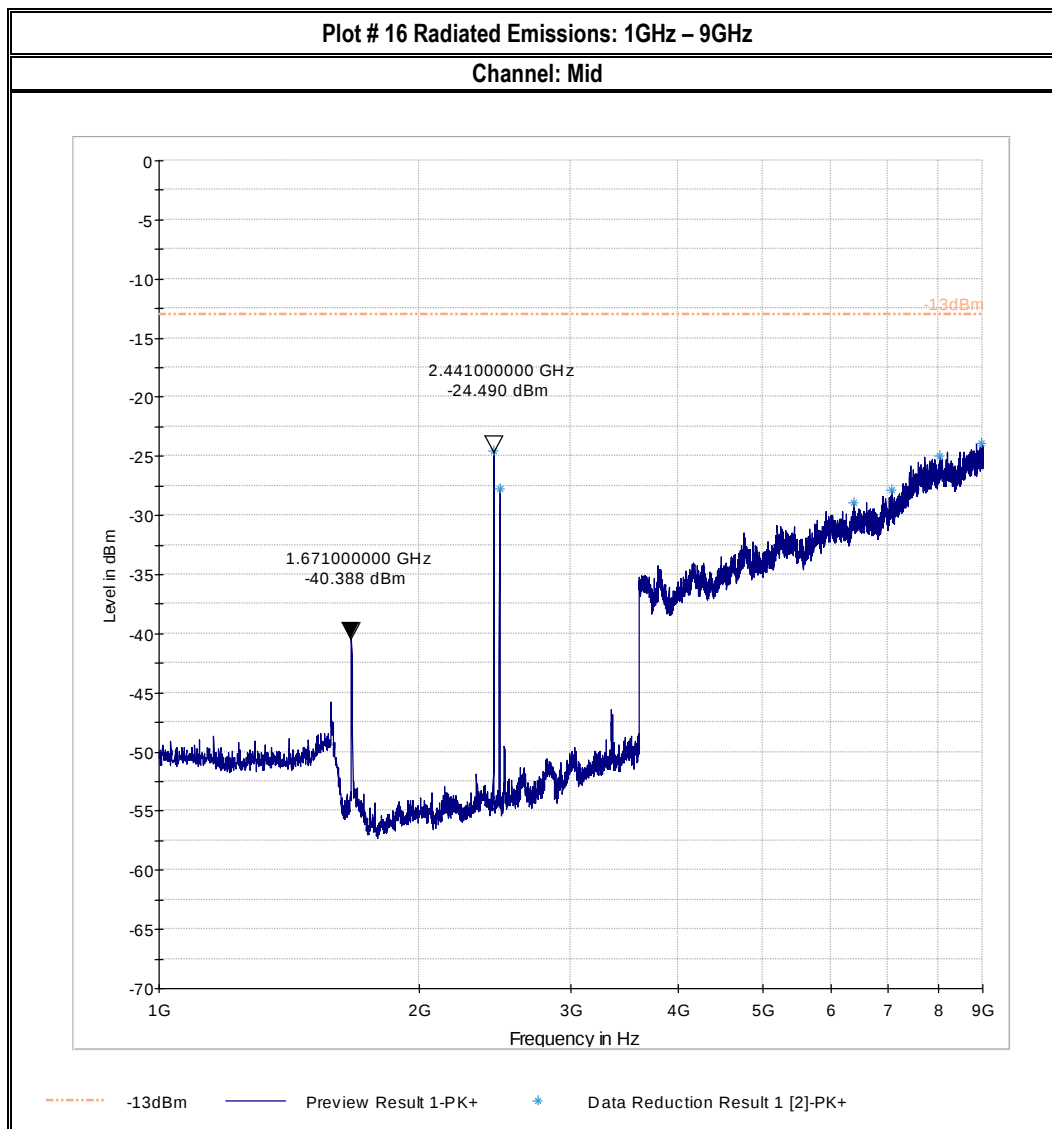
Channel: Mid

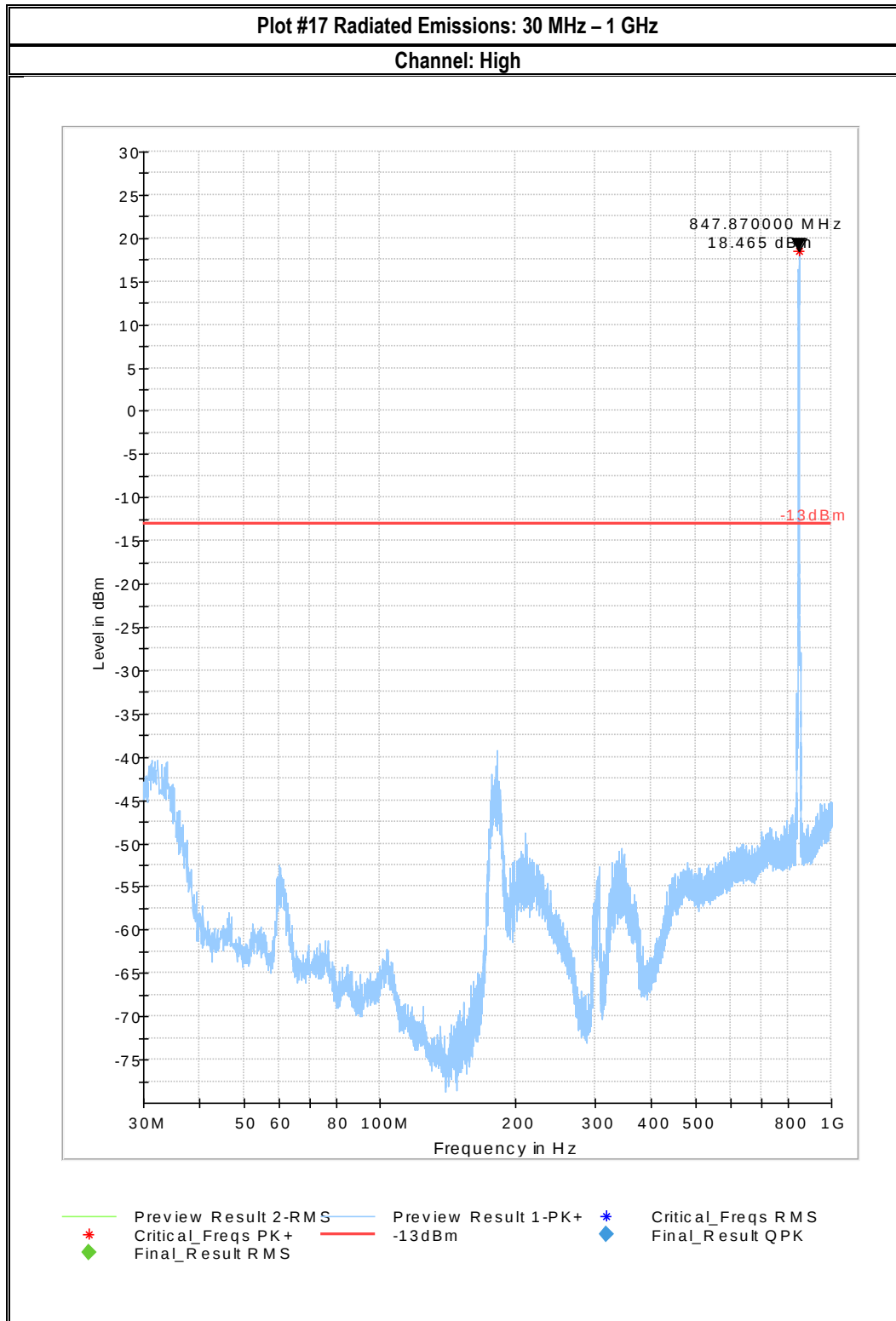


— -13dBm EIRP Limit converted to near field      — Preview Result 1-PK+  
\* Data Reduction Result 1 [1]-PK+



Note: The peak signal above is the transmit channel.

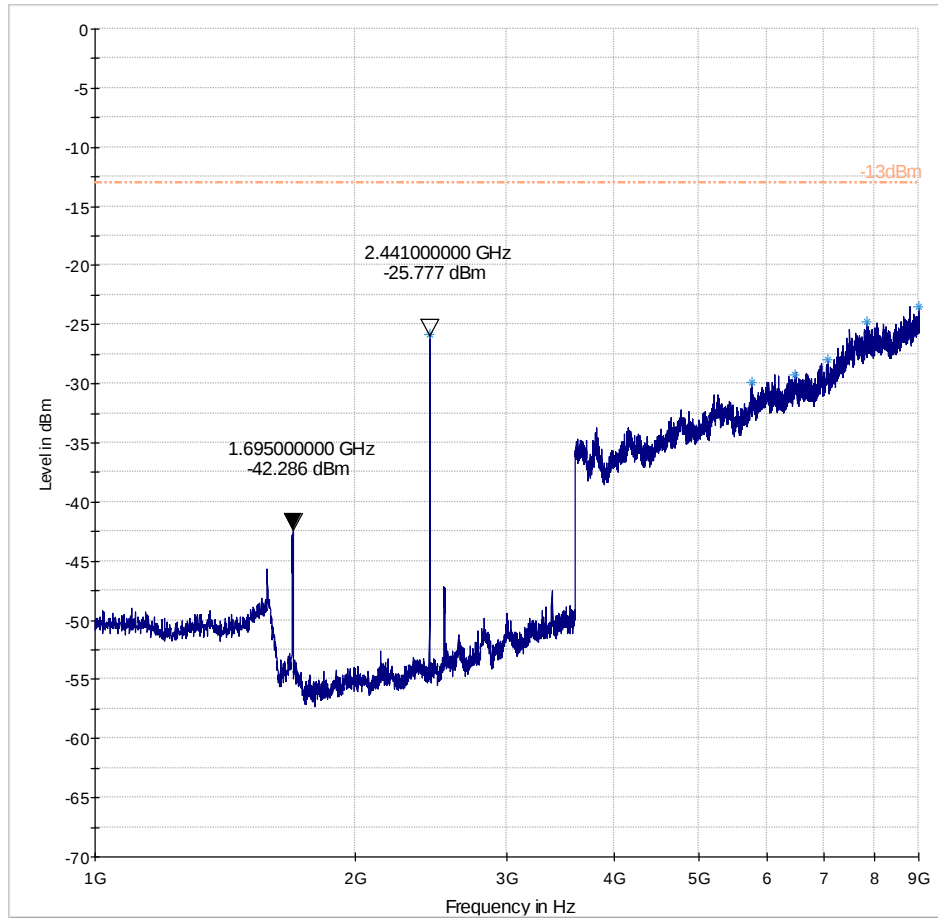




Note: The peak signal above is the transmit channel.

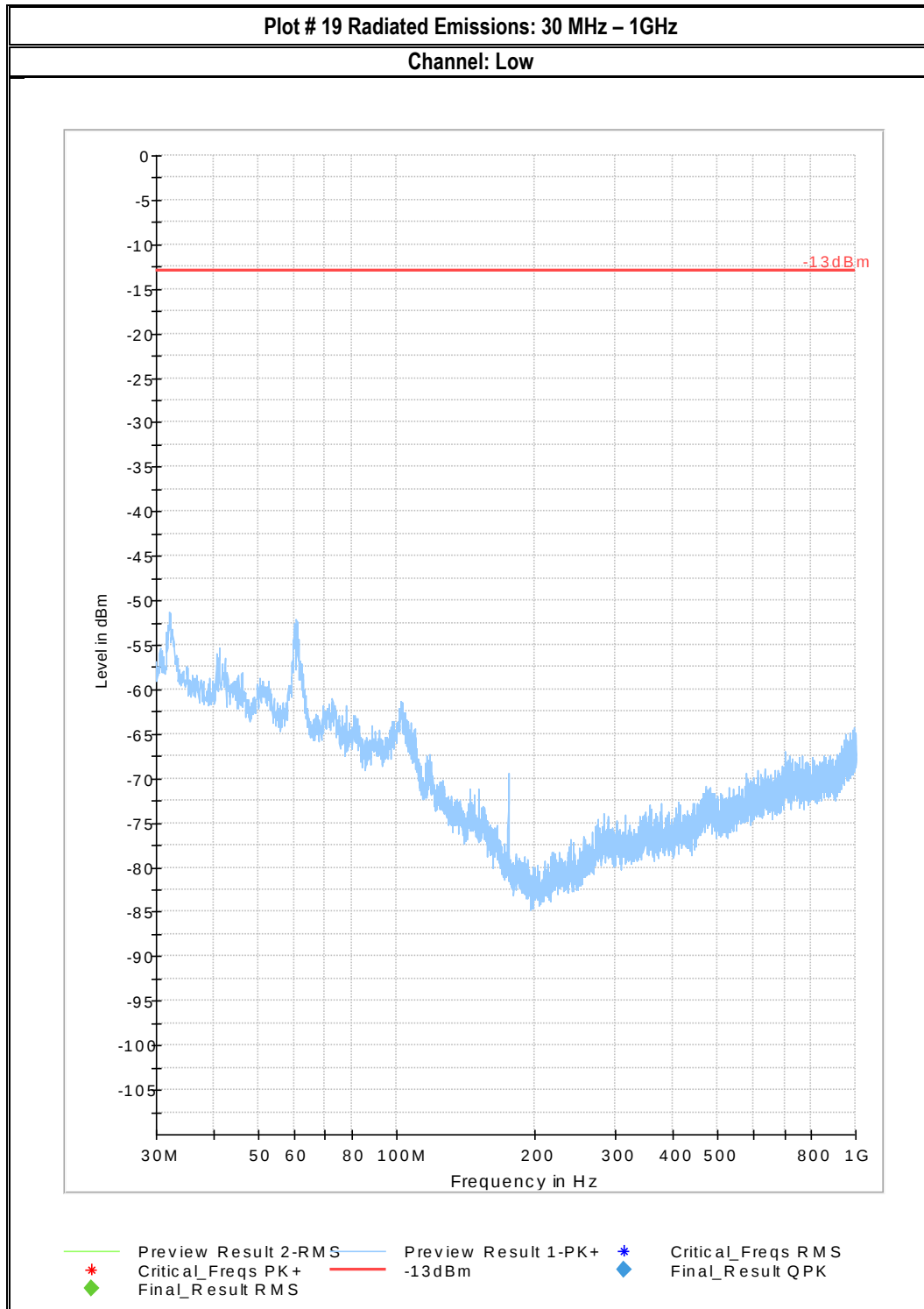
Plot #18 Radiated Emissions: 1GHz – 9GHz

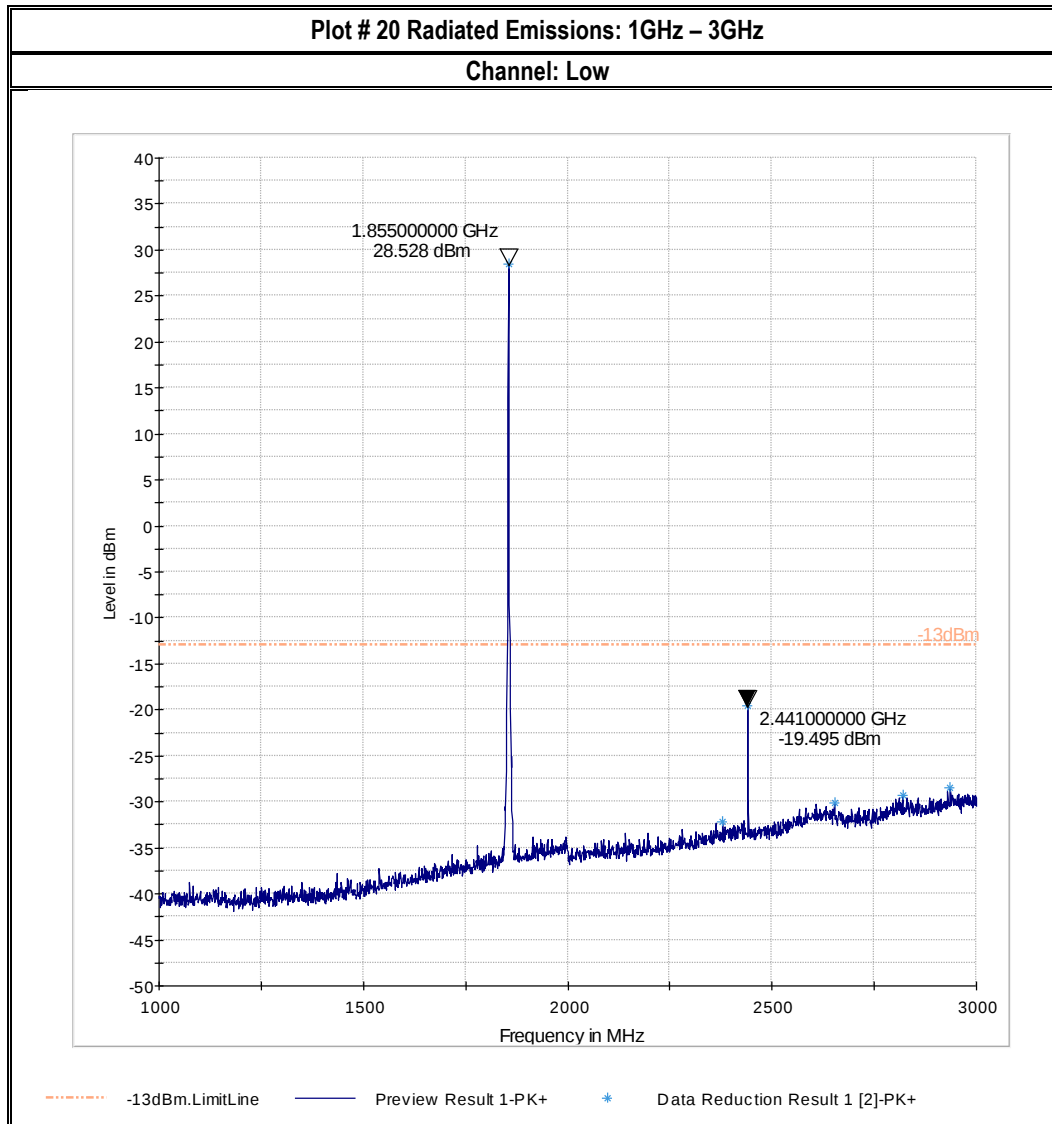
Channel: High



--- -13dBm    — Preview Result 1-PK+    \* Data Reduction Result 1 [2]-PK+

**LTE 2**

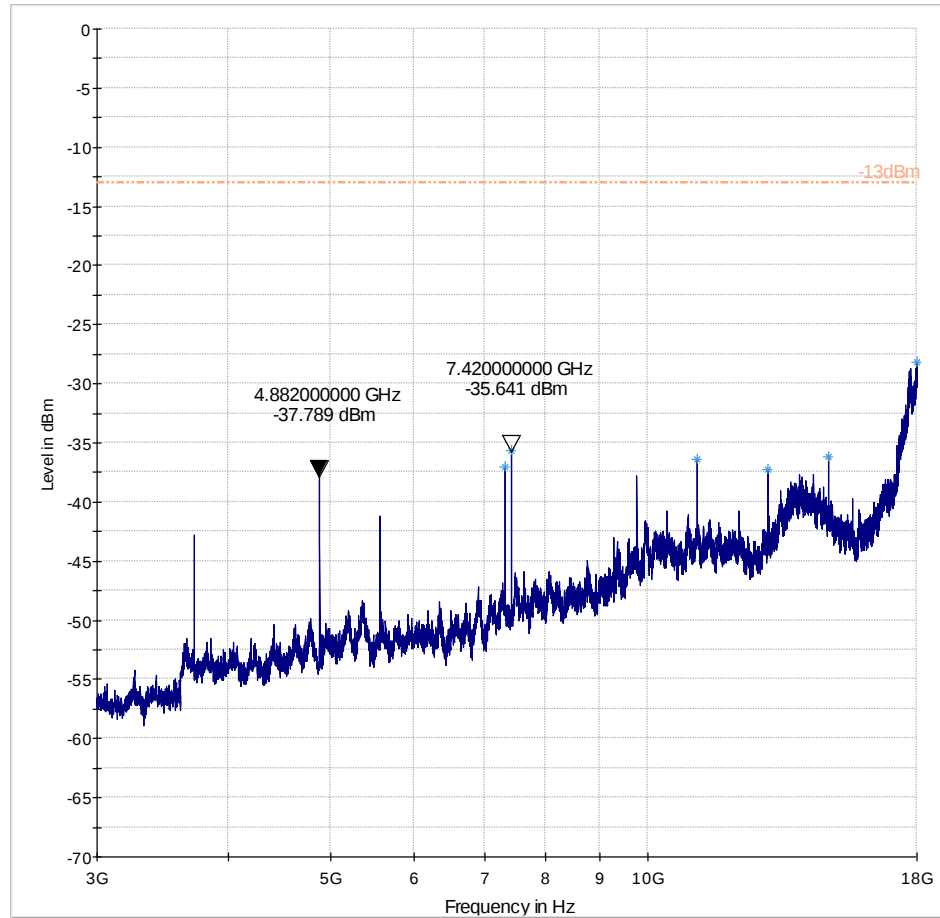




Note: The peak signal above is the transmit channel.

Plot # 21 Radiated Emissions: 3GHz – 18GHz

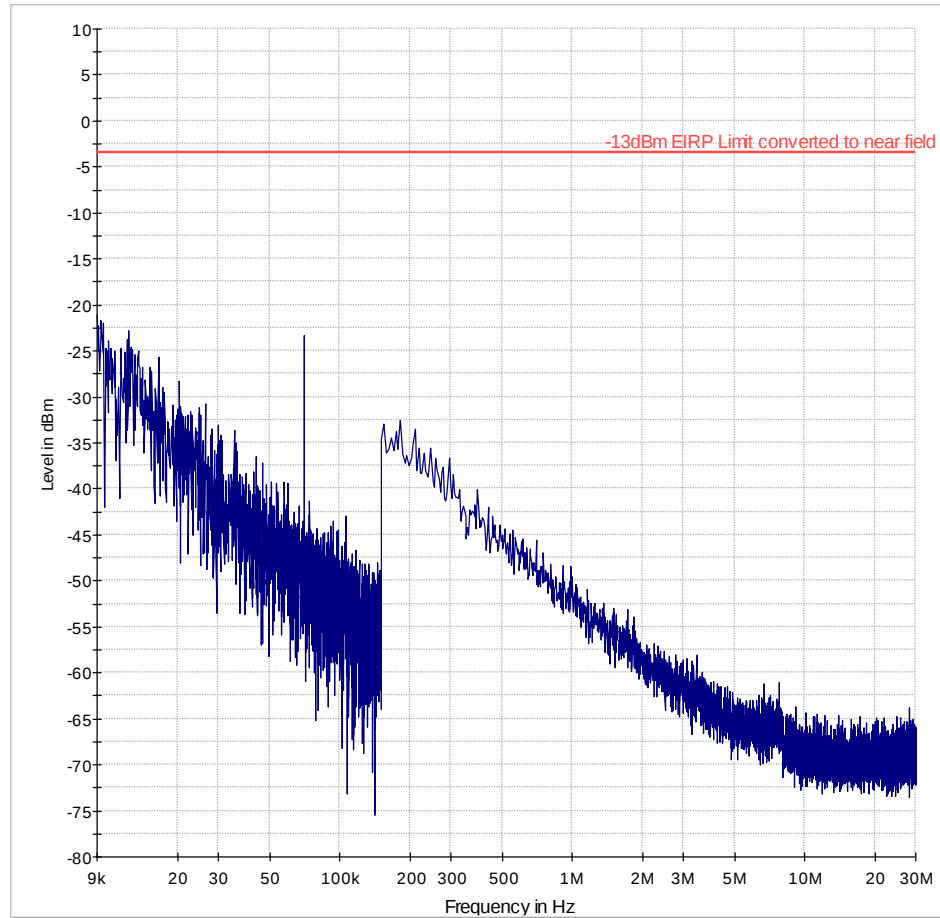
Channel: Low



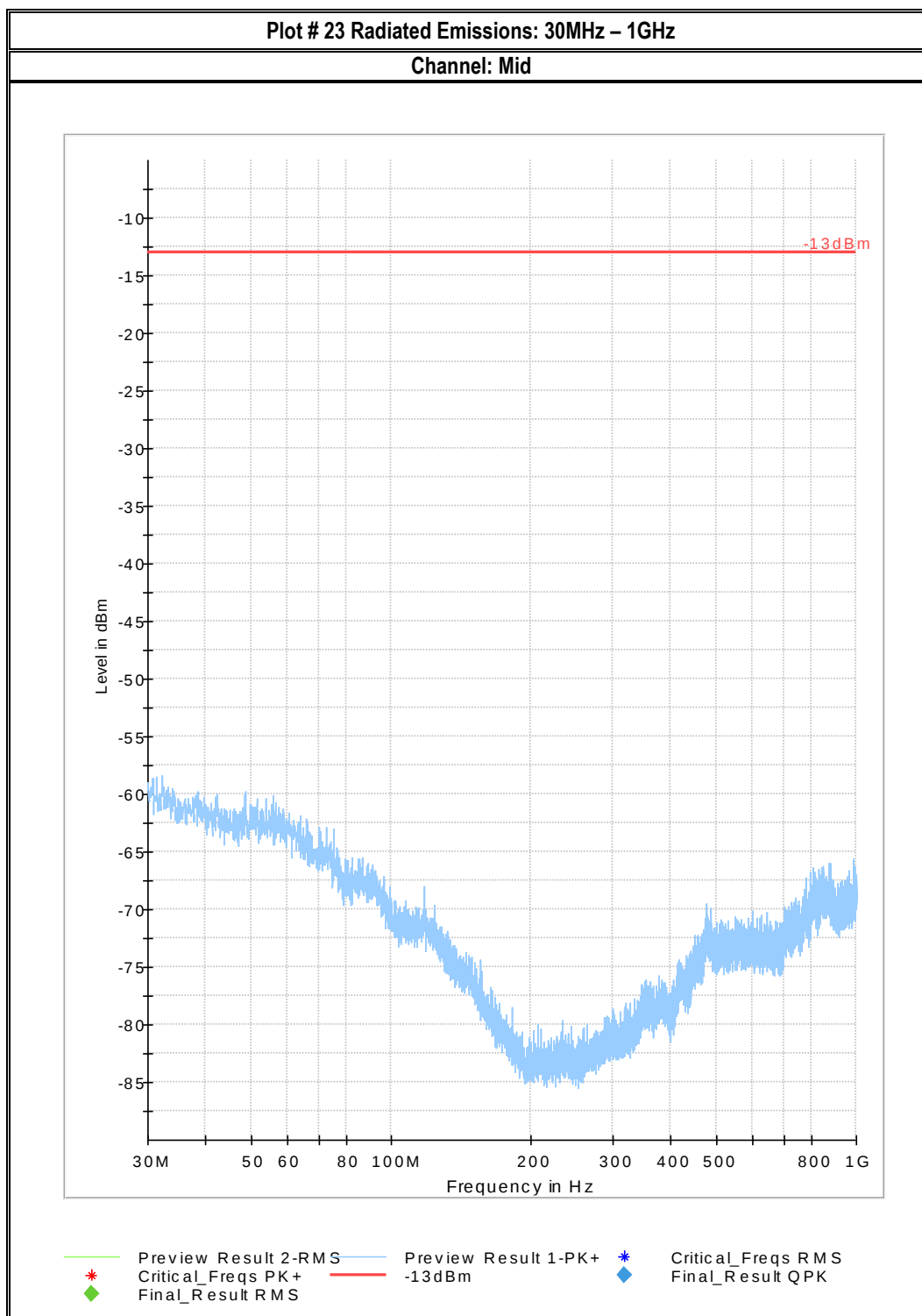
--- -13dBm.LimitLine      — Preview Result 1-PK+      \* Data Reduction Result 1 [3]-PK+

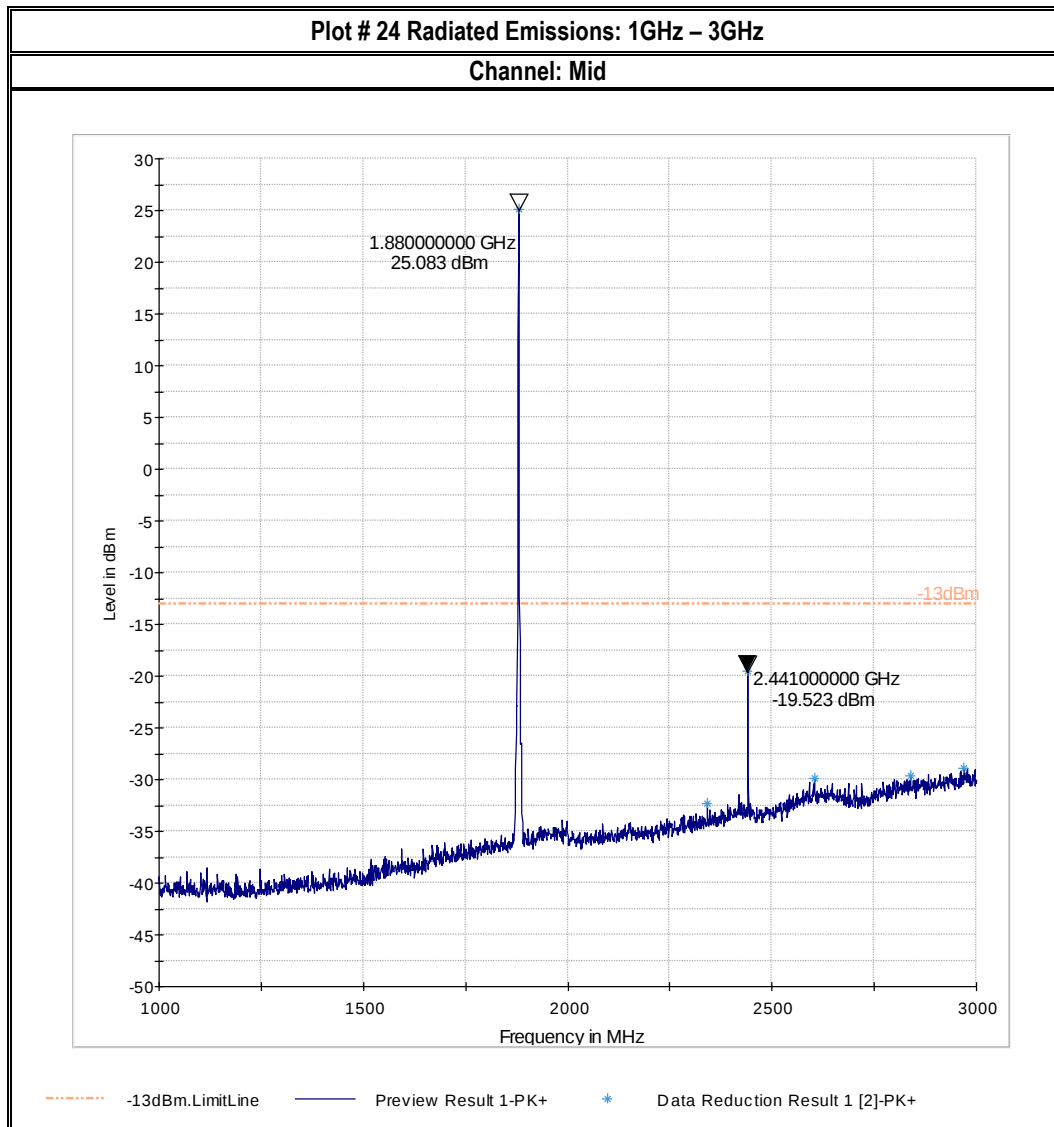
Plot # 22 Radiated Emissions: 9KHz – 30MHz

Channel: Mid

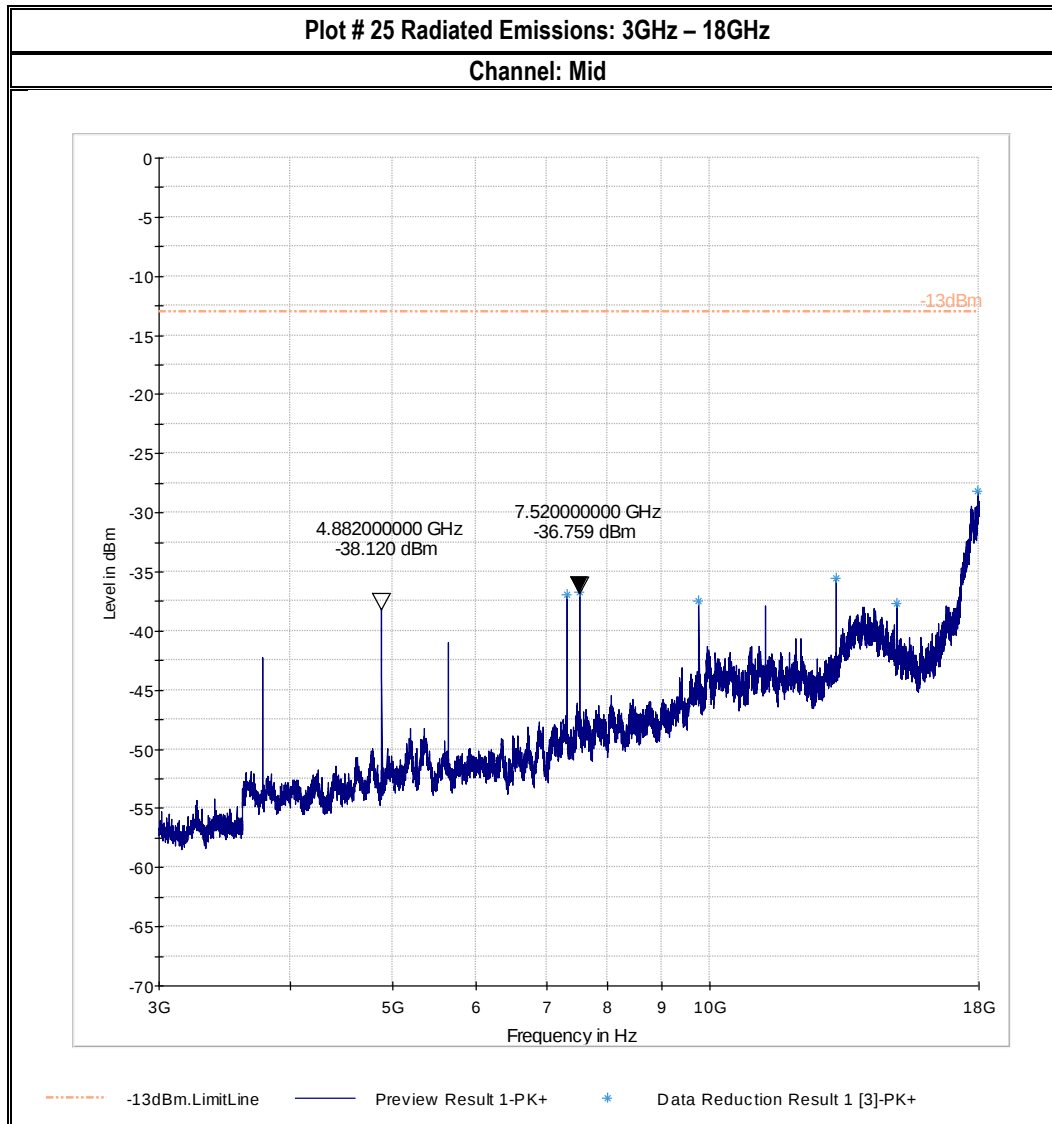


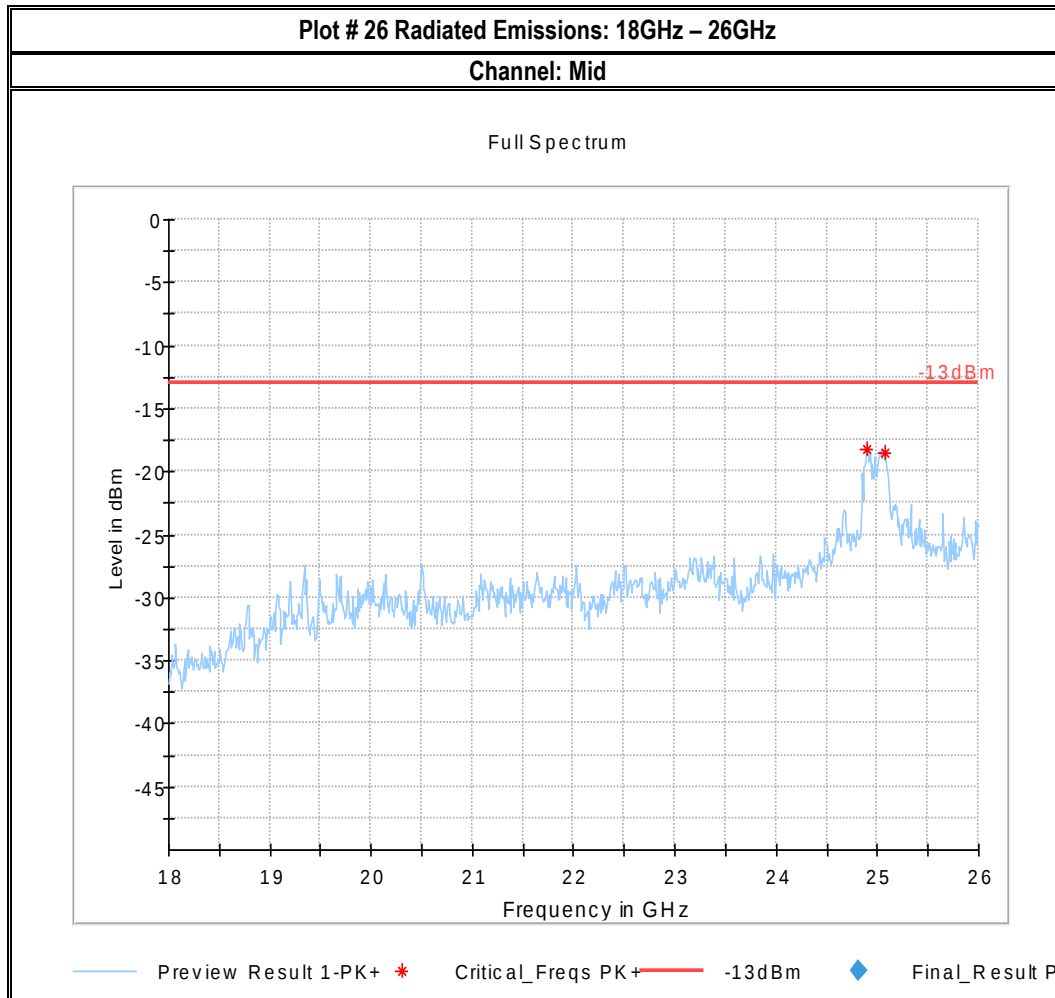
— -13dBm EIRP Limit converted to near field — Preview Result 1-PK+





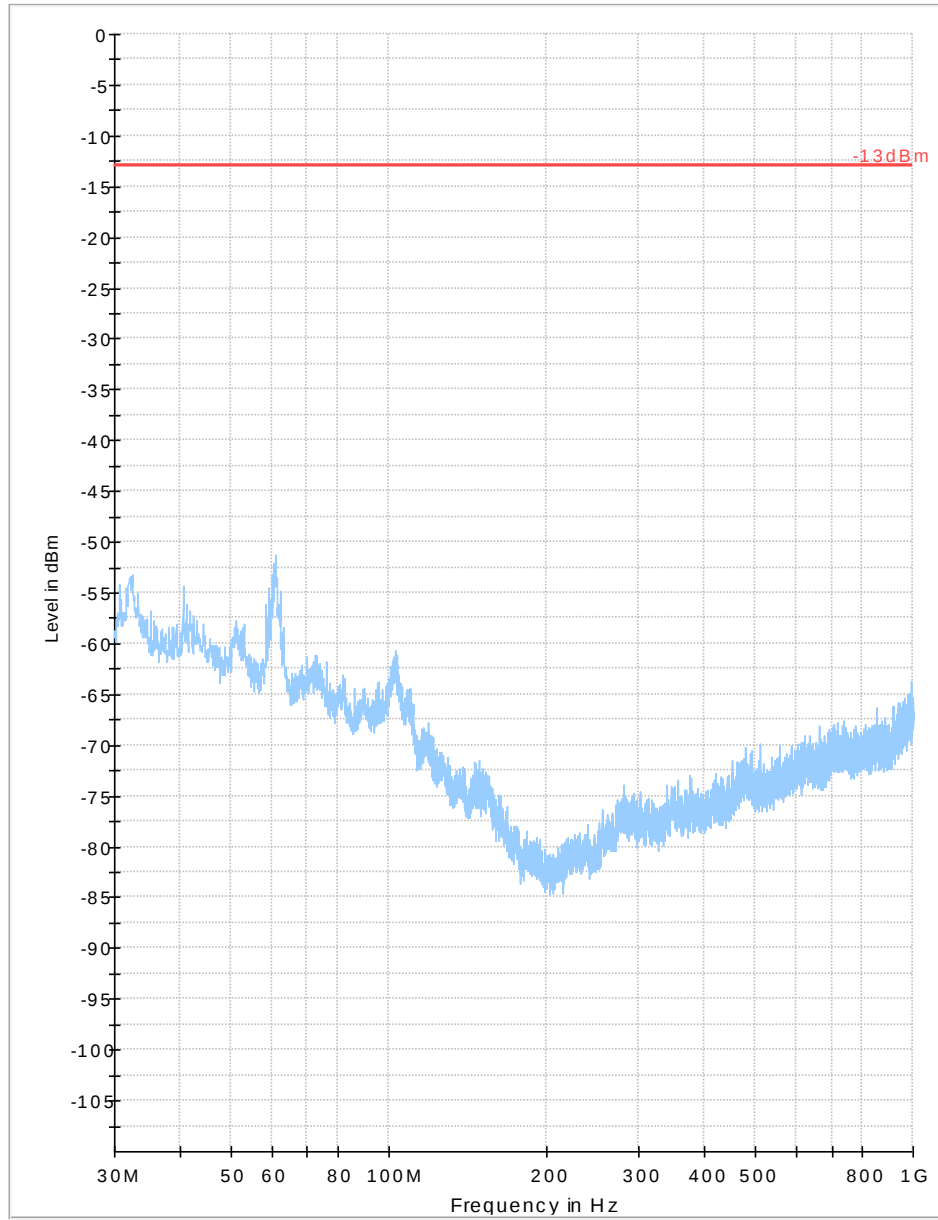
Note: The peak signal above is the transmit channel.





Plot # 27 Radiated Emissions: 30MHz – 1GHz

Channel: High



Preview Result 2-RMS  
Critical\_Freqs PK+  
Final\_Result RMS  
Preview Result 1-PK+  
-13dBm  
Critical\_Freqs RMS  
Final\_Result QPK

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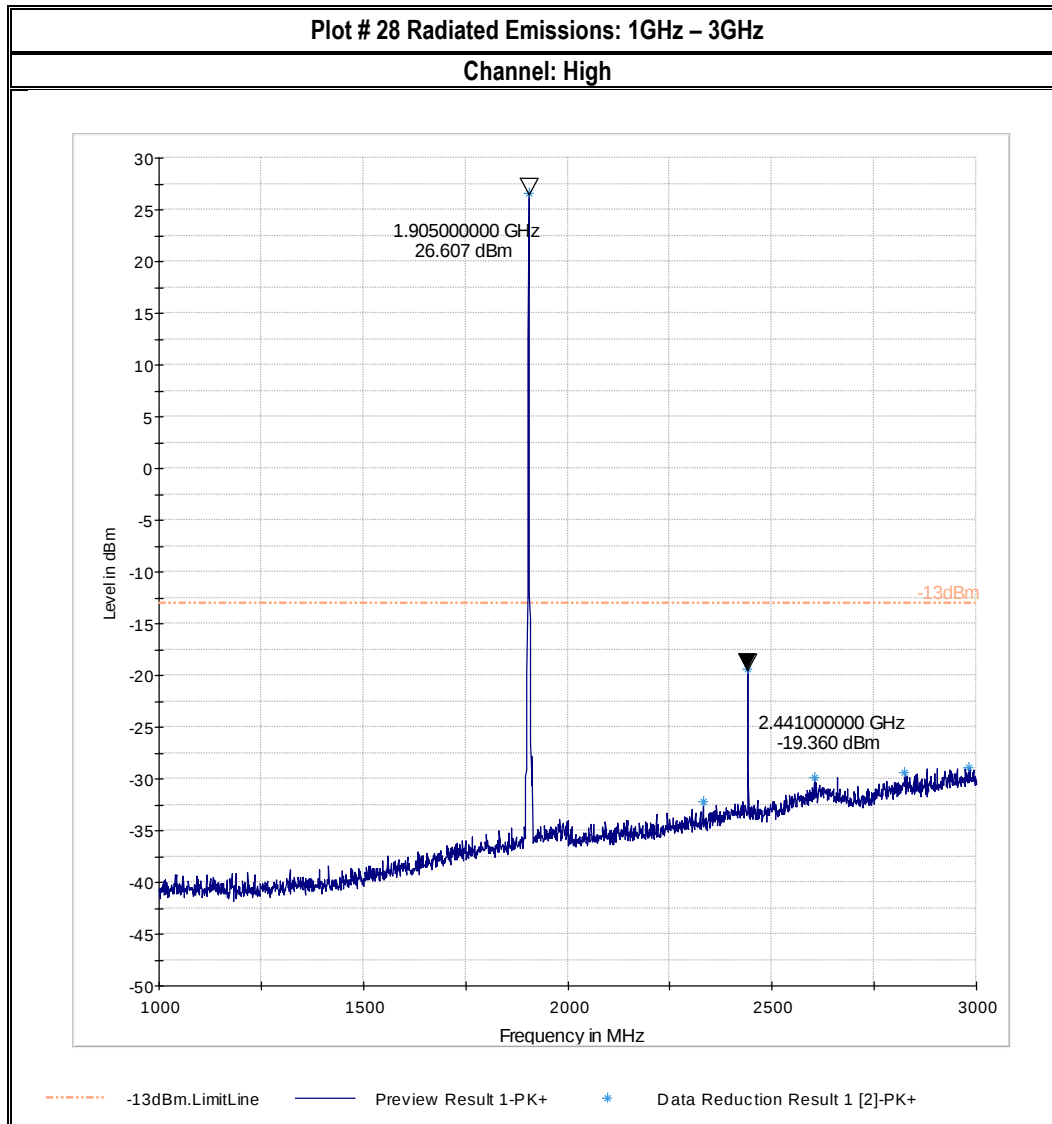


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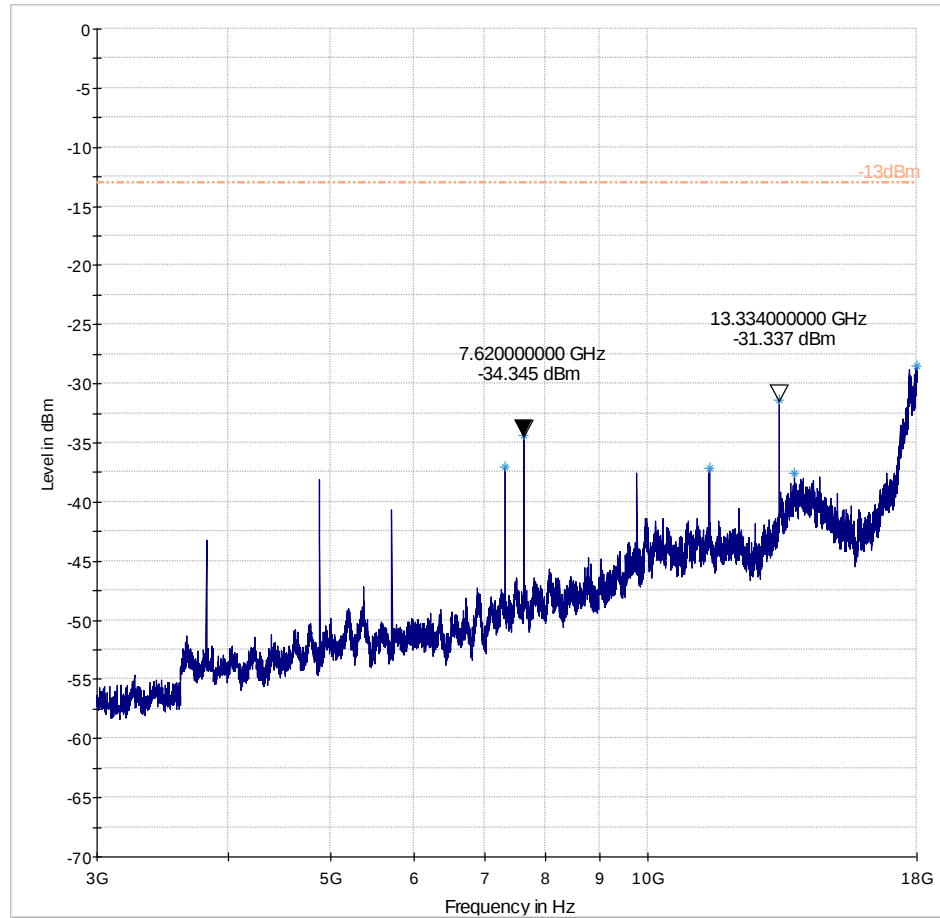
---



Note: The peak signal above is the transmit channel.

Plot # 29 Radiated Emissions: 3GHz – 18GHz

Channel: High

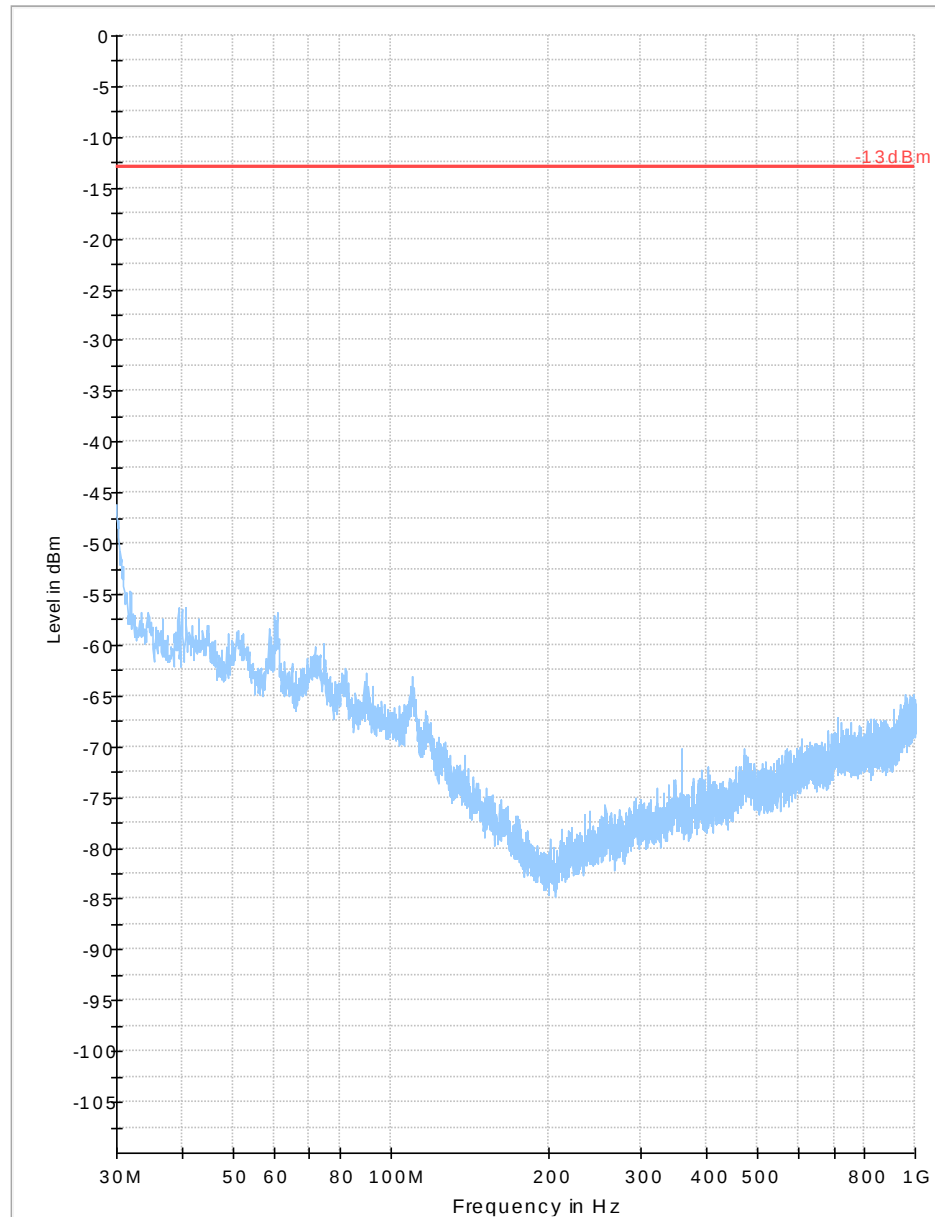


-13dBm.LimitLine      Preview Result 1-PK+      Data Reduction Result 1 [3]-PK+

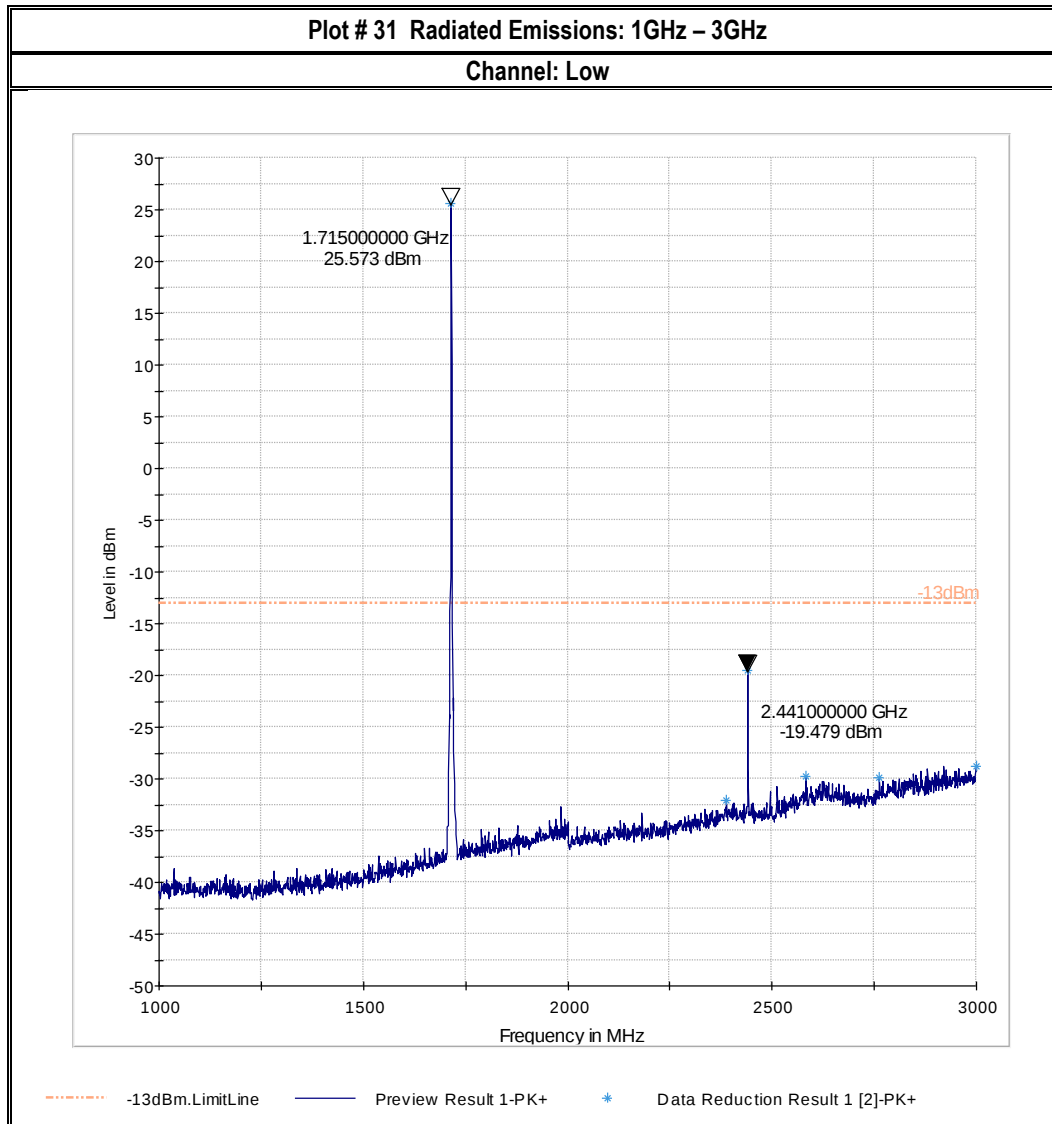
**LTE 4**

**Plot # 30 Radiated Emissions: 30MHz – 1GHz**

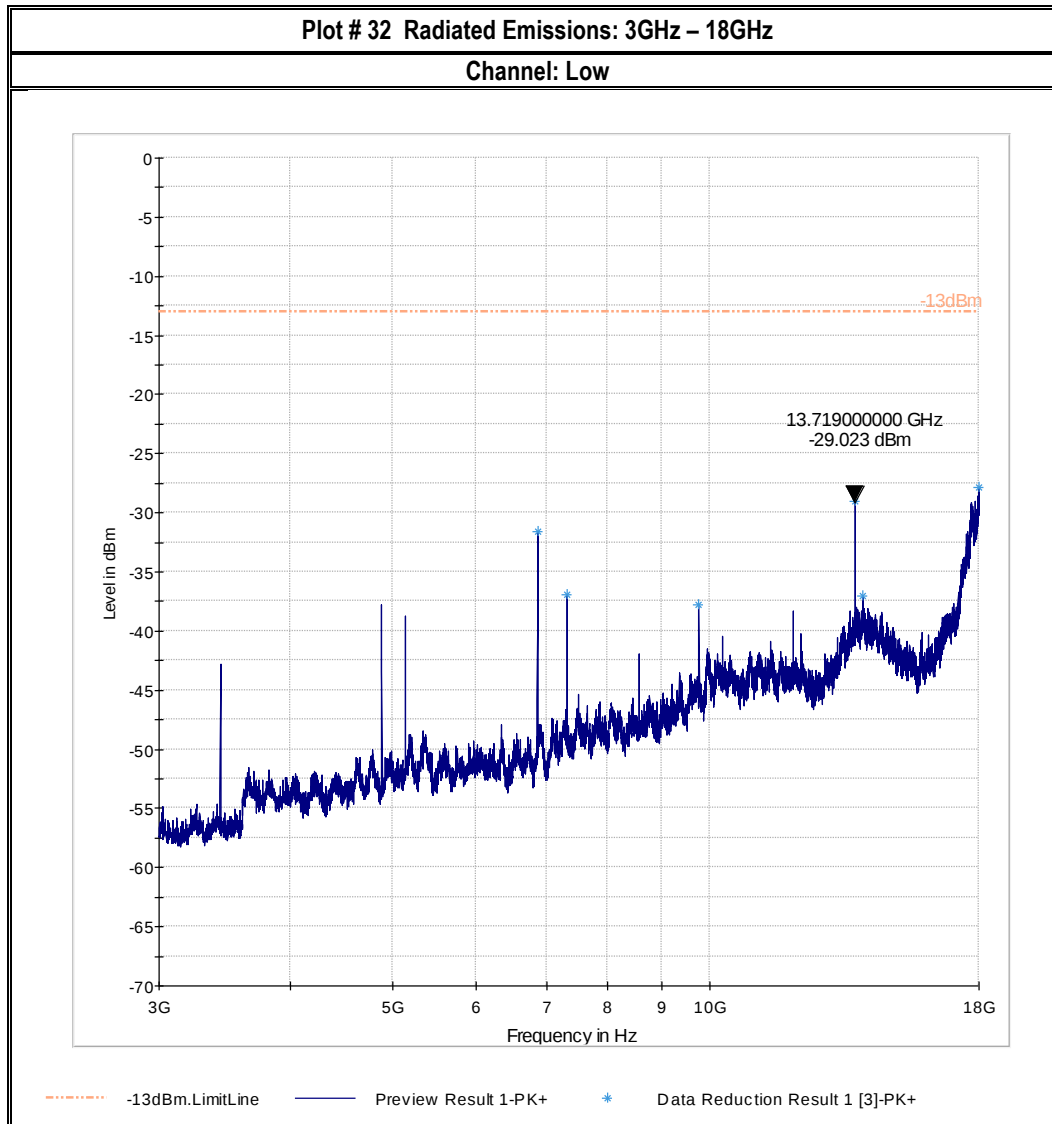
**Channel: Low**



Preview Result 2-RMS  
Critical\_Freqs PK+  
Final\_Result RMS  
Preview Result 1-PK+  
-13dBm  
Critical\_Freqs RMS  
Final\_Result QPK

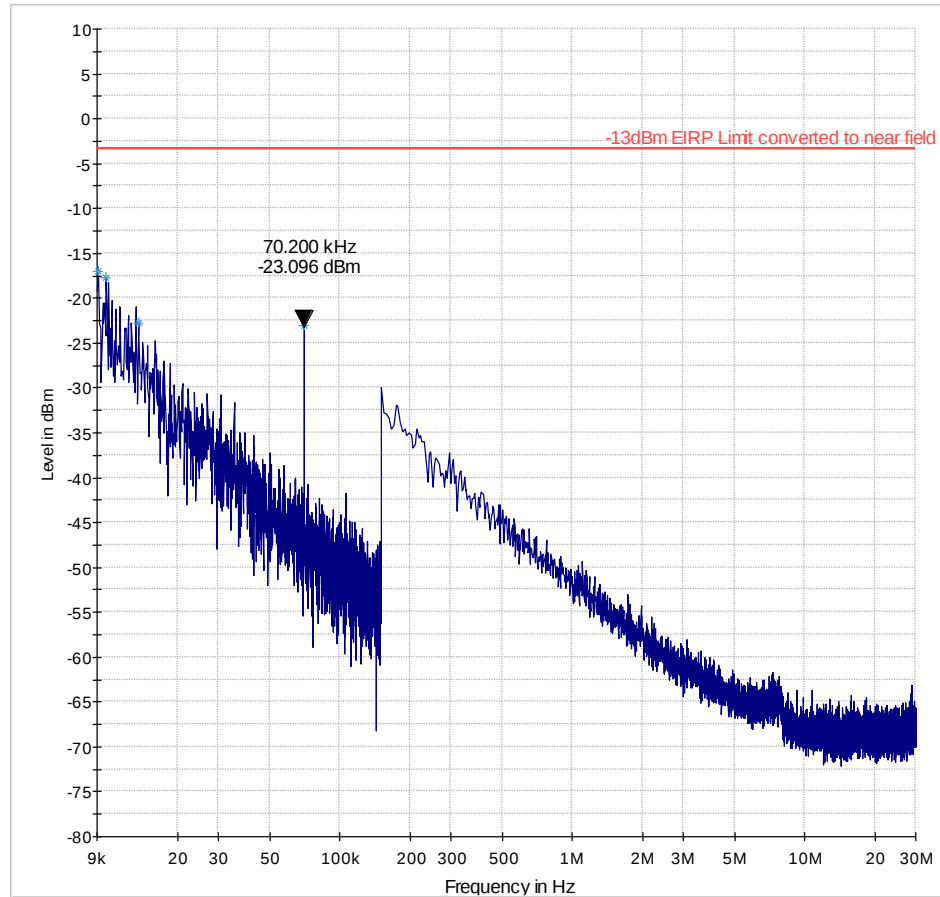


Note: The peak signal above is the transmit channel.



Plot # 33 Radiated Emissions: 9KHz – 30MHz

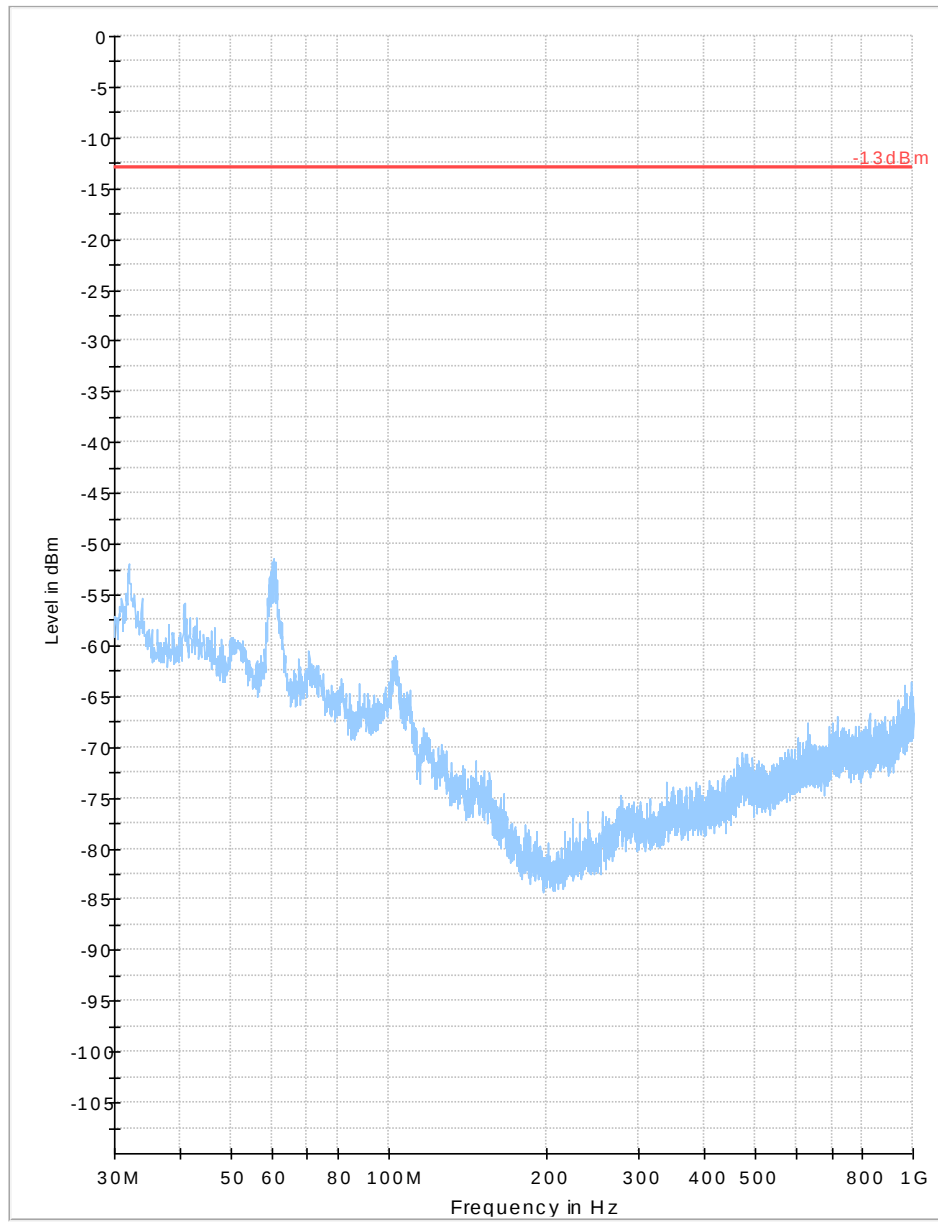
Channel: Mid



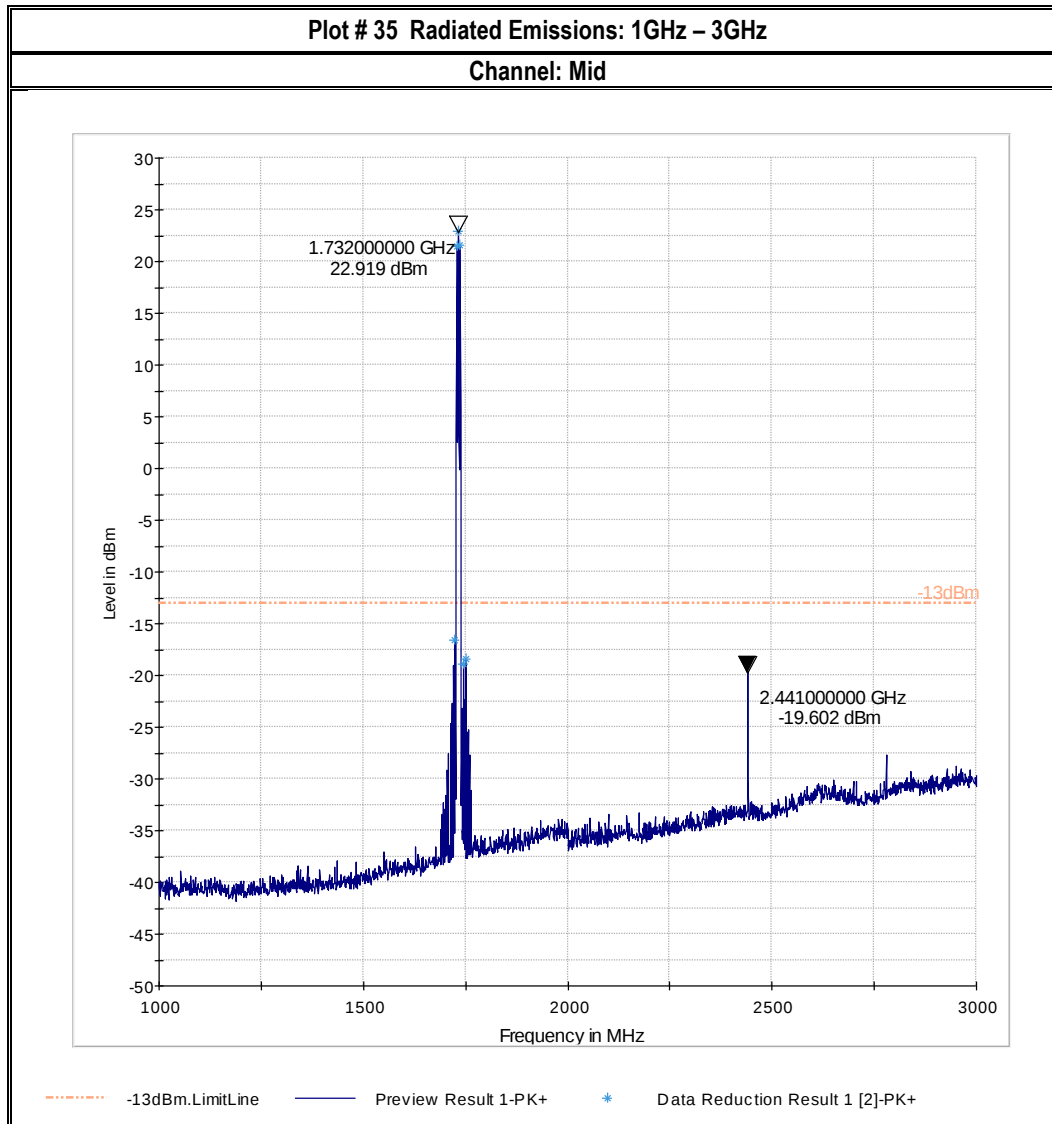
— -13dBm EIRP Limit converted to near field  
\* Data Reduction Result 1 [1]-PK+  
— Preview Result 1-PK+

Plot # 34 Radiated Emissions: 30MHz – 1GHz

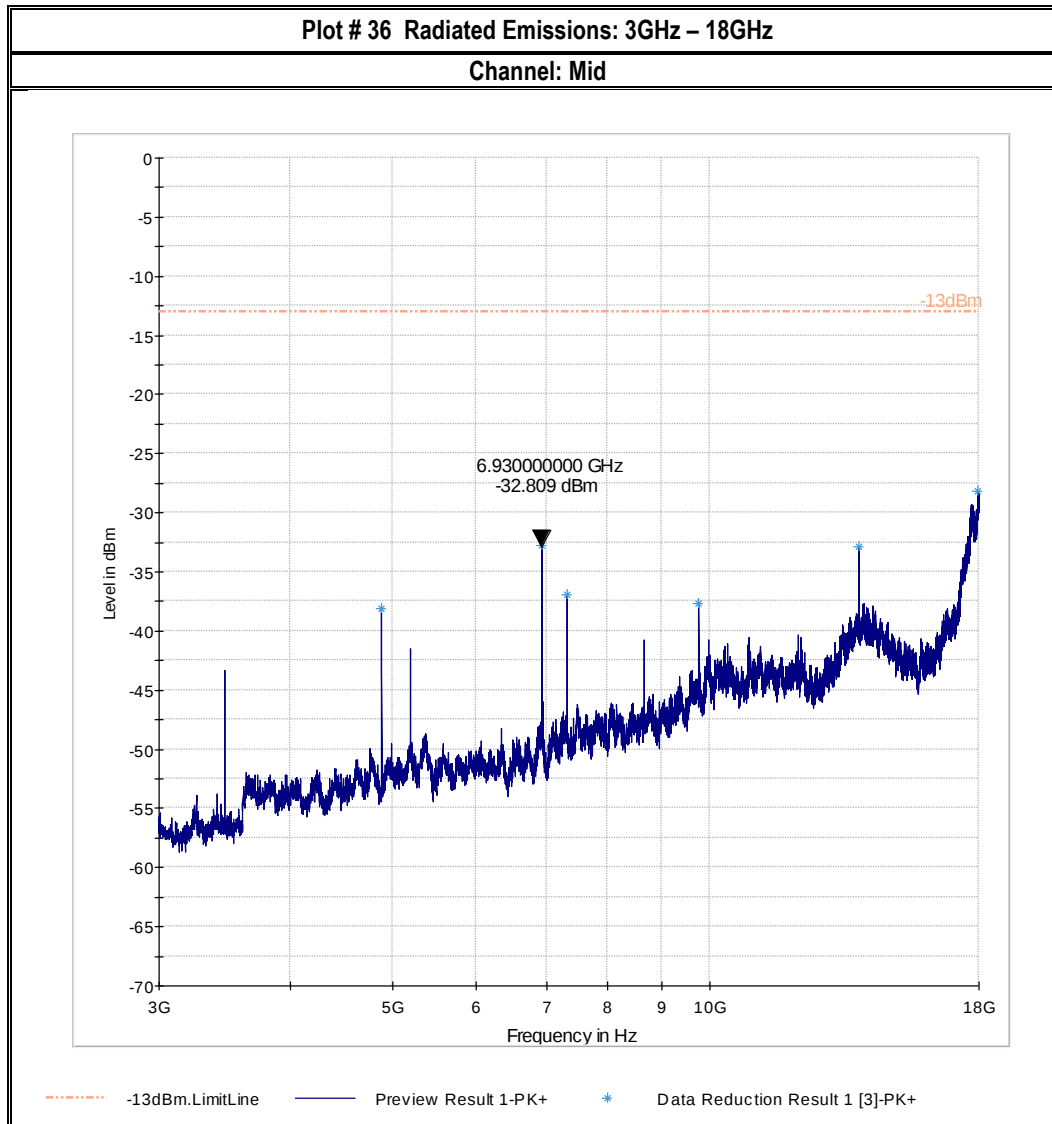
Channel: Mid



Preview Result 2-RMS  
Critical\_Freqs PK+  
Final\_Result RMS  
Preview Result 1-PK+  
-13dBm  
Critical\_Freqs RMS  
Final\_Result QPK

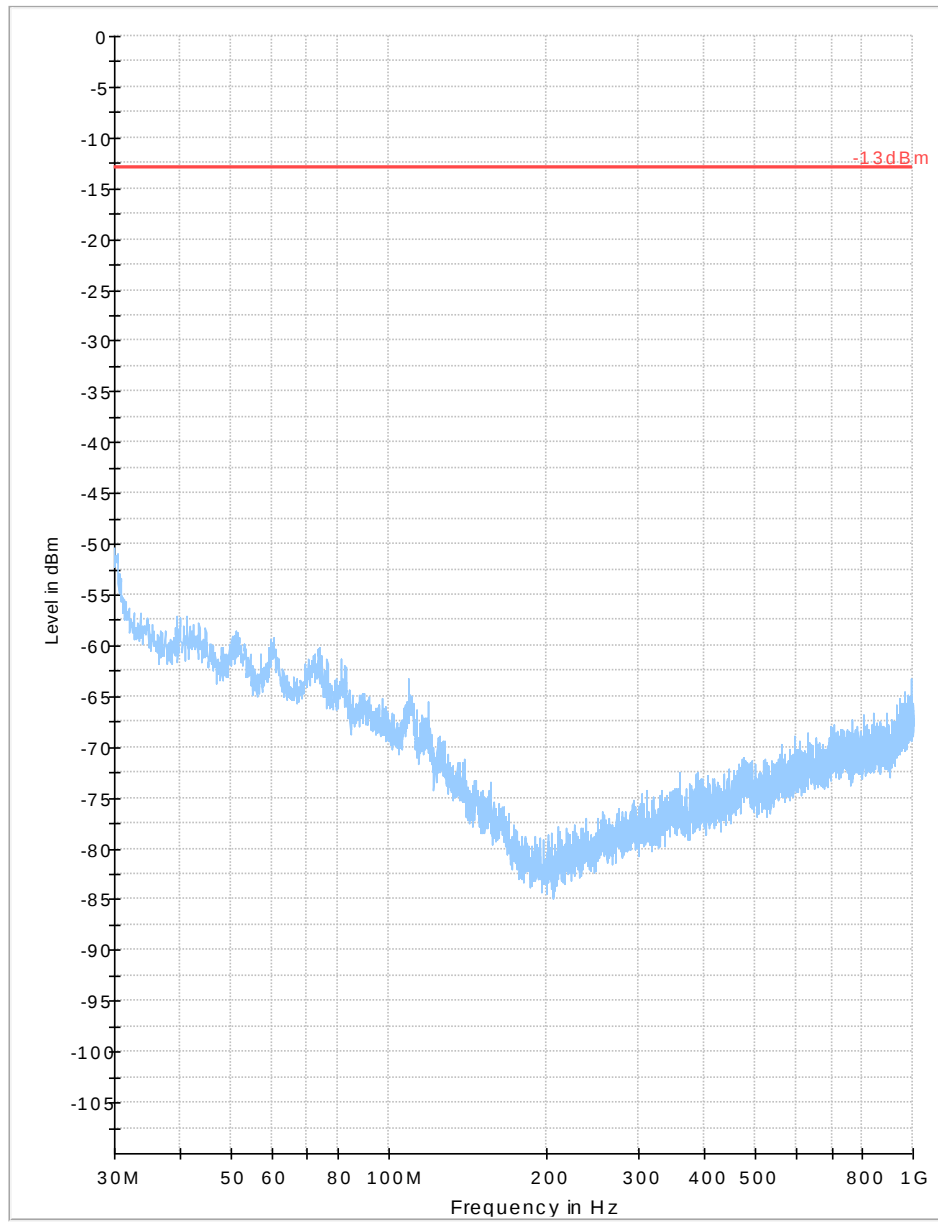


Note: The peak signal above is the transmit channel.

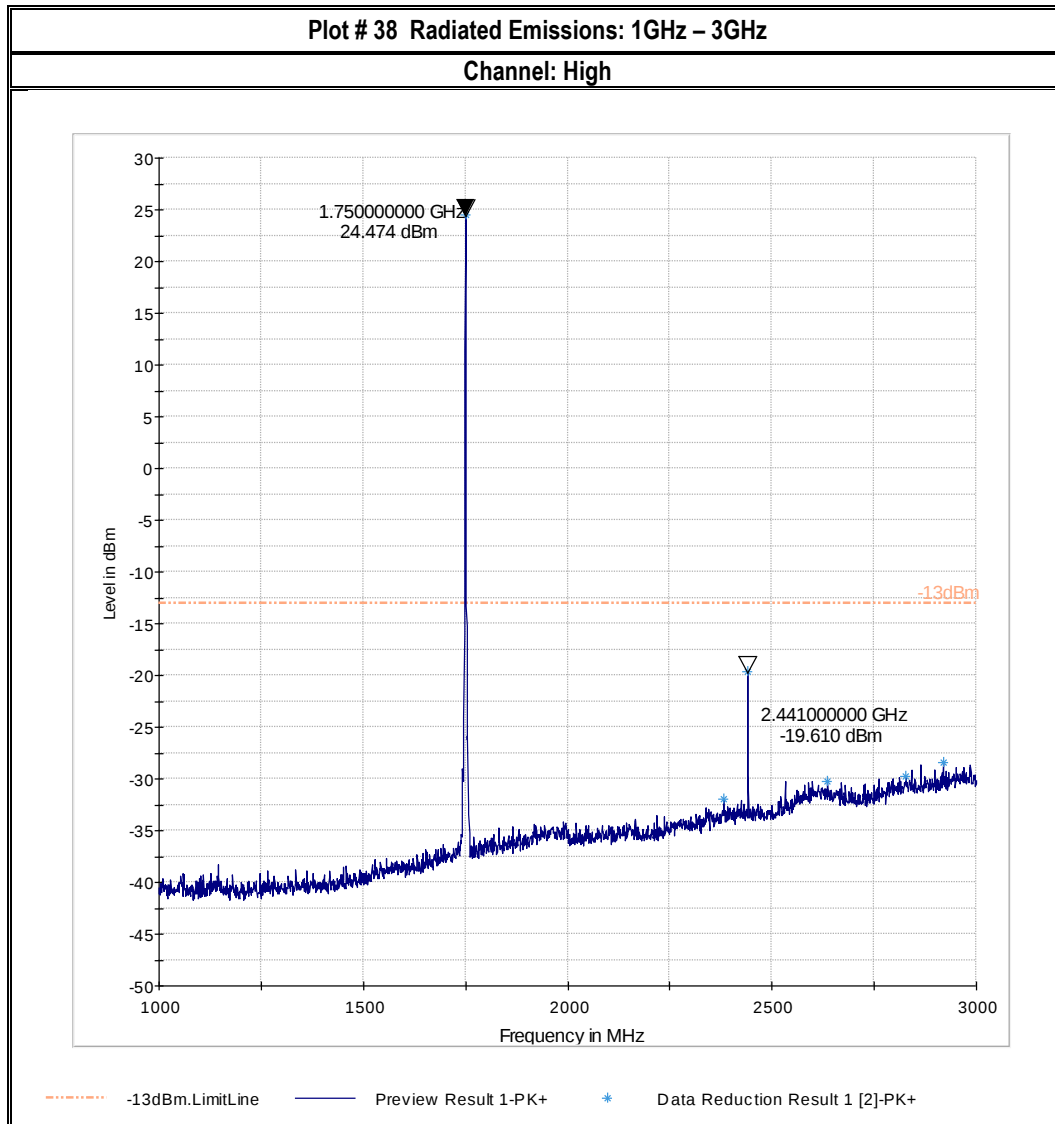


Plot # 37 Radiated Emissions: 30MHz – 1GHz

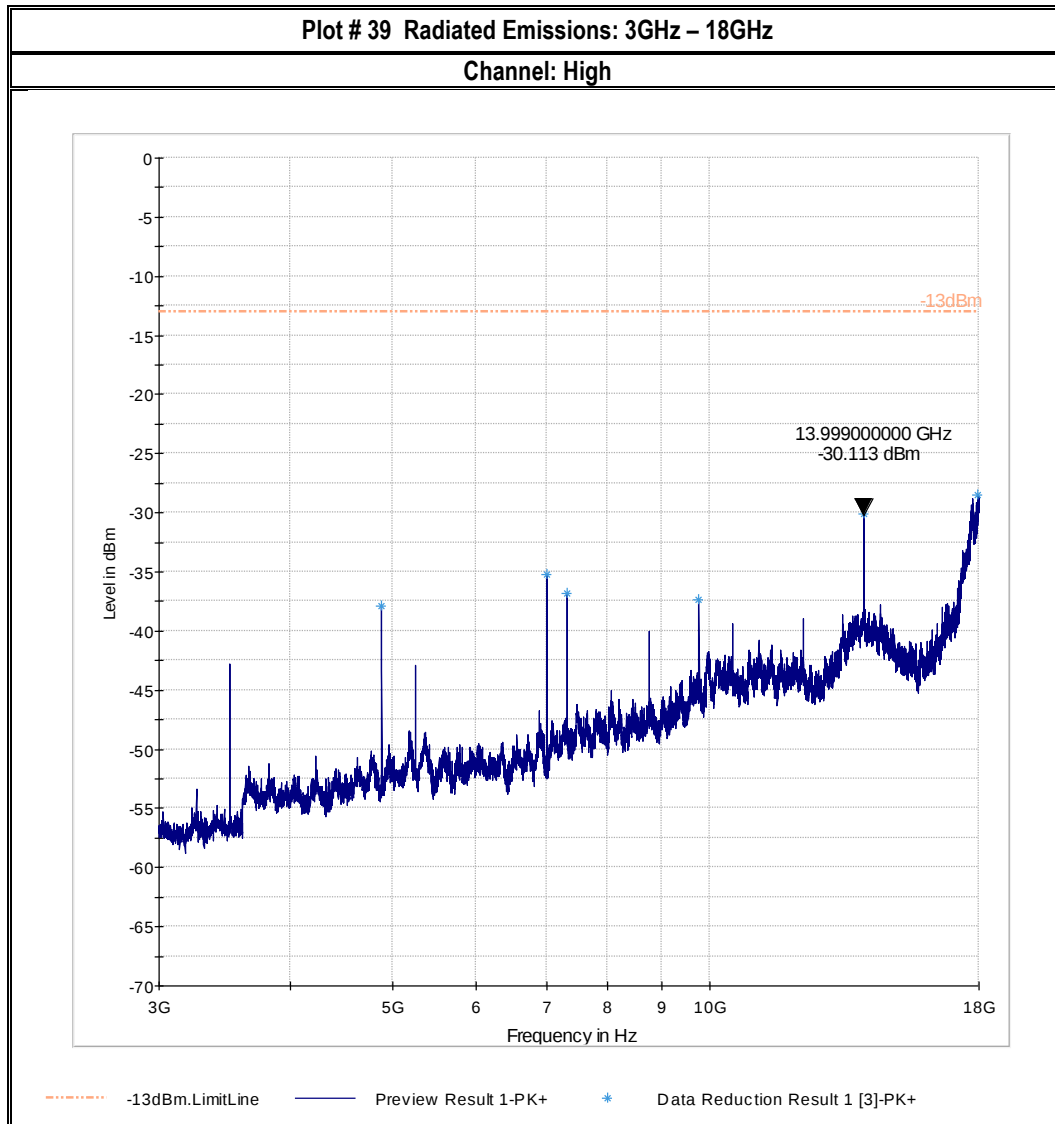
Channel: High



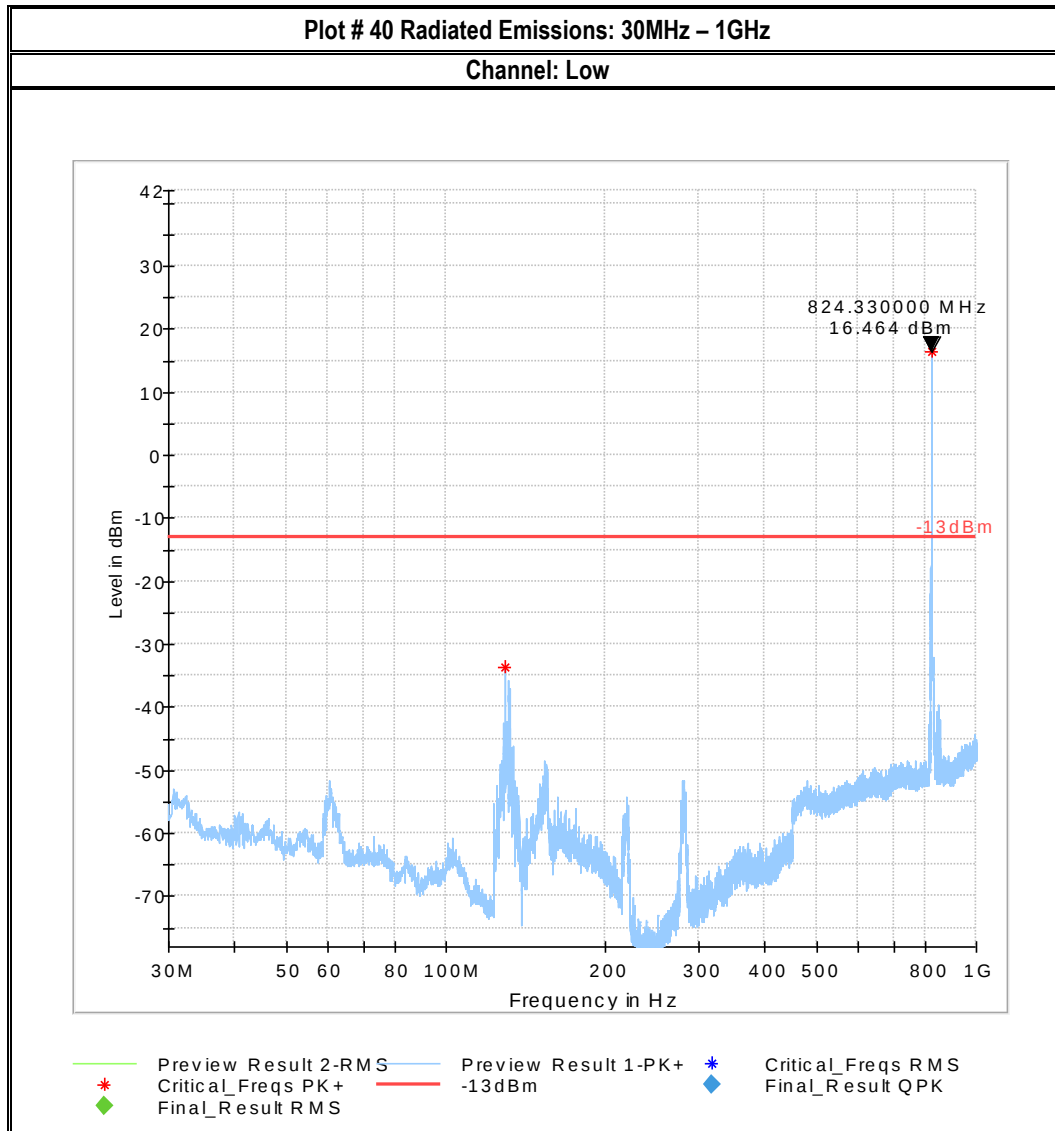
Preview Result 2-RMS  
Critical\_Freqs PK+  
Final\_Result RMS  
Preview Result 1-PK+  
-13dBm  
Critical\_Freqs RMS  
Final\_Result QPK



Note: The peak signal above is the transmit channel.



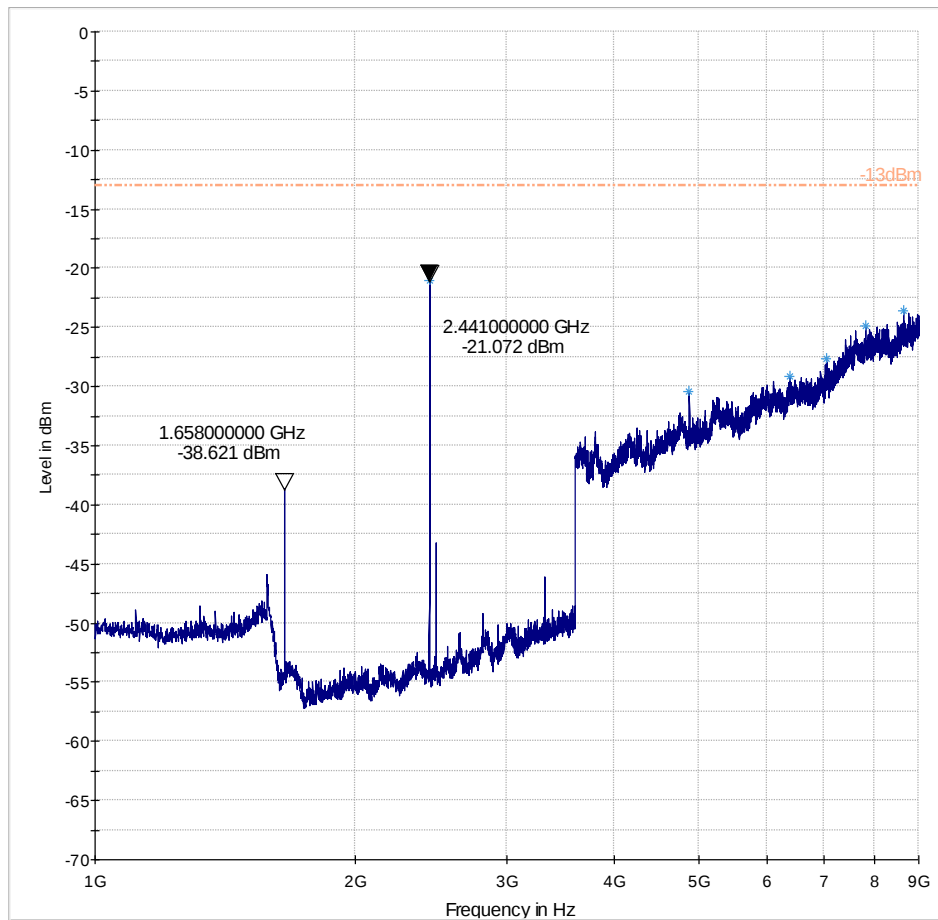
## LTE 5



Note: The peak signal above is the transmit channel.

Plot # 41 Radiated Emissions: 1GHz – 9GHz

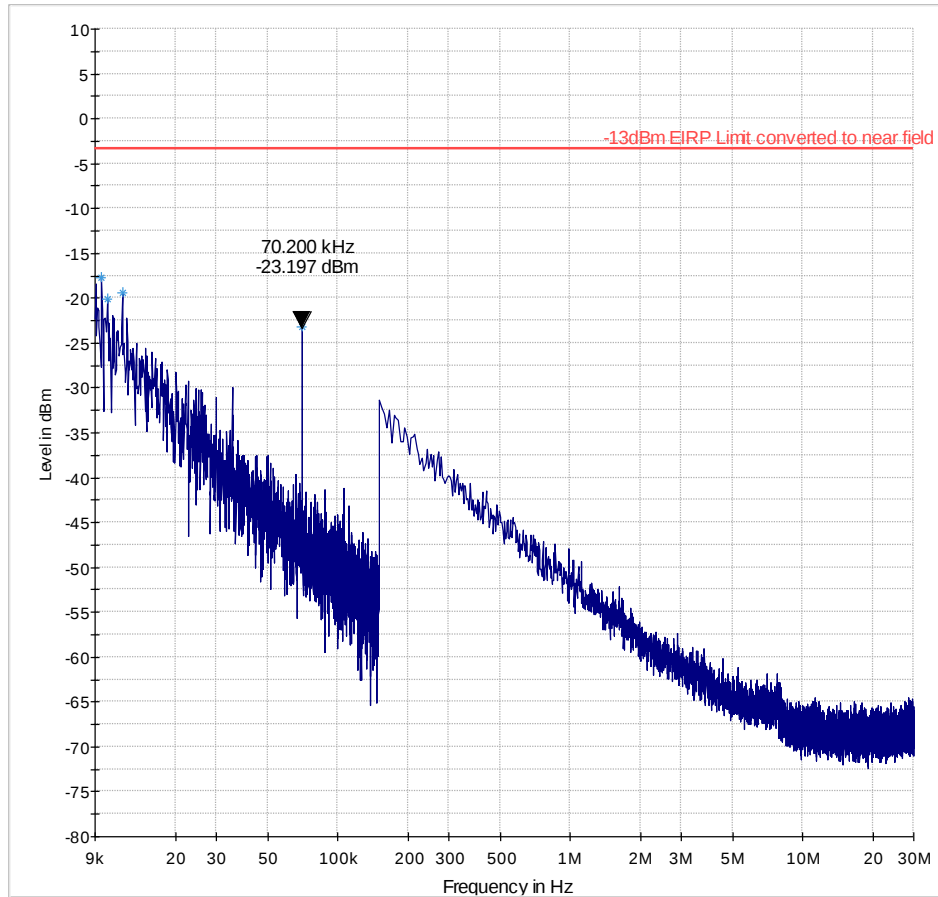
Channel: Low



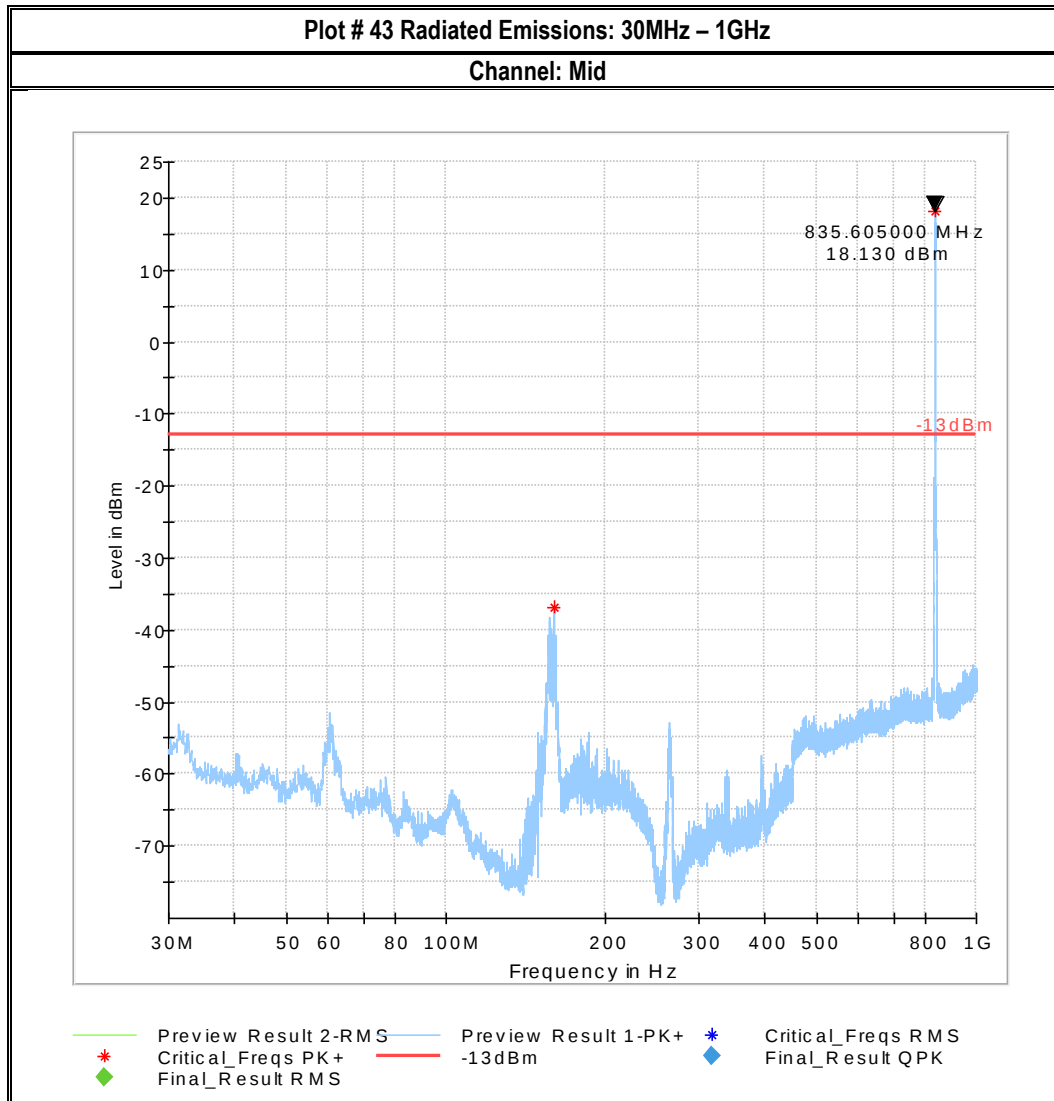
-13dBm      Preview Result 1-PK+      Data Reduction Result 1 [2]-PK+

Plot # 42 Radiated Emissions: 9KHz – 30MHz

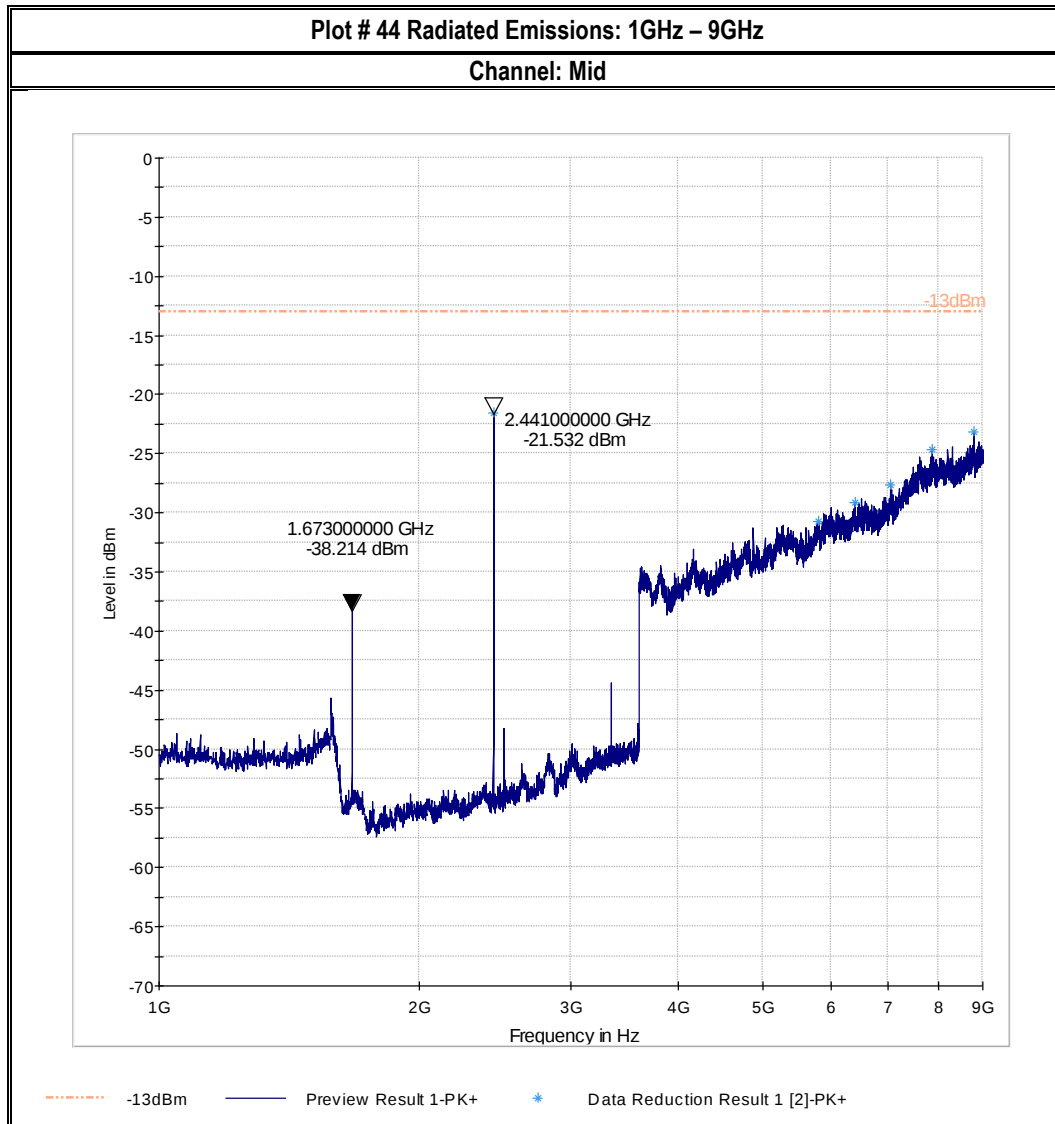
Channel: Mid

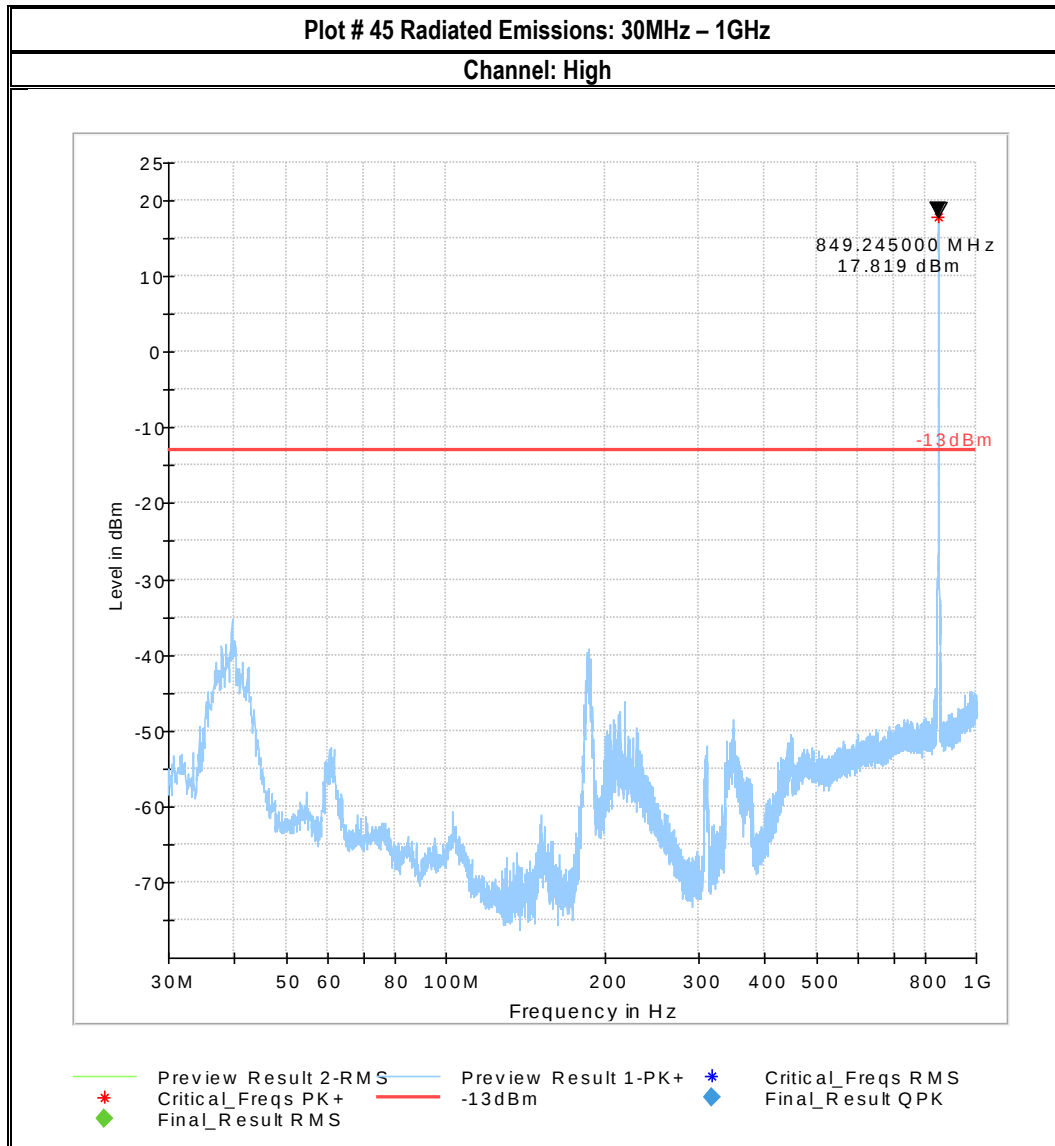


— -13dBm EIRP Limit converted to near field      — Preview Result 1-PK+  
\* Data Reduction Result 1 [1]-PK+

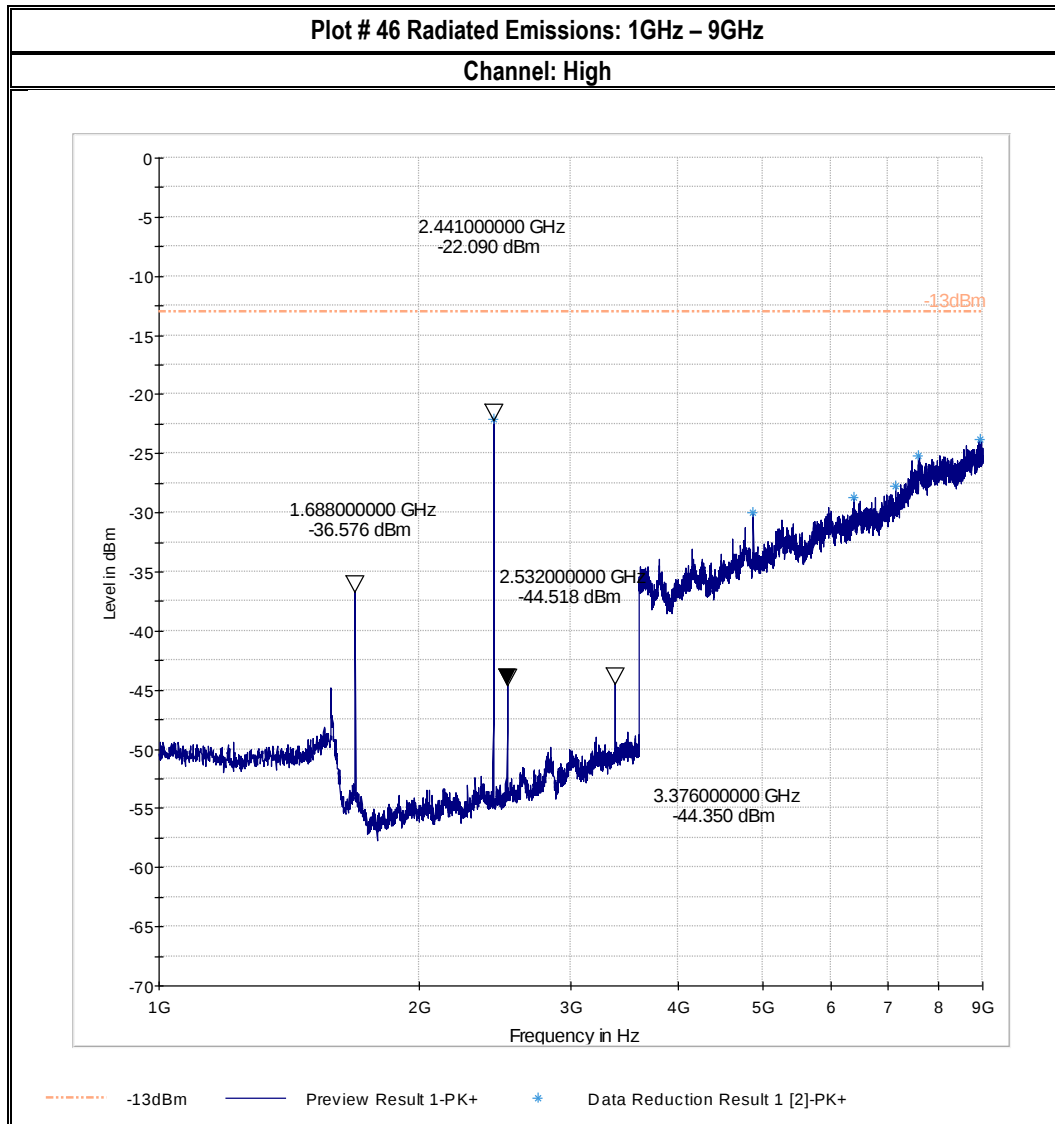


Note: The peak signal above is the transmit channel.

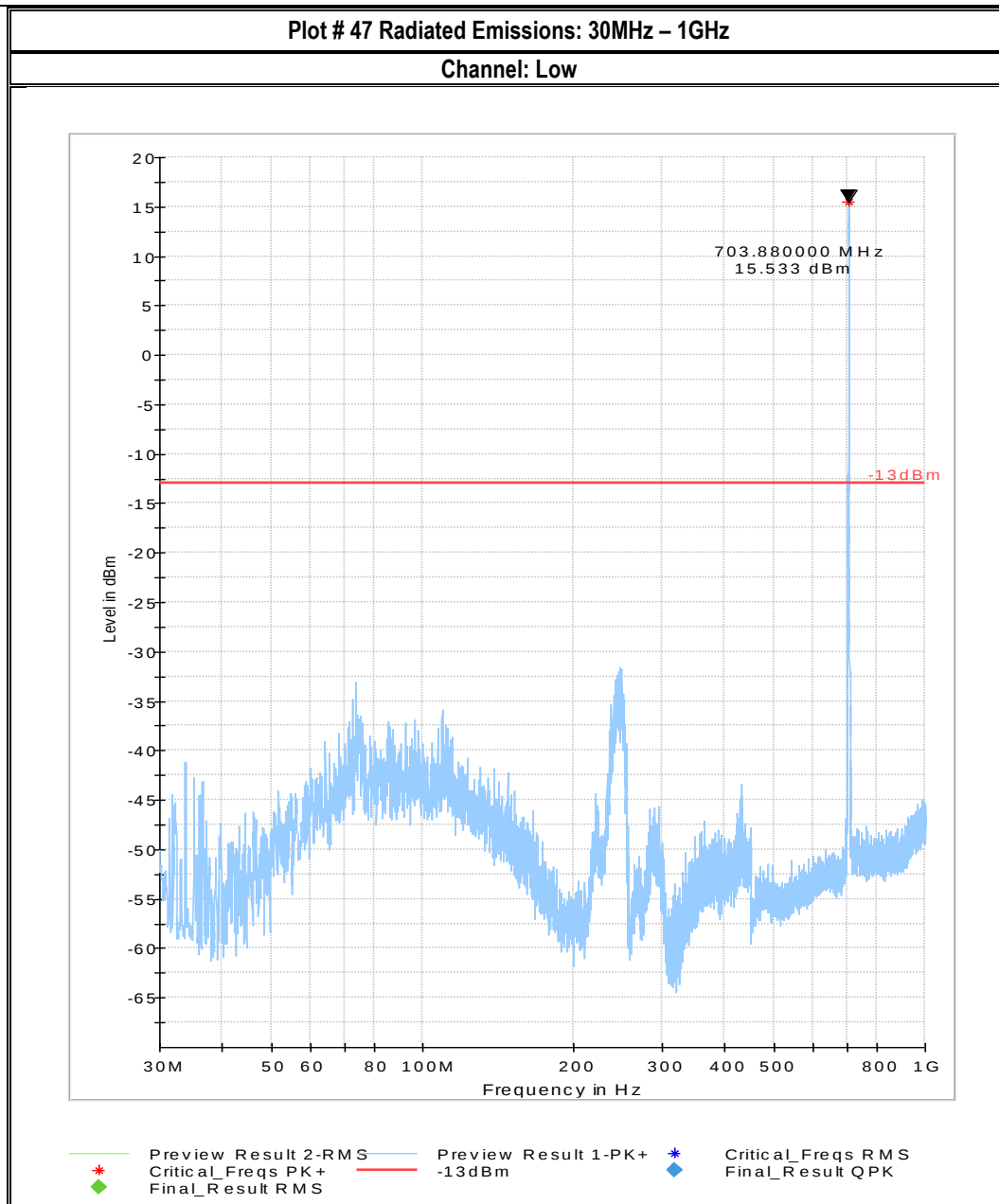




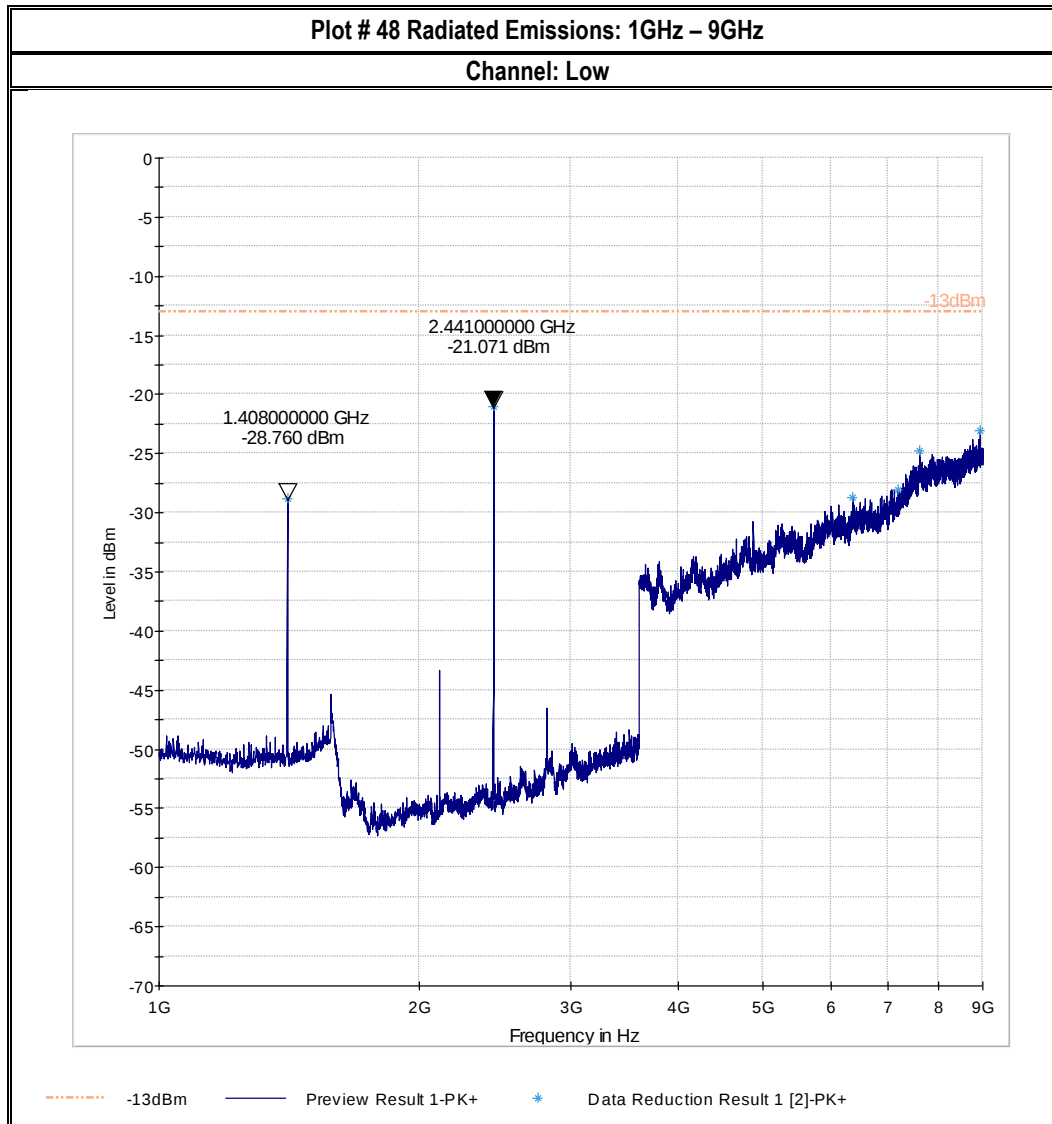
Note: The peak signal above is the transmit channel.



LTE 12

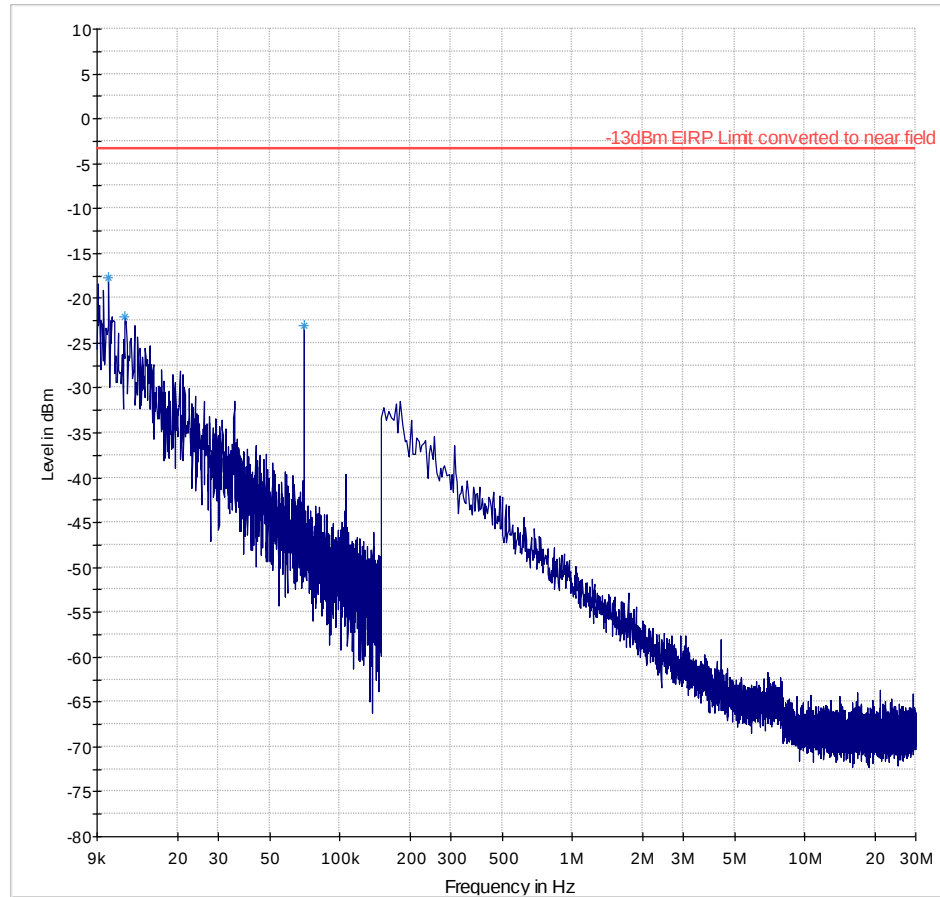


Note: The peak signal above is the transmit channel.

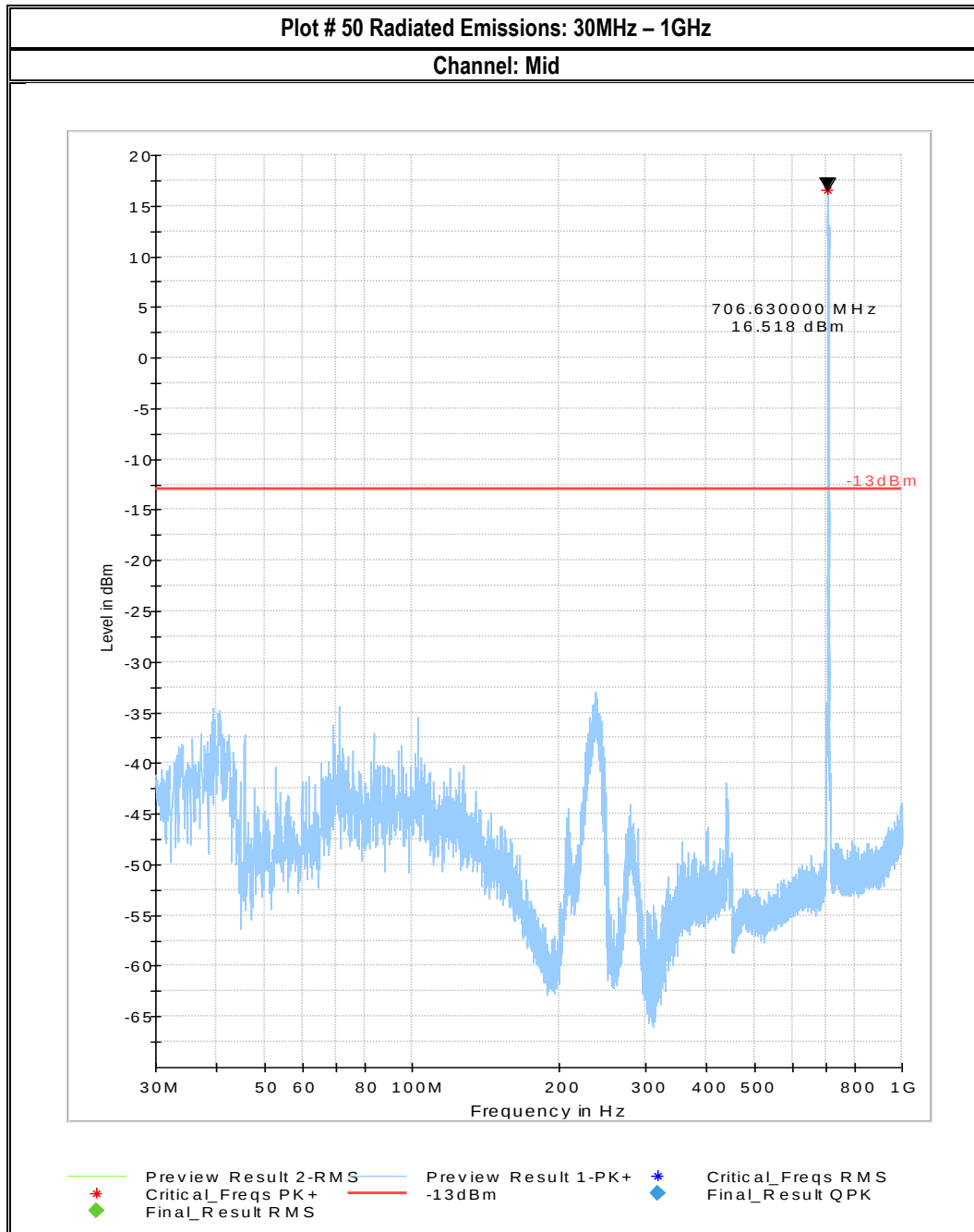


Plot # 49 Radiated Emissions: 9KHz – 30MHz

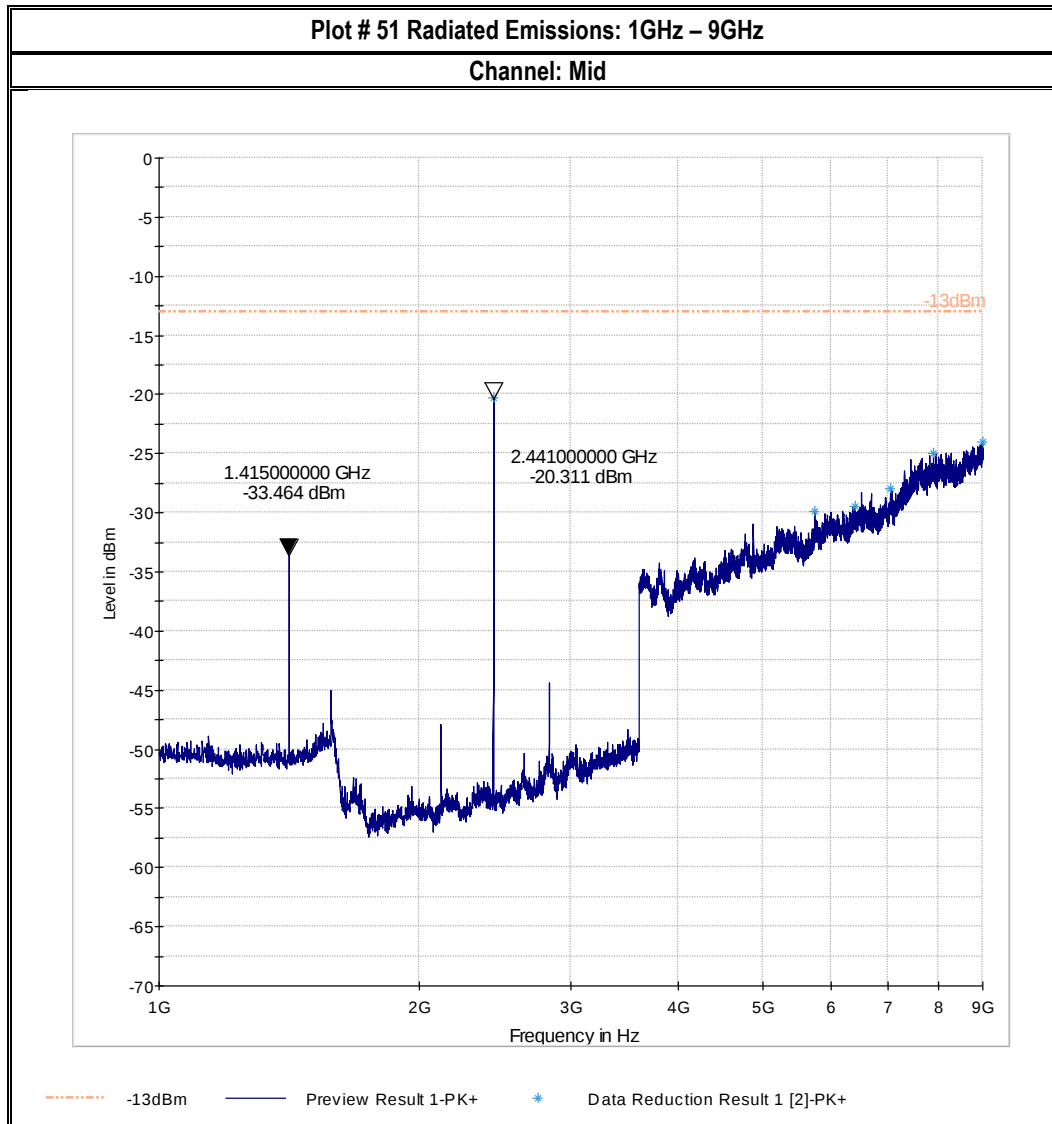
Channel: Mid

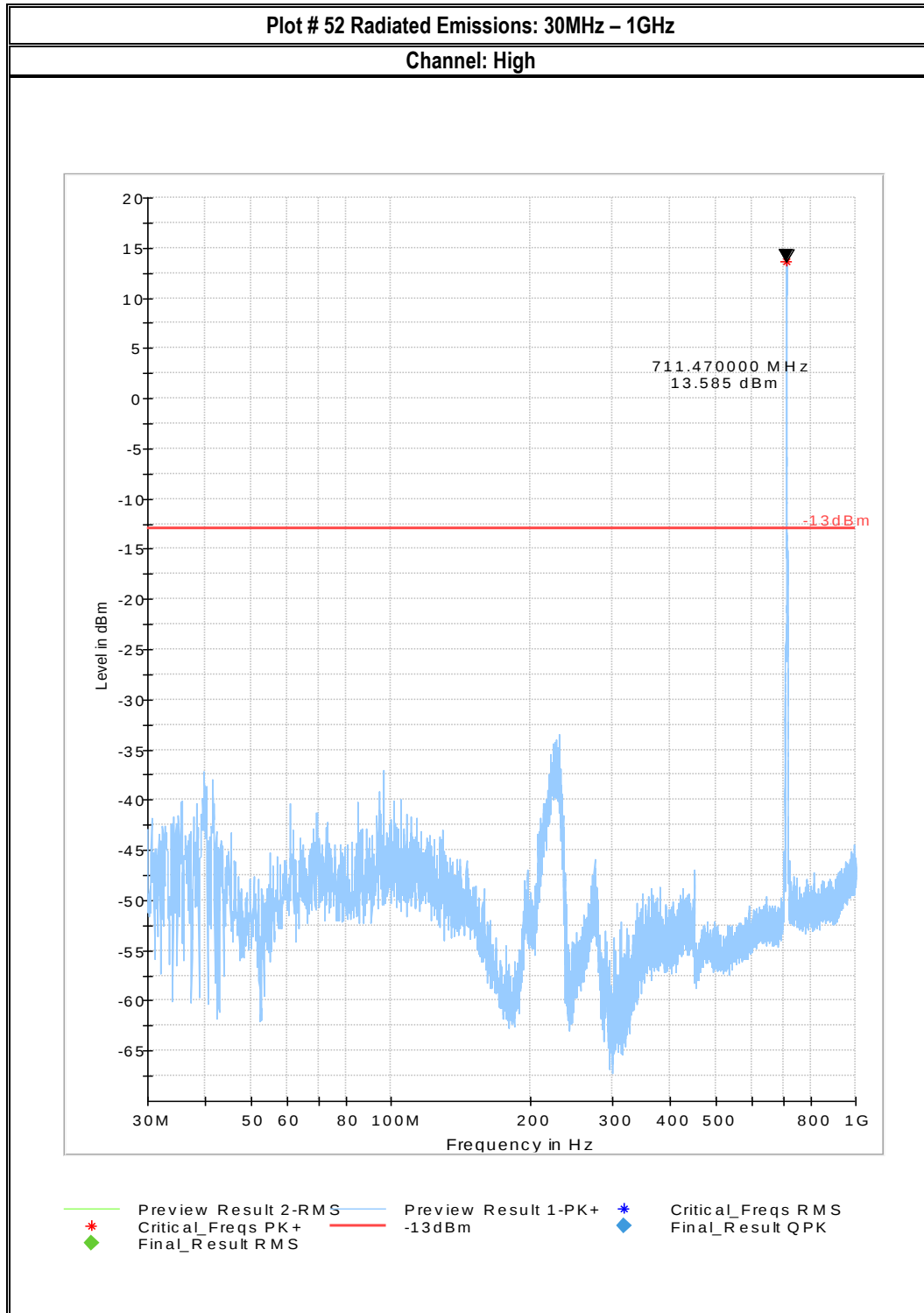


— -13dBm EIRP Limit converted to near field — Preview Result 1-PK+  
\* Data Reduction Result 1 [1]-PK+

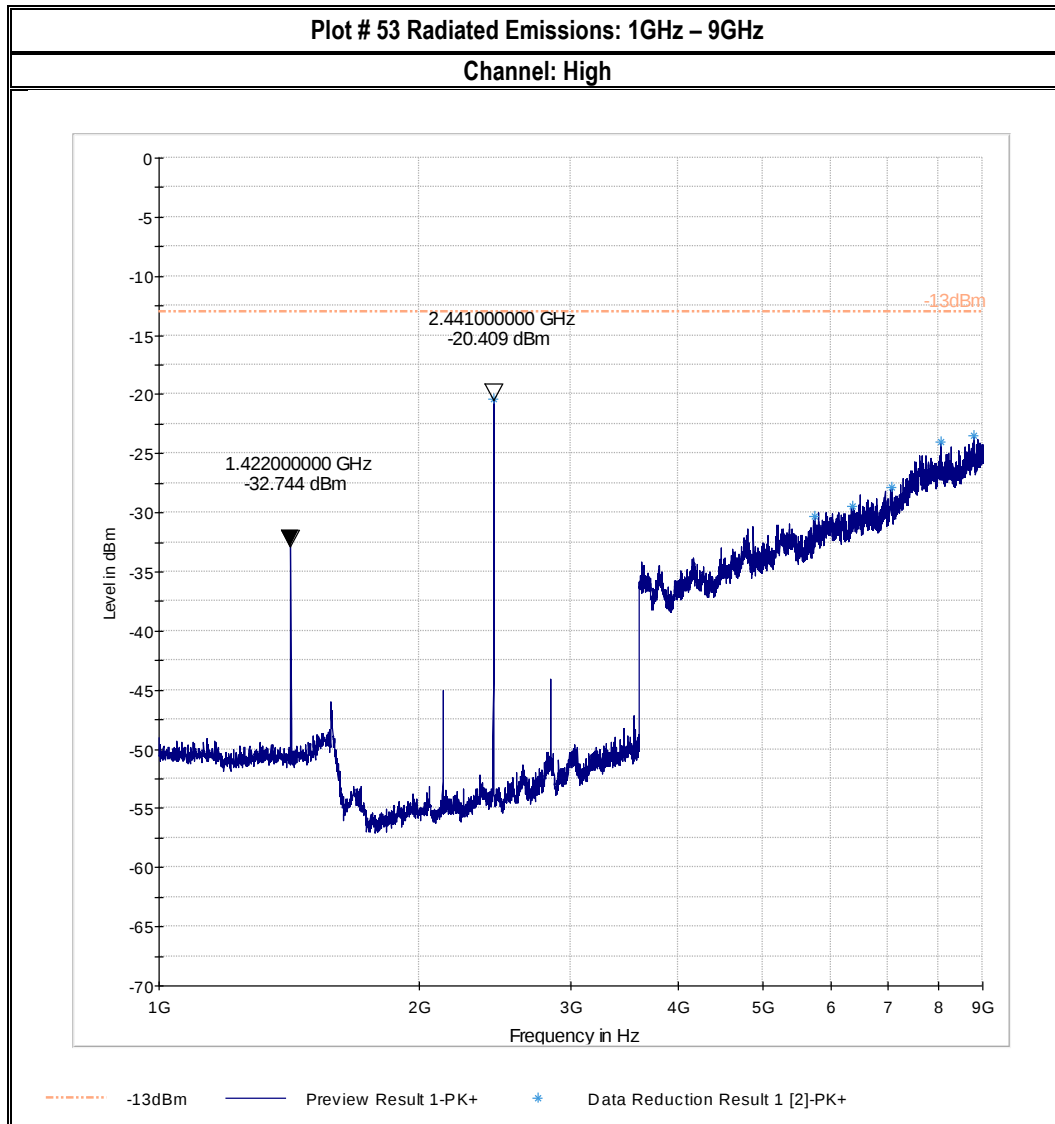


Note: The peak signal above is the transmit channel.

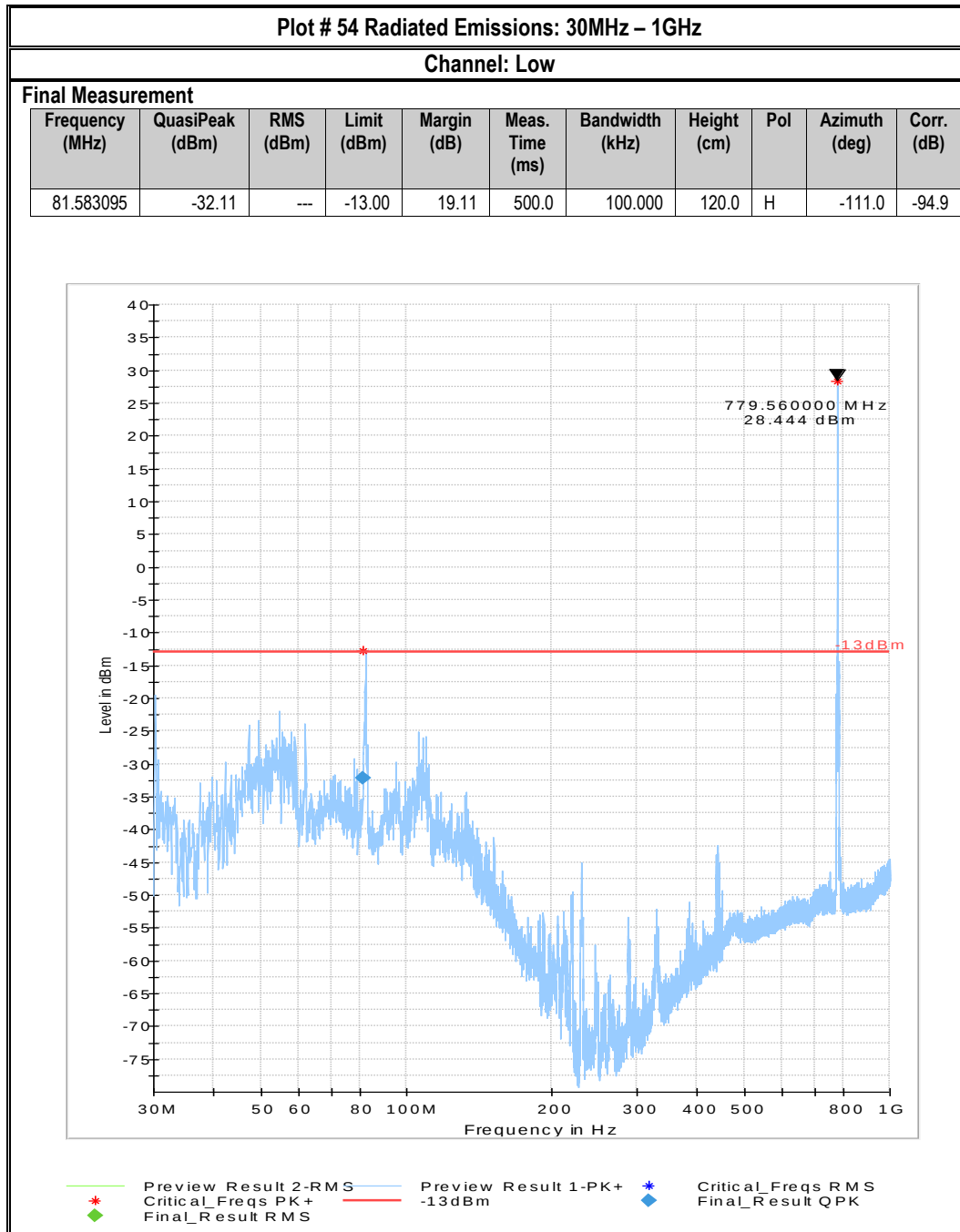




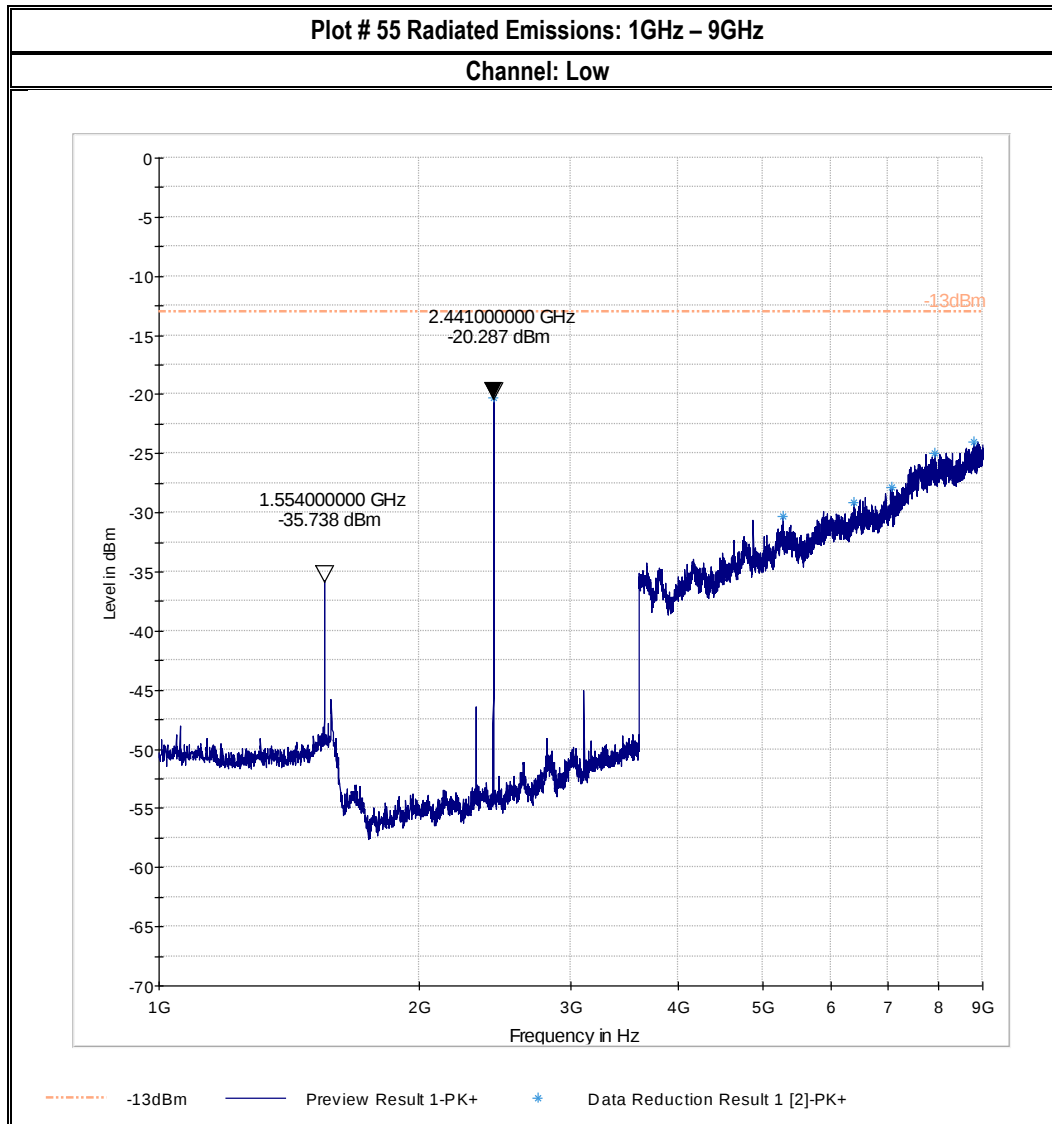
Note: The peak signal above is the transmit channel.



**LTE 13**

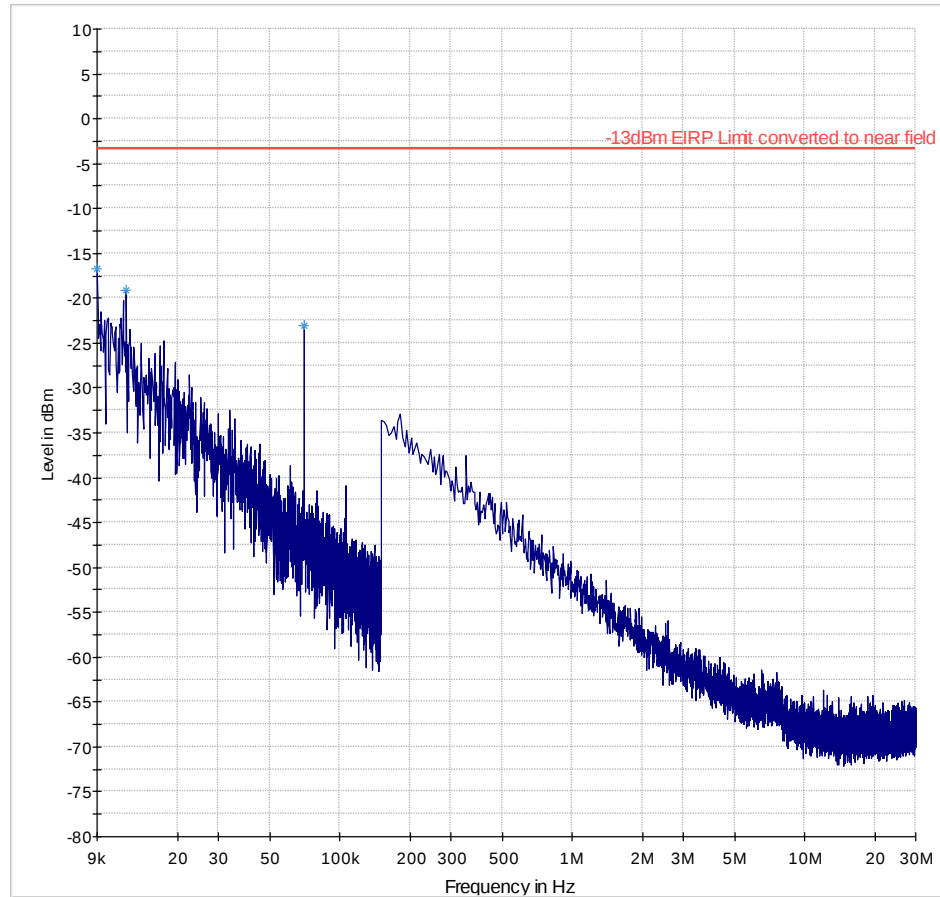


Note: The peak signal above is the transmit channel.

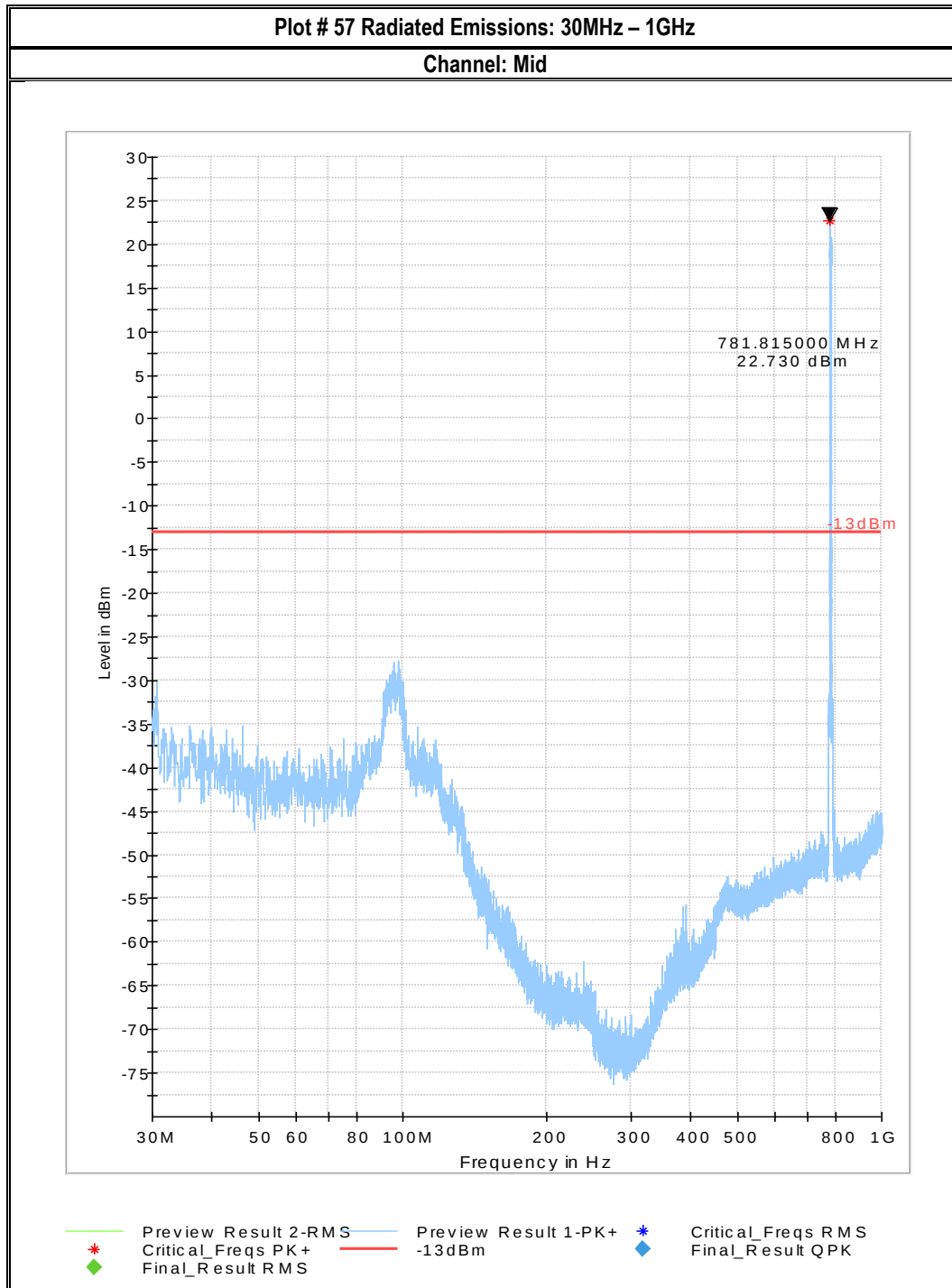


Plot # 56 Radiated Emissions: 9KHz – 30MHz

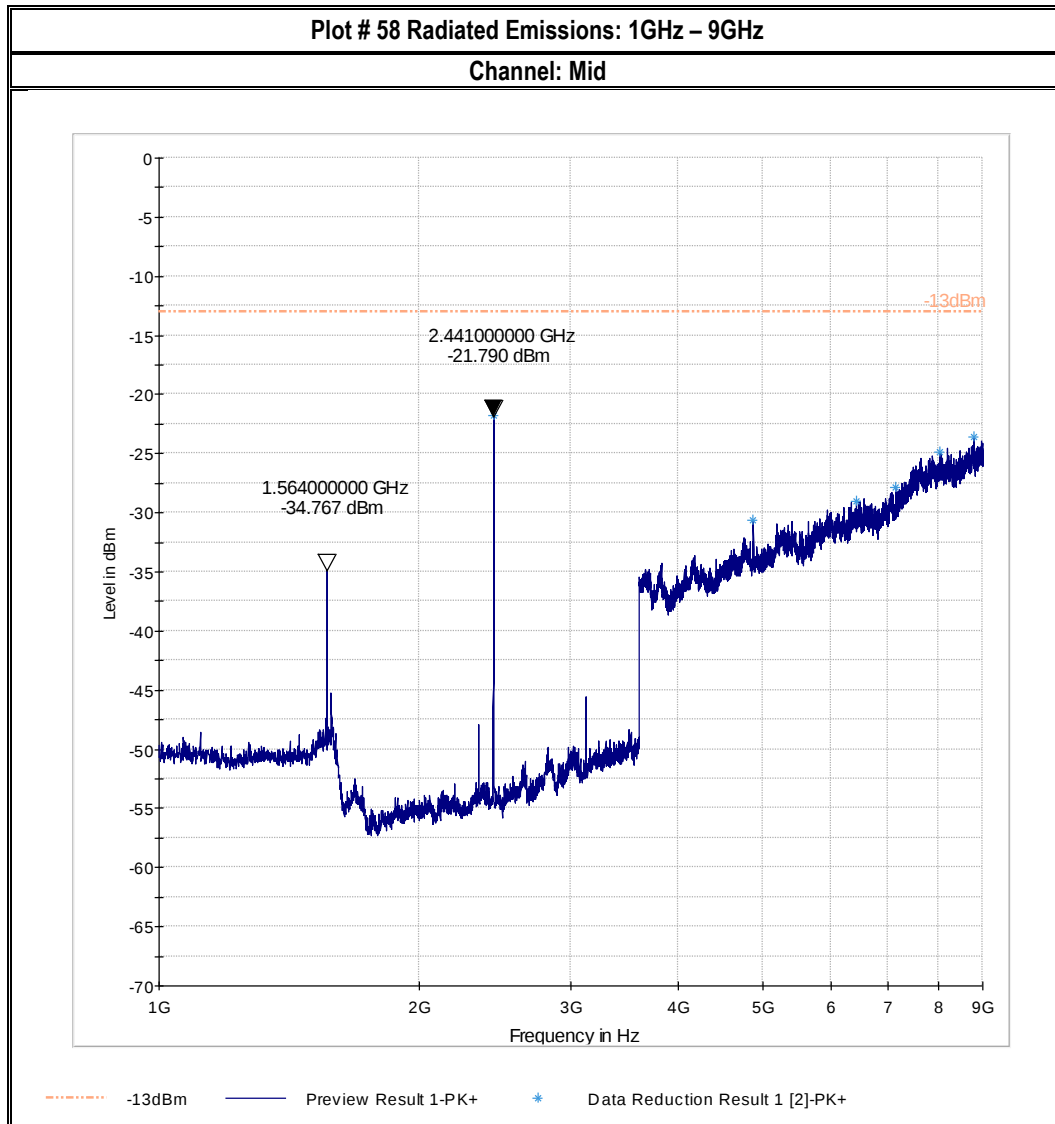
Channel: Mid

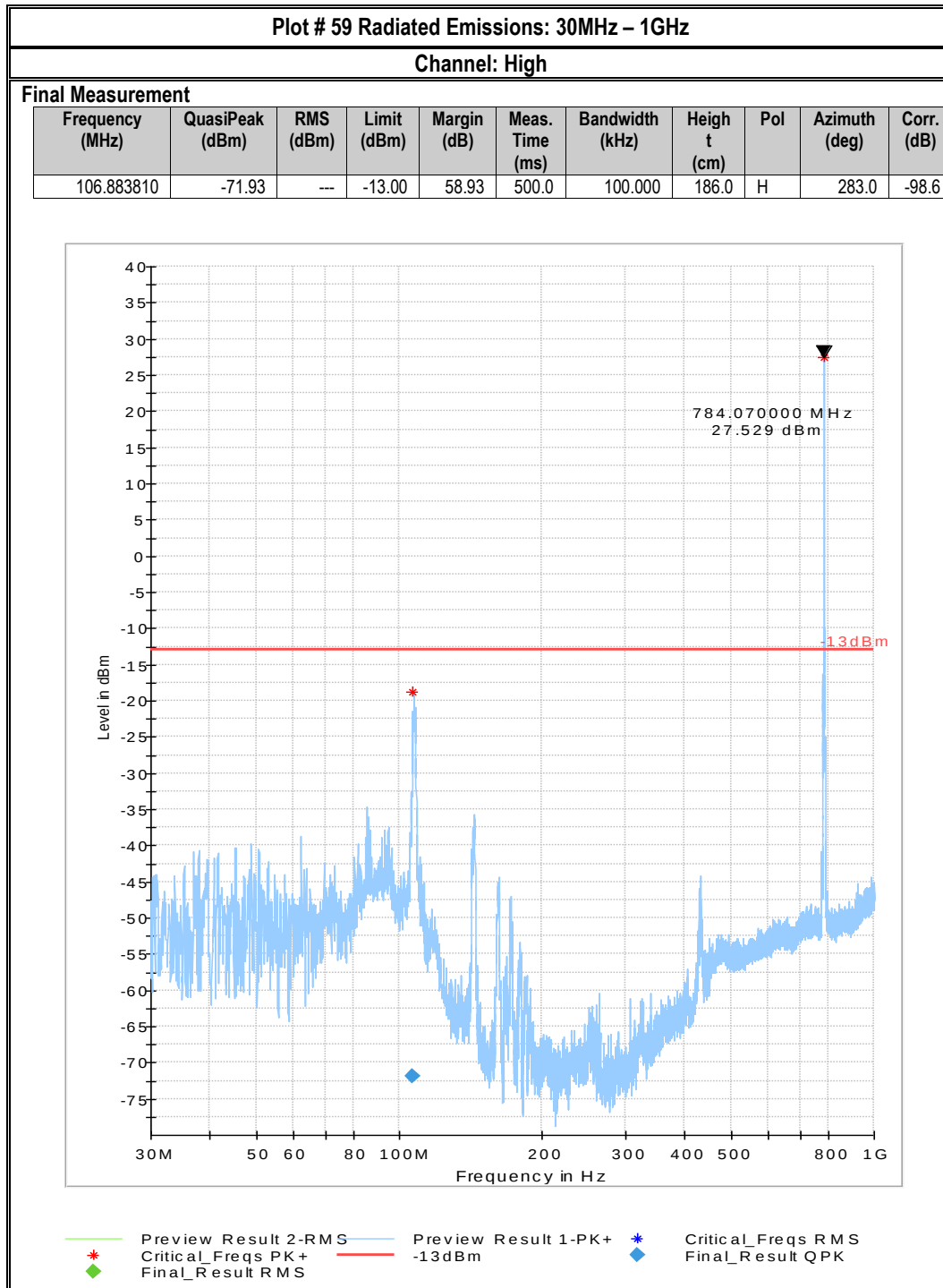


— -13dBm EIRP Limit converted to near field      — Preview Result 1-PK+  
\* Data Reduction Result 1 [1]-PK+

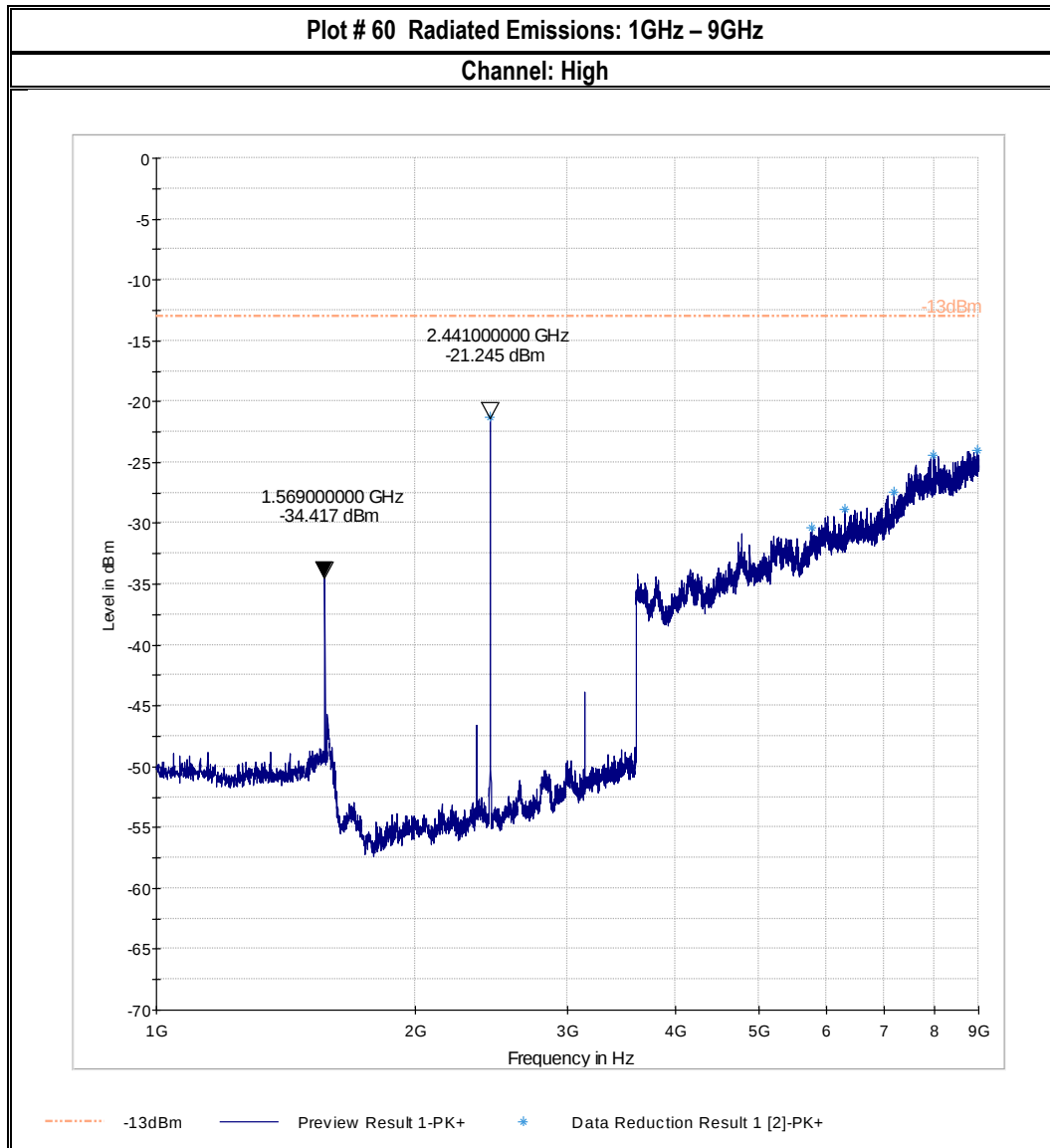


Note: The peak signal above is the transmit channel.





Note: The peak signal above is the transmit channel.



## 8 Test setup photos

Setup photos are included in supporting file name: "EMC\_CALAM-063-17001\_FCC\_IC\_Setup\_Photos.pdf"

## 9 Test Equipment And Ancillaries Used For Testing

| Item Name                  | Equipment Type            | Manufacturer    | Model     | Serial #                   | Calibration Cycle | Last Calibration Date |
|----------------------------|---------------------------|-----------------|-----------|----------------------------|-------------------|-----------------------|
| Biconilog Antenna 3142E    | Biconilog Antenna         | EMCO            | 3142E     | 00166067                   | 3 years           | 6/22/2017             |
| Biconical Antenna SAS-545  | Biconical Antenna         | A.H.System INC. | SAS-545   | 427                        | 1 Year            | 8/21/2017             |
| Active Loop 6507           | Loop Antenna              | ETS Lindgren    | 6507      | 00161344                   | 3 years           | 2/13/2015             |
| Antenna Horn 3115          | Horn Antenna              | EMCO            | 3115      | 35111                      | 3 years           | 7/24/2015             |
| Antenna Horn 3116          | Horn Antenna              | ETS Lindgren    | 3116      | 70497                      | 3 years           | 7/22/2015             |
| FSV. Signal Analyzer       | Signal Analyzer           | R&S             | FSV 40    | 1321.3008K39<br>-101022-ih | 2 Years           | 7/5/2017              |
| Digital Barometer          | Compact Digital Barometer | Control Company | 35519-055 | 91119547                   | 1 Years           | 6/5/2017              |
| CBT. Bluetooth Tester      | Bluetooth Tester          | R&S             | CBT       | 100212                     | 2 Years           | 7/9/2017              |
| ESU . EMI Test Receiver    | Test Receiver             | R&S             | ESU       | 1302.6005K40<br>-100251-KB | 2 years           | 7/10/2017             |
| Thermometer Humidity TM320 | Thermometer Humidity      | Dickson         | AY1072    | 0528                       | 1 Year            | 11/02/2016            |

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.

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## 10 Revision History

| Date       | Report Name                                      | Changes to report                                                    | Report prepared by |
|------------|--------------------------------------------------|----------------------------------------------------------------------|--------------------|
| 10/05/2017 | EMC_CALAM-063-17001_FCC_22_24_27-IC_NA1          | Initial Version                                                      | Issa Ghanma        |
| 10/10/2017 | EMC_CALAM-063-17001_FCC_22_24_27-<br>IC_NA1_REV1 | Section 3.1<br>Add the Max.Documented antenna<br>gain for each band. | Issa Ghanma        |