



FCC Test Report

FOR:

Garmin International

Model Name:

AA3111

Product Description:

Personal Navigation Device

FCC ID: IPH- IC ID: 1792A-A3111

IC ID: 1792A-A3111

Per:

47 CFR: Part 22, Part 24, Part 27

Report #: EMC-GARMIN-047-17001-FCC-22-24-27_Rev1

Date: November 3, 2017



A2LA Accredited

IC recognized #
3462B-2

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CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

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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. No deviations were ascertained during the course of the tests performed.

Company Name	Product Description	Model #
Garmin International	Personal Navigation Device	AA3111

Responsible for Testing Laboratory:

November 03, 2017	Compliance	Peter Nevermann (Director RC&E)	
Date	Section	Name	Signature

Responsible for the Report:

November 03, 2017	Compliance	Elijah Garcia (EMC Engineer)	
Date	Section	Name	Signature

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
Director RC&E:	Franz Engert
Project Engineer:	Kris Lazarov

2.2 Identification of the Client

Applicant's Name:	Garmin International
Street Address:	100 Regency Forest Drive, Suite 350
City/Zip Code	Cary, NC 27518
Country	USA
Contact Person	Jay Everett
Phone No.	919.337.0163
E-mail	jay.everett@garmin.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Garmin Corporation
Manufacturers Address:	No. 68, Jangshu 2nd Road
City/Zip Code	Xizhi Dist., New Taipei City 221
Country	Taiwan

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No	AA3111
HW Version	0
SW Version	2.30
FCC-ID	IPH-A3111
IC-ID	1792A-A3111
HVIN	AA3111 ¹
PMN	fleet™ 790 xy, fleet™ 780 xy, and fleet™ 770 xy
Product Description	Personal Navigation Device
Frequency Range / number of channels	Nominal band: 2412 MHz (Ch. 1) – 2472 (Ch.13), 13 channels
Type(s) of Modulation	802.11b: DSSS 802.11g/n: OFDM 802.11n: MCS (20 & 40 MHz)
Modes of Operation	802.11b/g/n (Client)
Antenna Information as declared	max gain 1.575 dBi
Max. Output Powers	Peak Conducted Power 16.19dBm
Power Supply/ Rated Operating Voltage Range	4.5 V dc (min) / 5 V dc (nom) / 5.5 V dc (max)
Operating Temperature Range	-10 °C to 55 °C
Other Radios included in the device	Bluetooth Basic / EDR: GFSK, $\pi/4$ DQPSK, 8DPSK Bluetooth Low Energy: GFSK
Sample Revision	☐ Prototype Unit ☒ Production Unit ☐ Pre-Production

¹ Fleet™ 790 xy was fully tested and a spot-check was performed on, fleet™ 780 xy, and fleet™ 770 xy, refer to section 3.5

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	39F003818	0	2.30	Radiated and AC Conducted Emissions
2	39F003830	0	2.30	Conducted RF

3.3 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	Serial Number
1	AC/DC Adapter	PSAF10R-050Q	Phihong	P164604044A1

3.4 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT#2 + AE#1	The radio of the EUT was configured to a fixed channel transmission with 100% duty cycle using software that is not available to the end user. The measurement equipment was connected to the 50 ohm RF port of the EUT.
2	EUT#1 + AE#1	The radio of the EUT was configured to a fixed channel transmission with 100% duty cycle using software that is not available to the end user. The internal antenna was connected.

3.5 Miscellaneous EUT Information

Only Fleet™ 790 xy was fully tested and based on the information that were provided by Garmin about the differences, the lab concluded that only a spot check is needed which was performed on, fleet™ 780 xy, and fleet™ 770 xy.

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to evaluate the compliance of the EUT against the relevant requirements specified in the Code of Federal Regulations Title 47 parts 22, 24, 27 to support the equipment certification under FCC ID: IPH-A3111 IC ID: 1792A-A3111.`.

Full conducted measurements according to the above standards are filed under the certification of the module FCC-ID:IPH-A3111 with a singular grant. Thus this report verifies the radiated performance.

5 Measurement

5.1 Date of Testing:

08/02/2017 - 08/12/2017

5.2 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

150 kHz to 30 MHz	± 0.7 dB (LISN)
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RF conducted measurement	± 0.5 dB
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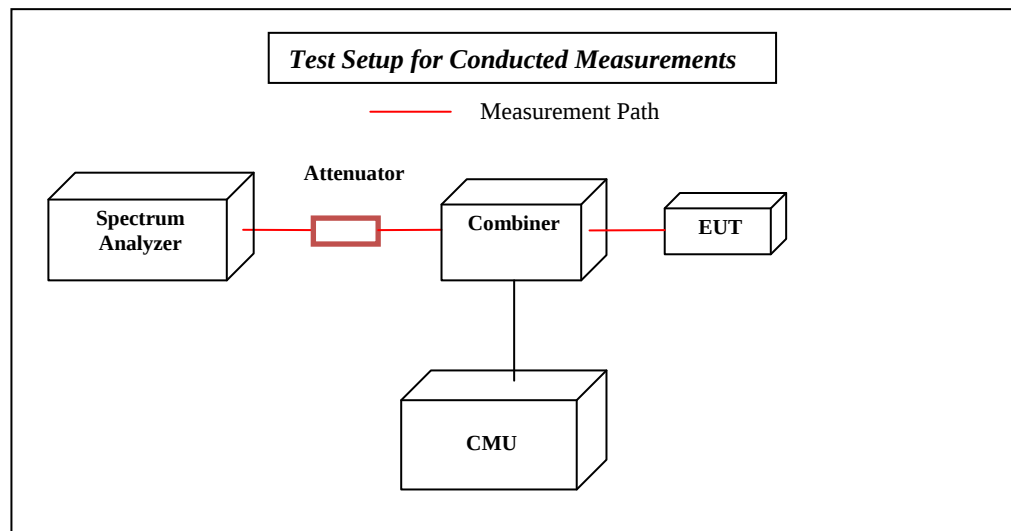
5.3 Environmental Conditions during Testing:

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

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

5.4 Conducted measurements

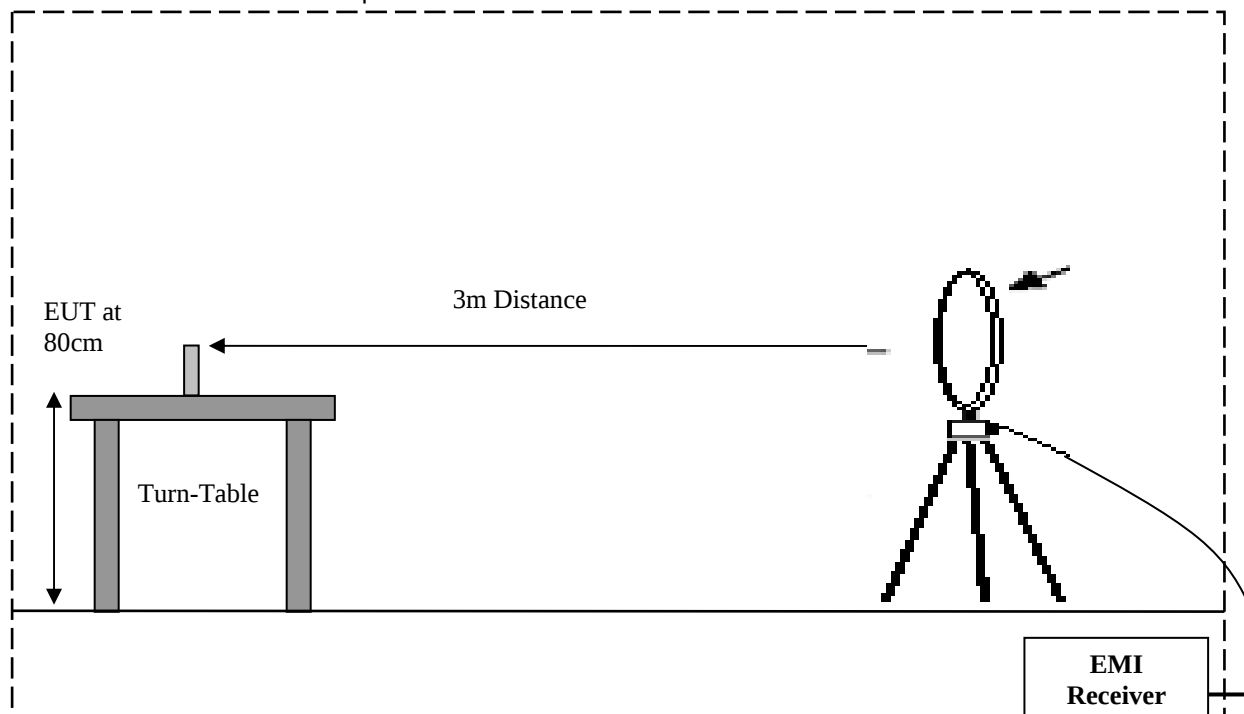
Testing is performed according to the guidelines provided in FCC publication (KDB) 971168 D01 v02r02 – “Measurement Guidance for Certification of Licensed Digital Transmitters” and according to relevant parts of TIA-603C 2004 as detailed below.



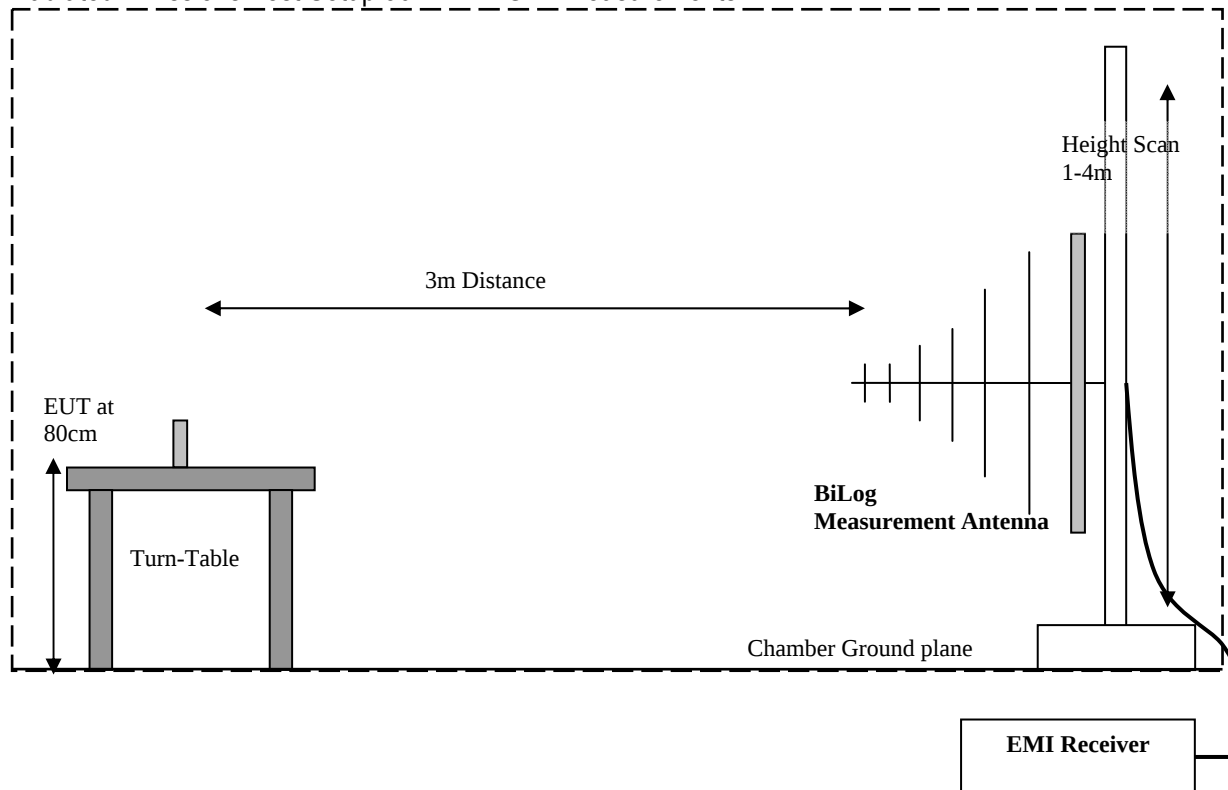
5.5 Radiated Measurement

- 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.

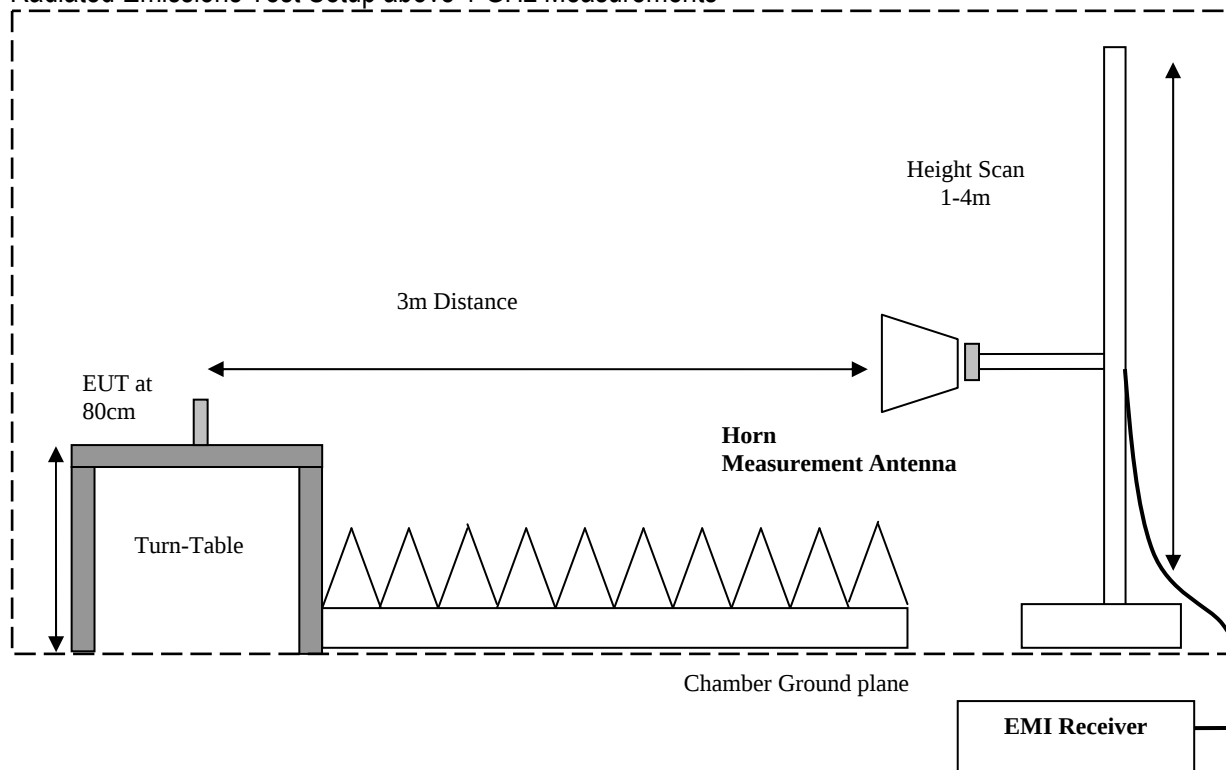
Radiated Emissions Test Setup below 30 MHz Measurements



Radiated Emissions Test Setup 30 MHz-1 GHz Measurements



Radiated Emissions Test Setup above 1 GHz Measurements



5.6 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

6 Measurement Results Summary

6.1 FCC 22:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (a) RSS-132 5.4	RF Output Power	Nominal	UMTS/LTE	☐	☐	☐	■	Note 2
§2.1055 §22.355 RSS-132 5.3	Frequency Stability	Nominal	UMTS/LTE	☐	☐	☐	■	Note 2
§2.1049 §22.917(b) RSS-132 5.2	Occupied Bandwidth	Nominal	UMTS/LTE	☐	☐	☐	■	Note 2
§2.1051 §22.917 RSS-132 5.5	Band Edge Compliance	Nominal	UMTS/LTE	☐	☐	☐	■	Note 2
§2.1051 §22.917 RSS-132 5.5	Conducted Spurious Emissions	Nominal	UMTS/LTE	☐	☐	☐	■	Note 2
§2.1053 §22.917 RSS-132 5.5	Radiated Spurious Emissions	Nominal	UMTS/LTE	■	☐	☐	☐	Complies

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

Note 2: Leveraged from module certification.

6.2 FCC 24 & 27:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046; §24.232 (a); §27.50 (d) RSS-133 6.4	RF Output Power	Nominal	UMTS/LTE	☐	☐	☐	■	Note 2
§2.1055; §24.235; §27.54 RSS-133 6.3	Frequency Stability	Nominal	UMTS/LTE	☐	☐	☐	■	Note 2
§2.1049; §24.238; §27.53 RSS-133 6.2	Occupied Bandwidth	Nominal	UMTS/LTE	☐	☐	☐	■	Note 2
§2.1051; §24.238; §27.53 RSS-133 6.5	Band Edge Compliance	Nominal	UMTS/LTE	☐	☐	☐	■	Note 2
§2.1051; §24.238; §27.53 RSS-133 6.5	Conducted Spurious Emissions	Nominal	UMTS/LTE	☐	☐	☐	■	Note 2
§2.1053; §24.238; §27.53 RSS-133 6.5	Radiated Spurious Emissions	Nominal	UMTS/LTE	■	☐	☐	☐	Complies

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

Note 2: Leveraged from module certification.

7 RF Output Power verification

7.1 Reference:

FCC: CFR Part 2.1046, CFR Part 22.913, CFR Part 24.232, CFR Part 27.50

7.2 Limits:

7.2.1 FCC Part 22.913 (a)

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

7.2.2 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.

7.2.3 FCC Part 27.50 (d) (4)

(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.

8 Radiated Spurious Emissions

8.1 References:

FCC: CFR Part 2.1053, CFR Part 22.917, CFR Part 24.238,

IC: RSS-Gen issue 4, section 6.13; RSS-132 issue 3, section 5.5; RSS-133 issue 6, section 6.5

8.2 Limits:

(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.

For all power levels +30dBm to 0dBm, this becomes a constant specification of -13dBm.

8.2.1 FCC 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

8.2.2 FCC 24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(b) *Measurement procedure.* Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz of 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

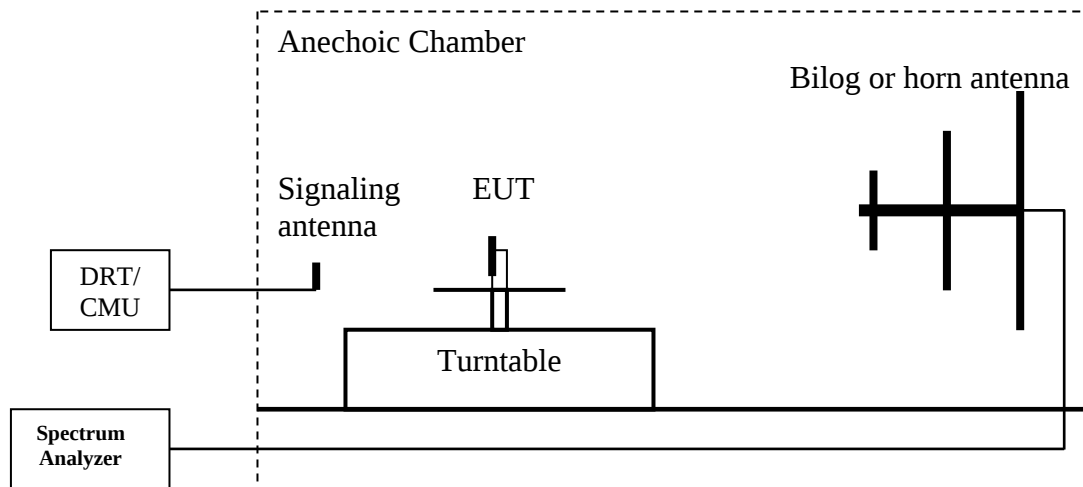
8.2.3 RSS-132 Section 5.5.1.1 and RSS-133 Section 6.5.1

In the first 1.0 MHz band immediately outside and adjacent to the licensee's frequency block, the power of emissions per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in watts) by at least $43 + 10 \log_{10}(P)$, dB. After the first 1.0 MHz, the power of emissions shall be attenuated below the transmitter output power by at least $43 + 10 \log_{10}(P)$, dB, in any 100 kHz bandwidth.

After the first 1.5 MHz, the power of emissions shall be attenuated below the transmitter output power by at least $43 + 10 \log_{10}(P)$, dB, in any MHz of bandwidth.

8.3 Radiated out of band measurement procedure:

Ref: TIA-603C 2004- 2.2.12 Unwanted emissions: Radiated Spurious



1. Connect the equipment as shown in the above diagram with the EUT's antenna in a horizontal orientation.
2. Adjust the settings of the Digital Radio Communication Tester (DRT) to set the EUT to its maximum power at the required channel.
3. Set the spectrum analyzer to measure peak hold with the required settings.
4. Place the measurement antenna in a horizontal orientation. Rotate the EUT 360°. Raise the measurement antenna up to 4 meters in 0.5 meters increments and rotate the EUT 360° at each height to maximize all emissions. Measure and record all spurious emissions (**LVL**) up to the tenth harmonic of the carrier frequency.
5. Replace the EUT with a horizontally polarized half wave dipole or known gain antenna. The center of the antenna should be at the same location as the center of the EUT's antenna.
6. Connect the antenna to a signal generator with known output power and record the path loss in dB (**LOSS**). **LOSS** = Generator Output Power (dBm) – Analyzer reading (dBm).
7. Determine the level of spurious emissions using the following equation:
Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):
8. Repeat steps 4, 5 and 6 with all antennas vertically polarized.
9. Determine the level of spurious emissions using the following equation:
Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):
10. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.
(Note: Steps 5 and 6 above are performed prior to testing and **LOSS** is recorded by test software. Steps 3, 4 and 7 above are performed with test software.)

8.3.1 Sample Calculations for Radiated Measurements:

Power Measurements using Substitution Procedure:

The measurement on the Spectrum Analyzer is used as a basis for the Substitution procedure. The EUT is replaced with a Signal Generator and an antenna. The setting on the Signal Generator is varied until the Spectrum Analyzer displays the original reading. EIRP is calculated as-

EIRP (dBm)= Signal Generator setting (dBm)- Cable Loss (dB)+ Antenna Gain (dBi). Example below.

Frequency (MHz)	Measured SA (dBμV)	Signal Generator setting (dBm)	Antenna Gain (dBi)	Dipole Gain (dBd)	Cable Loss (dB)	EIRP (dBm)
1000	95.5	24.5	6.5	0	3.5	27.5

8.3.2 Spectrum Analyzer Settings

Settings for FCC 22

	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

Settings for FCC 24

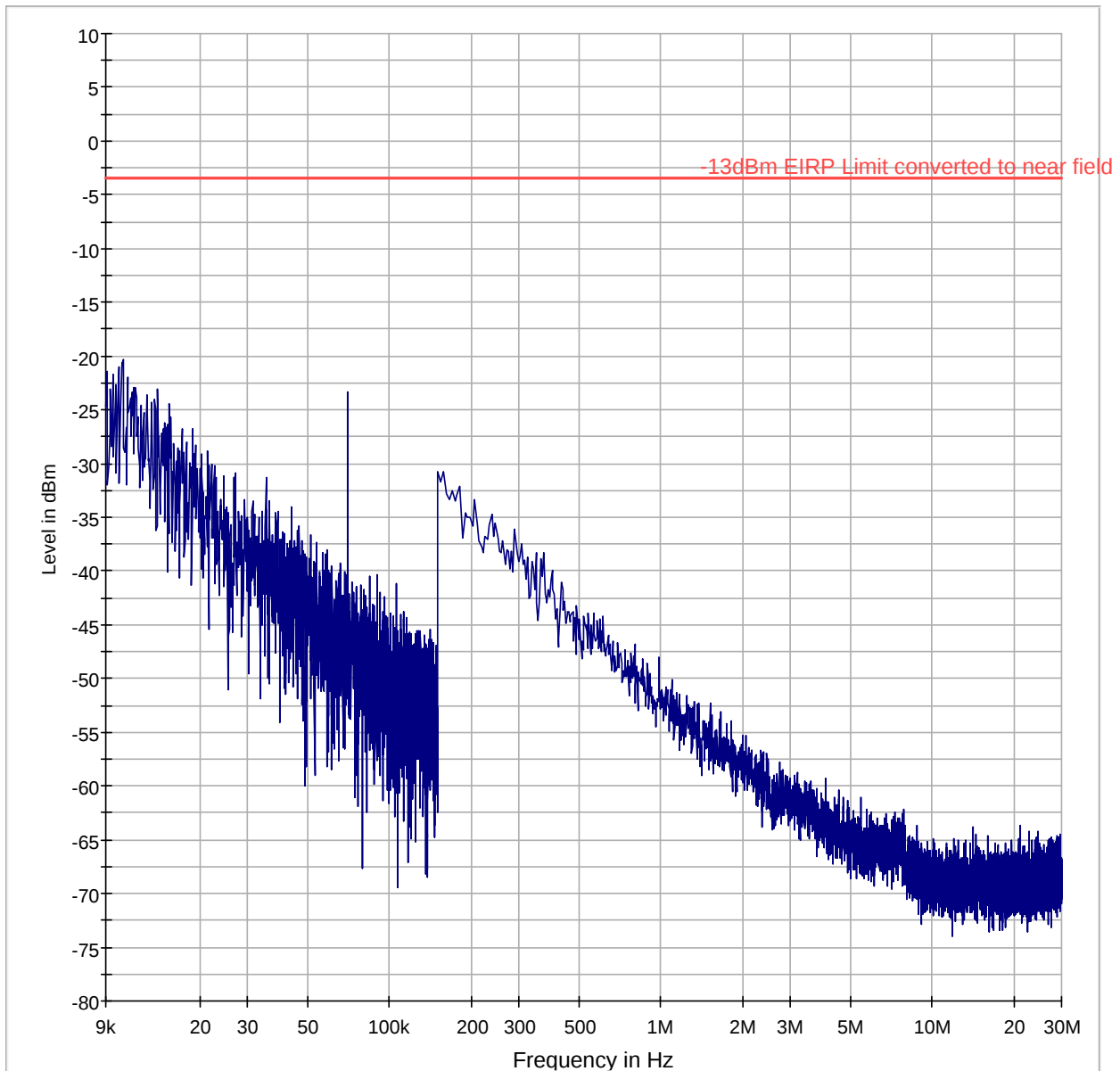
	30MHz – 1 GHz	1 – 2.7 GHz	2.7 – 18 GHz	18 – 19.1 GHz
Resolution Bandwidth	100 kHz	1 MHz	1 MHz	1 MHz
Video Bandwidth	100 kHz	1 MHz	1 MHz	1 MHz
Detector	Peak	Peak	Peak	Peak
Trace Mode	Max Hold	Max Hold	Max Hold	Max Hold
Sweep Time	Auto	Auto	Auto	Auto

8.4 Summary Measurement result:

Channel	EUT Operating Mode	Scan Frequency	Limit (dBm)	Result	Note
Mid	UMTS FDD II / LTE Band 2	9 kHz – 26 GHz	-13	Pass	
Mid	UMTS FDD V / LTE Band 4, 12, 13	9 kHz – 18 GHz	-13	Pass	
Mid	LTE Band 5	1 GHz - 9 GHz	-13	Pass	

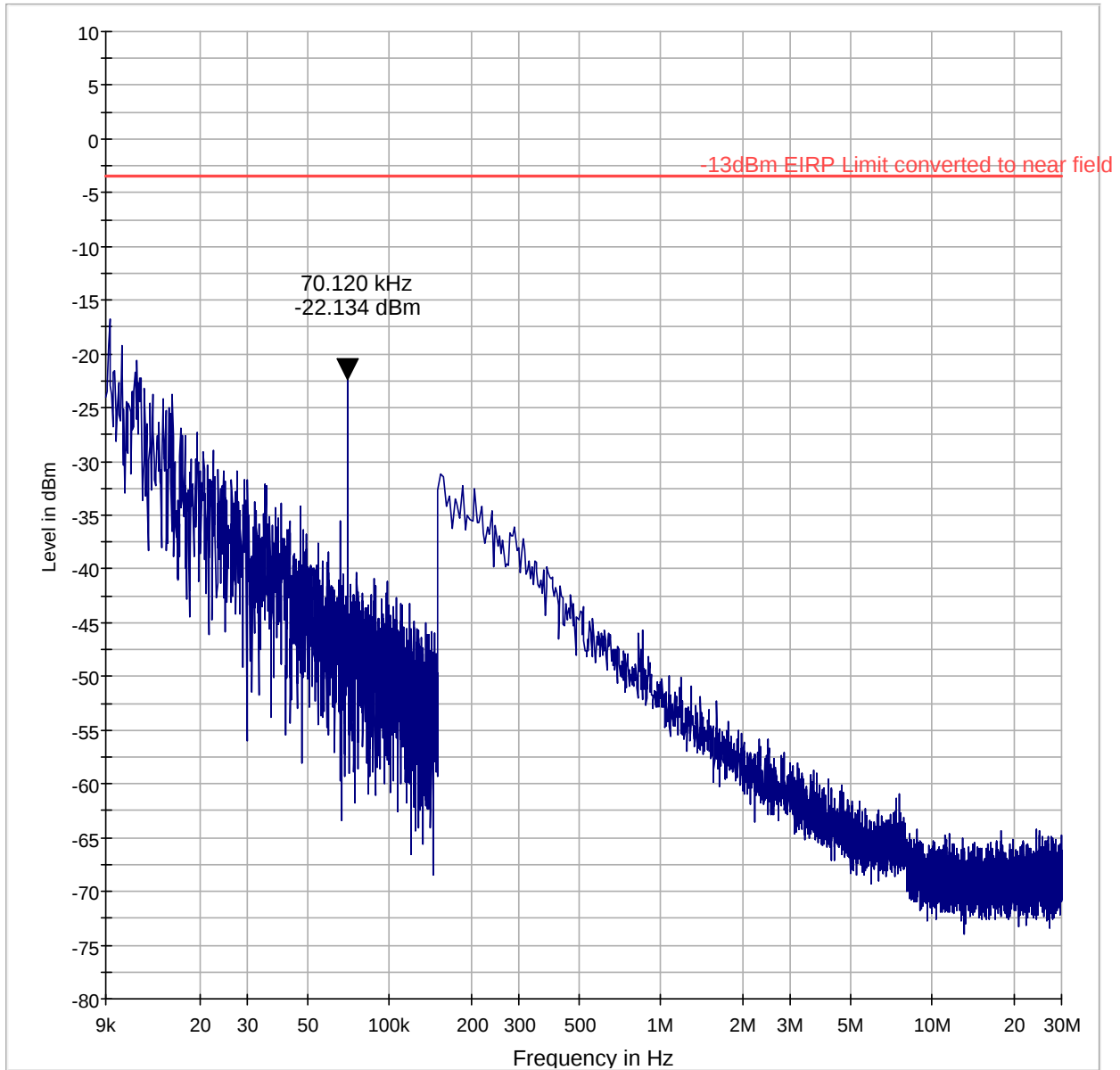
8.5 Measurement Plots UMTS/LTE co. Tx with Wi-Fi on mid channel

8.5.1 9 kHz - 30 MHz, Ch. Mid (UMTS II) co Tx. with Wi-Fi Tx on mid channel



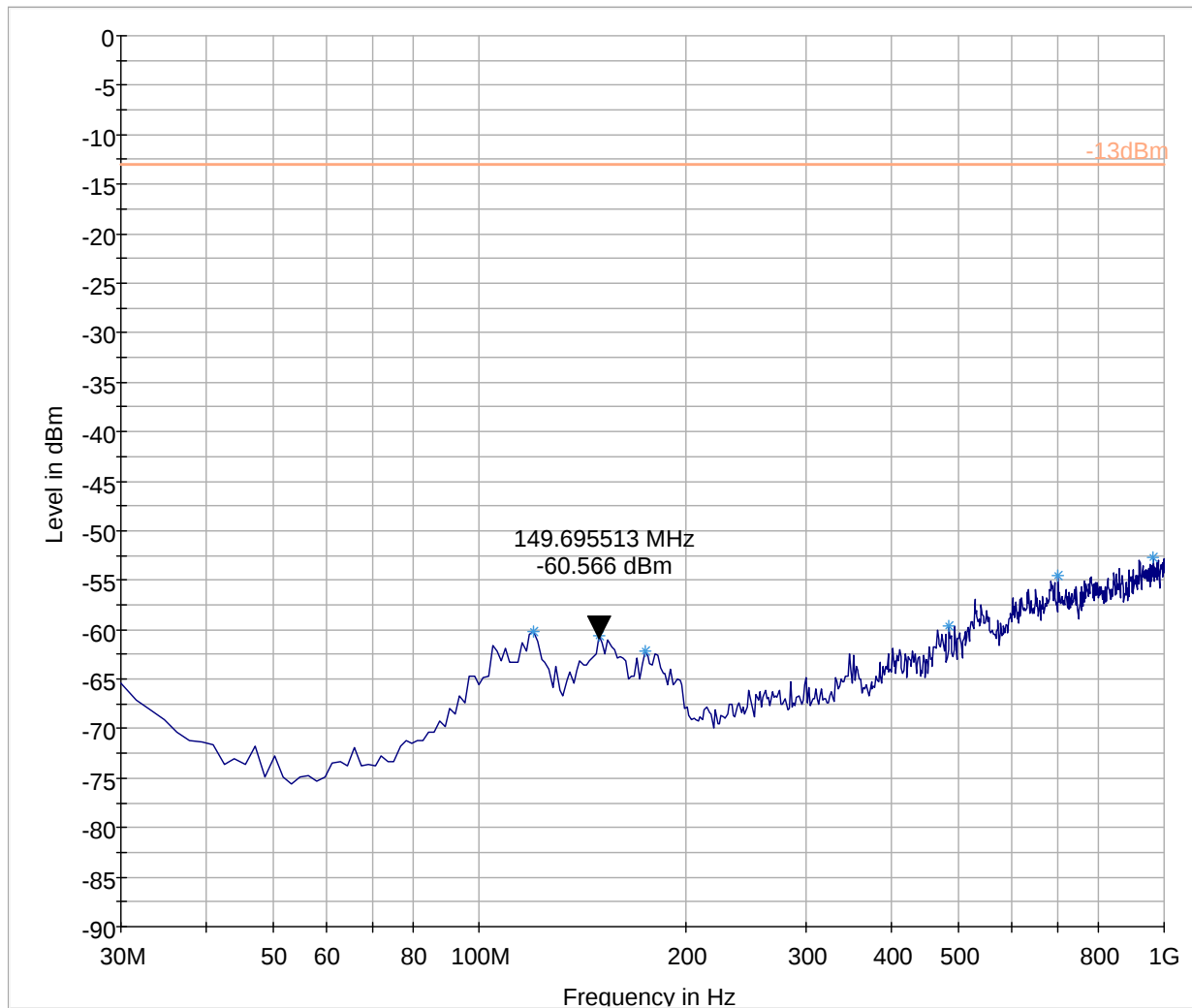
— -13dBm EIRP Limit converted to near field — Preview Result 1-PK+

8.5.2 9 kHz - 30 MHz, Ch. Mid (LTE) co Tx. with Wi-Fi Tx on mid channel



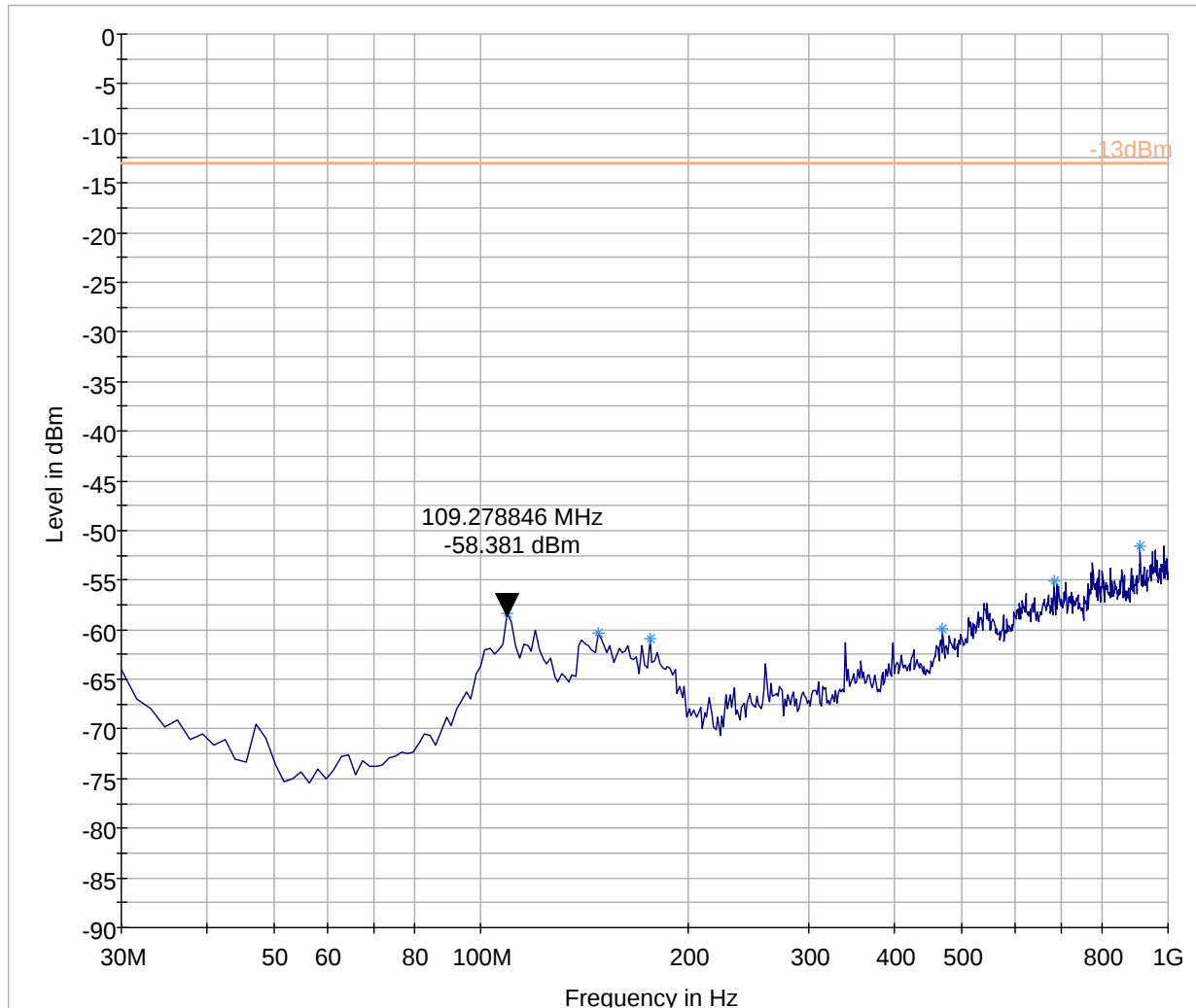
— -13dBm EIRP Limit converted to near field — Preview Result 1-PK+

8.5.3 30 MHz - 1000 MHz, Ch. Mid (UMTS II) co Tx. with Wi-Fi Tx on mid channel



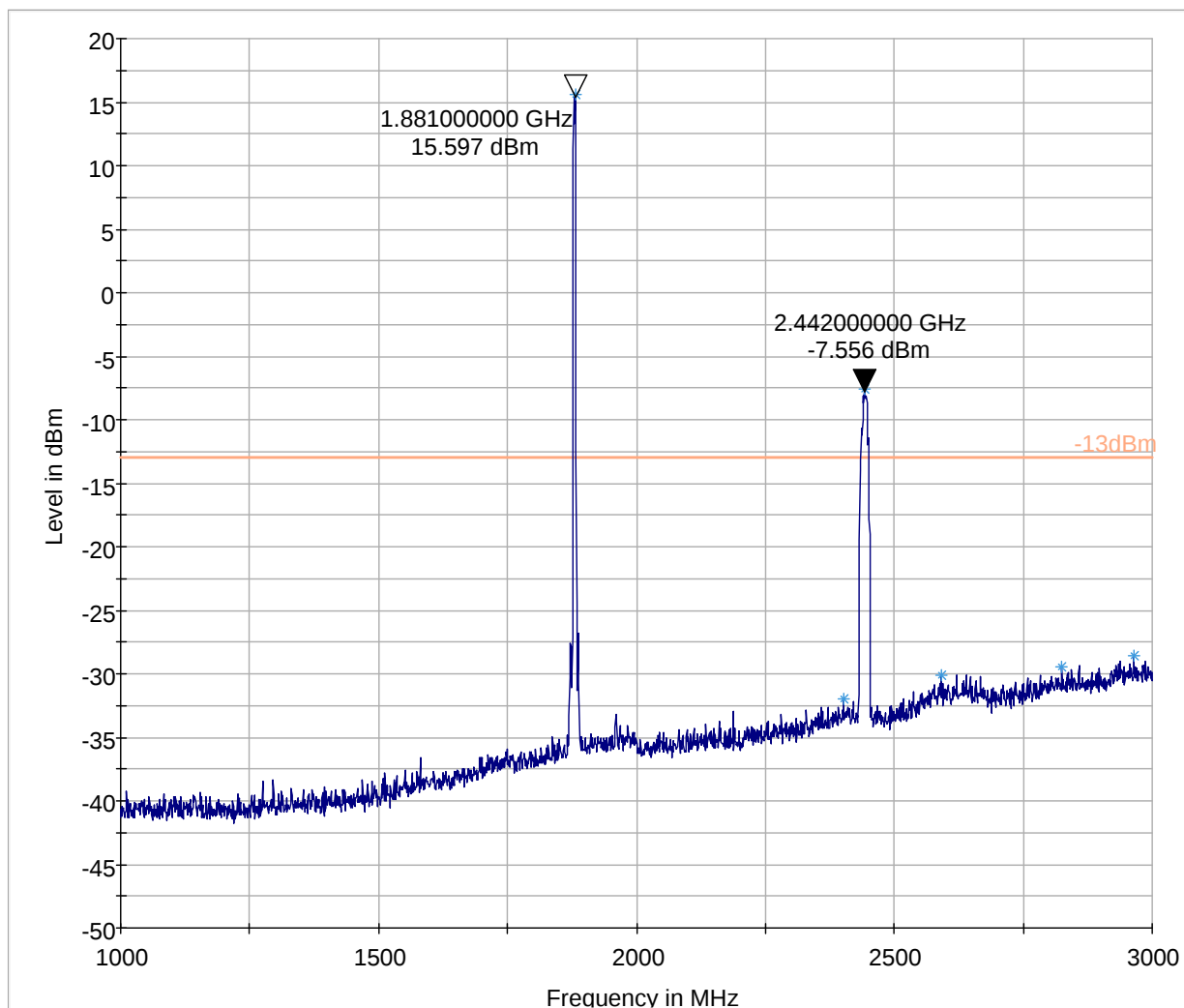
— -13dBm.LimitLine — Preview Result 1-PK+ * Data Reduction Result 1 [1]-PK+

8.5.4 30 MHz - 1000 MHz, Ch. Mid (LTE Band 2) co Tx. with Wi-Fi Tx on mid channel



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

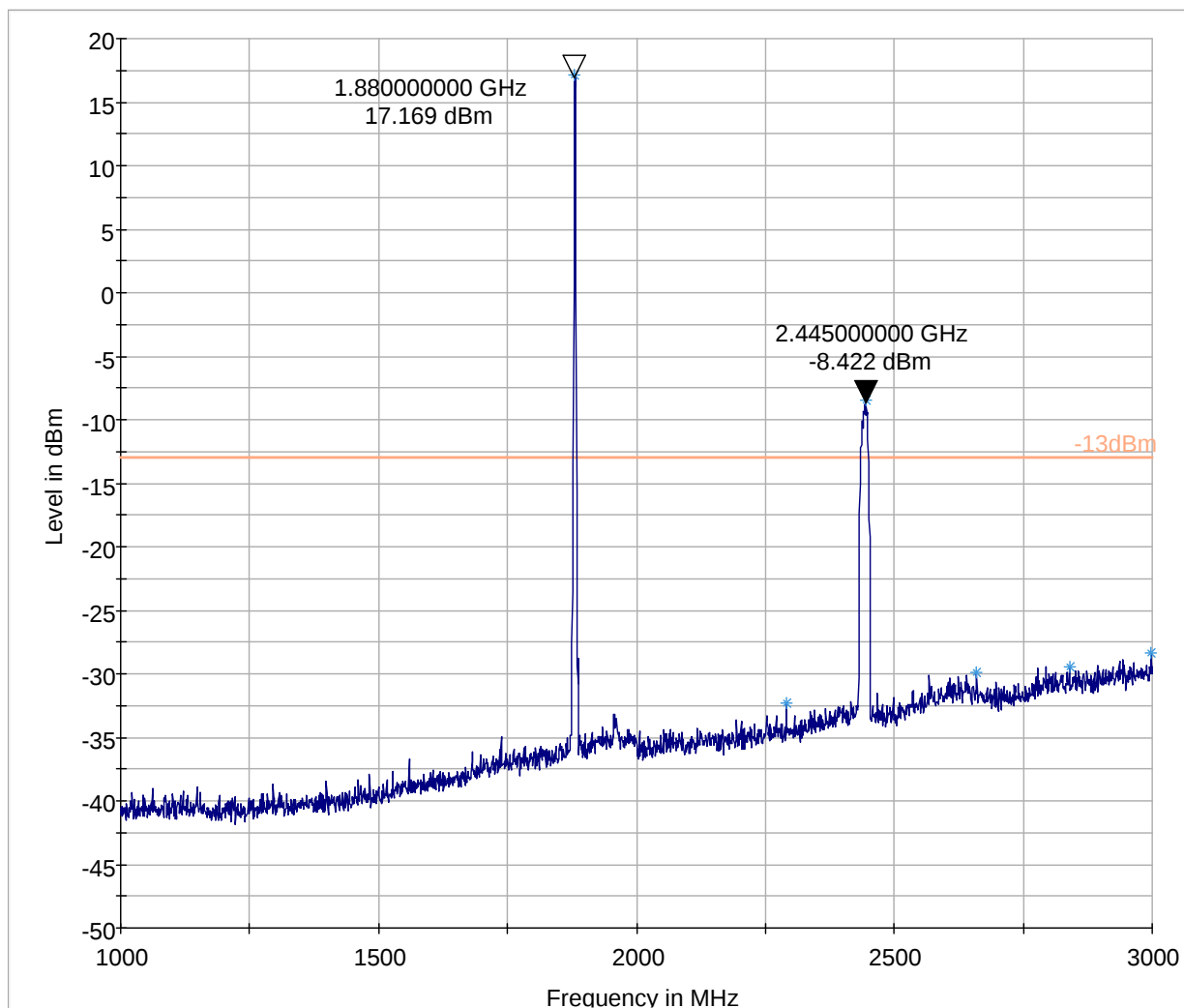
8.5.5 1 - 3 GHz, Ch. Mid (UMTS II) co Tx. with Wi-Fi Tx on mid channel



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

1880 MHz - UMTS Mid channel Tx
 2442 MHz - Wi-Fi Mid channel Tx

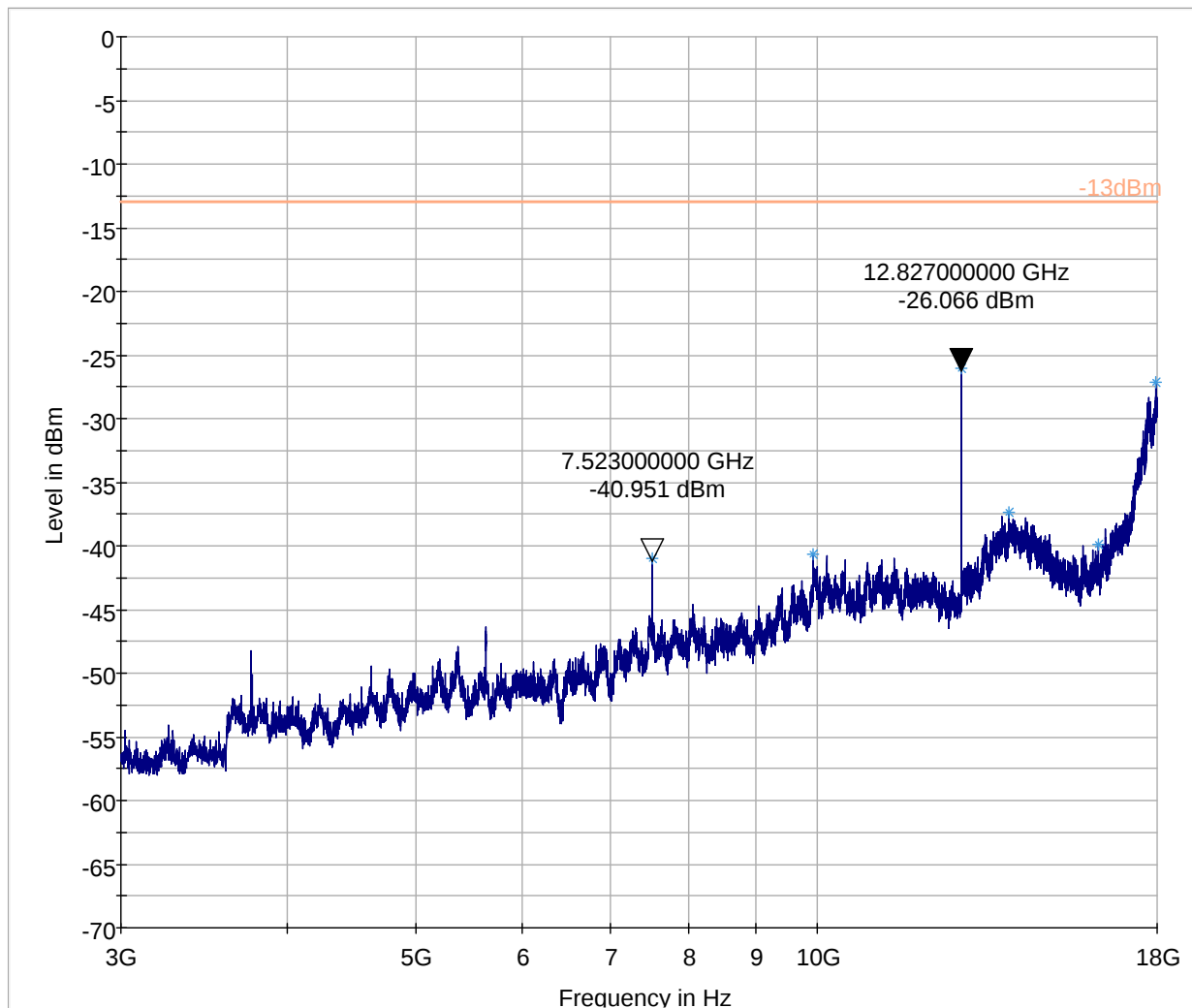
8.5.6 1 - 3 GHz, Ch. Mid (LTE Band 2) co Tx. with Wi-Fi Tx on mid channel



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

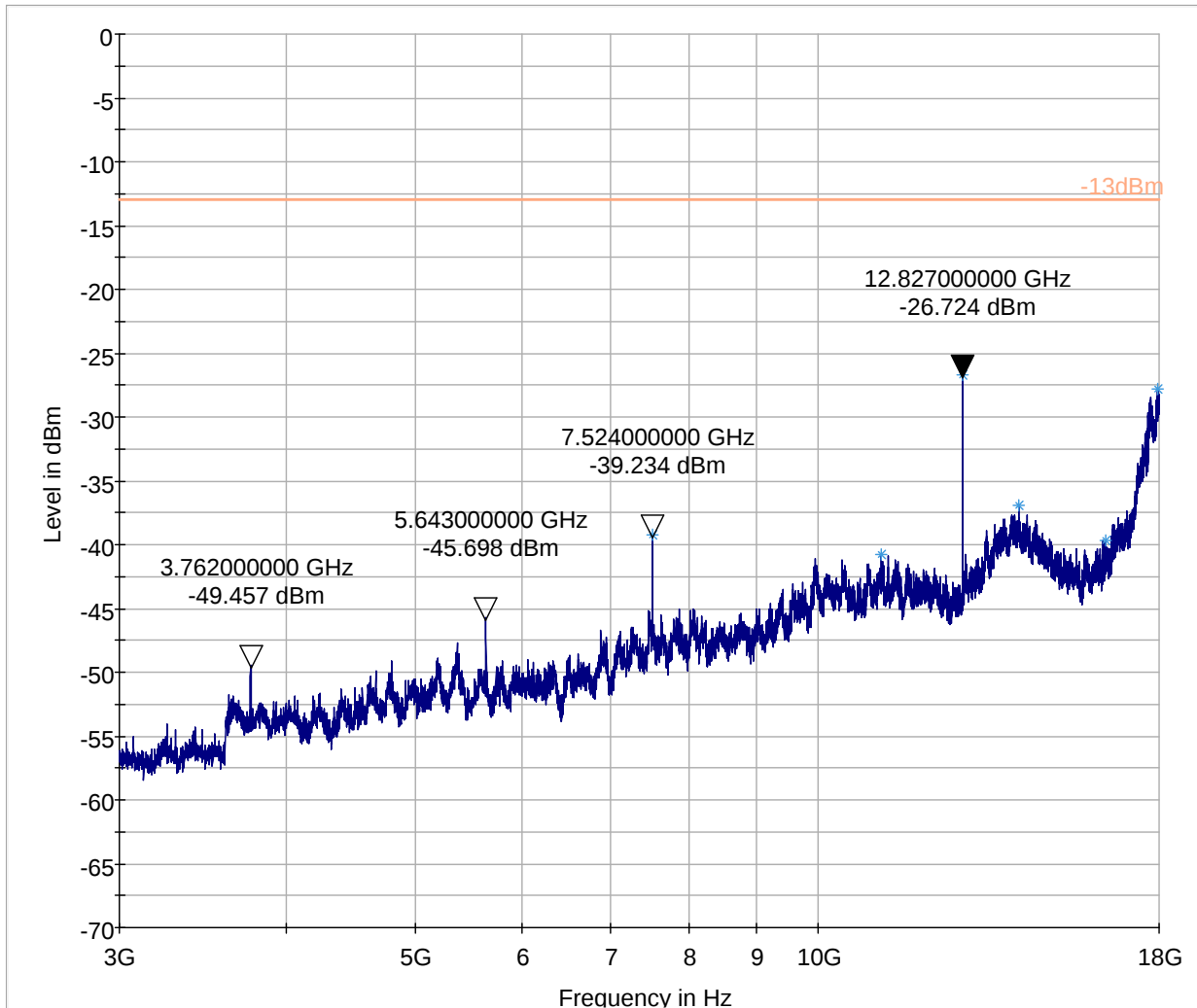
1880 MHz - UMTS Mid channel Tx
2442 MHz - Wi-Fi Mid channel Tx

8.5.7 3 - 18 GHz, Ch. Mid (UMTS II) co Tx. with Wi-Fi Tx on mid channel



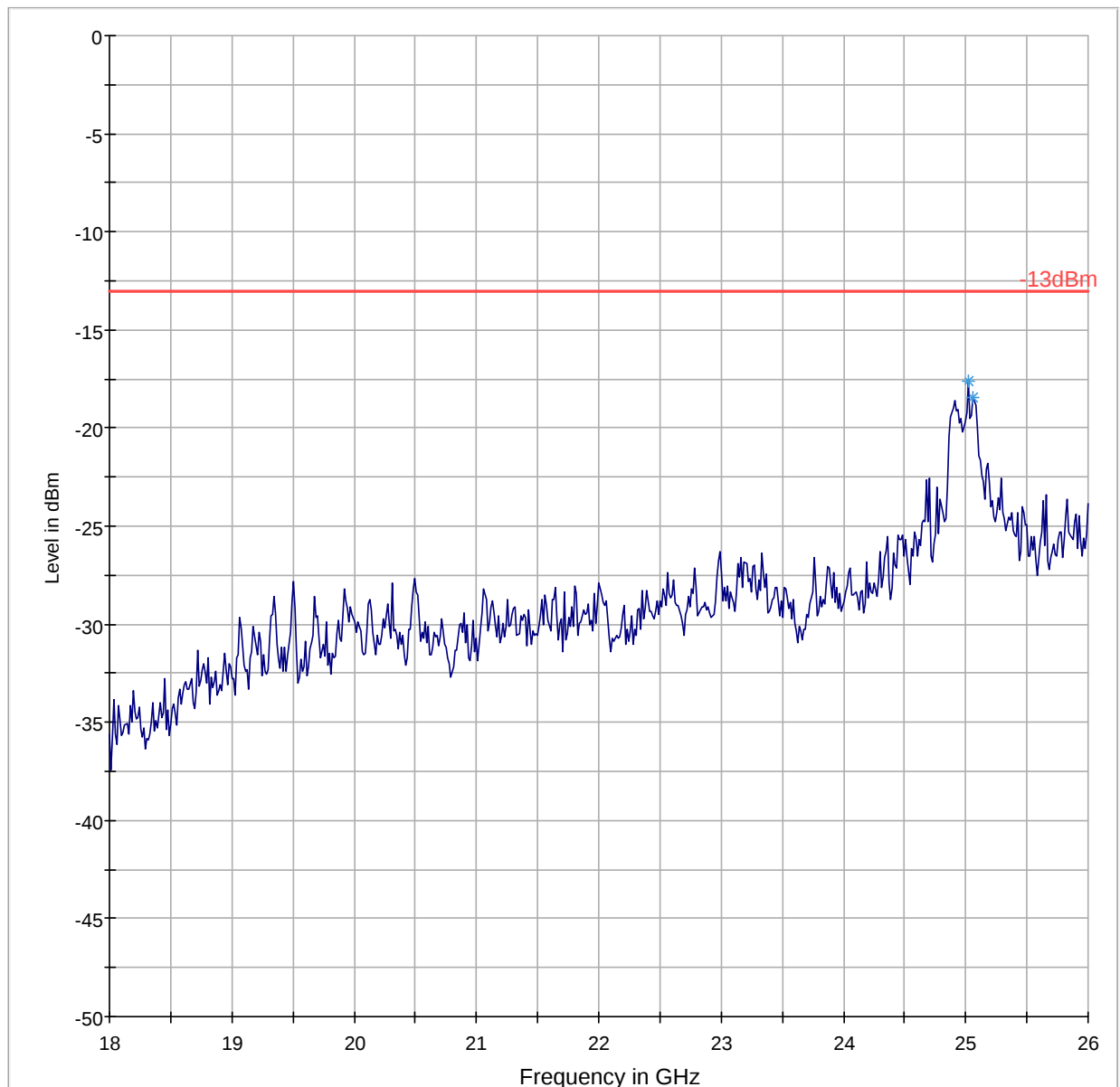
— -13dBm.LimitLine — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+

8.5.8 3 - 18 GHz, Ch. Mid (LTE Band 2) co Tx. with Wi-Fi Tx on mid channel



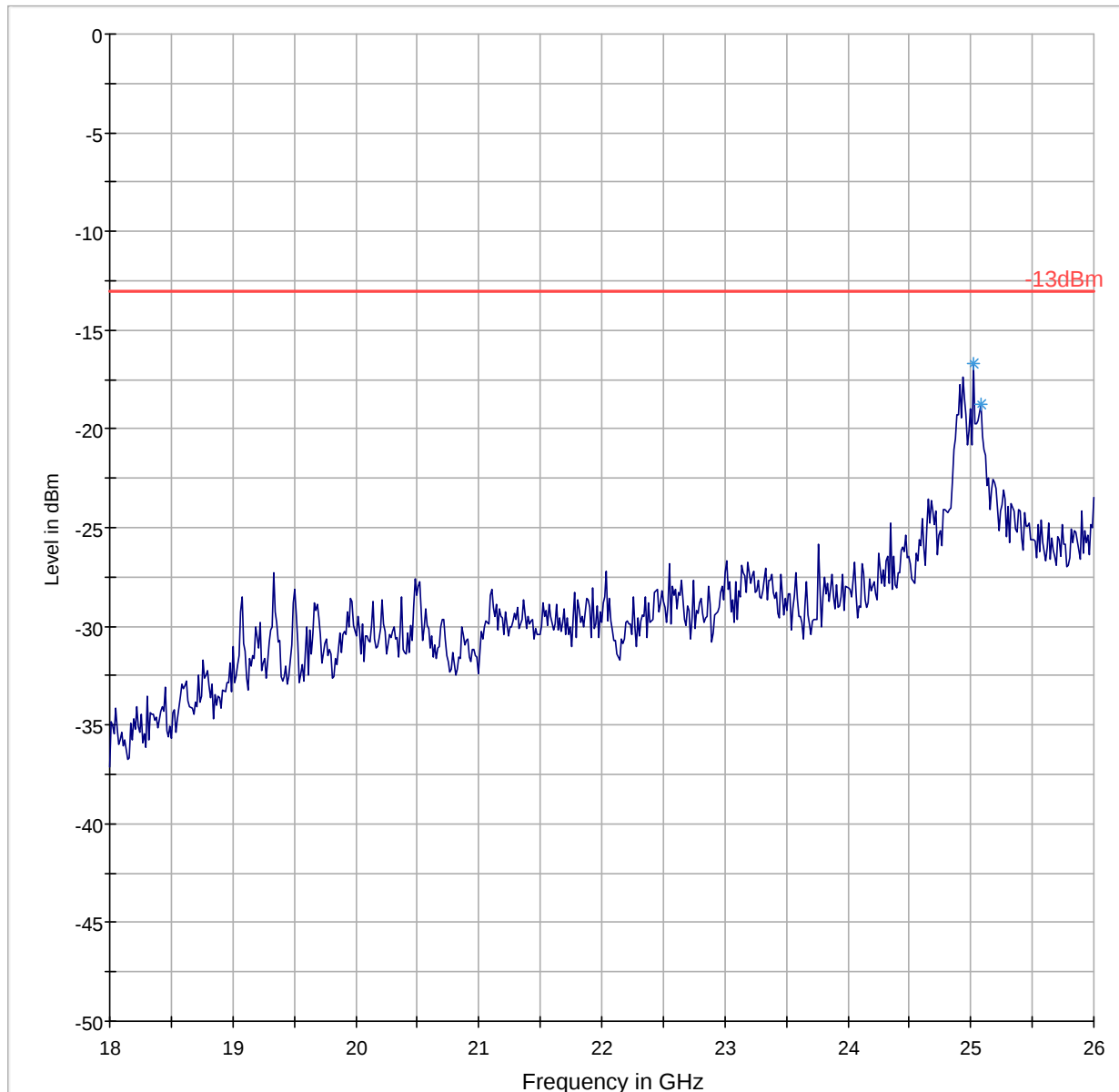
— -13dBm.LimitLine — Preview Result 1-PK+ * Data Reduction Result 1 [3]-PK+

8.5.9 18 - 26 GHz, Ch. Mid (UMTS II) co Tx. with Wi-Fi Tx on mid channel



— -13dBm — Preview Result 1-PK+ * Data Reduction Result 1 [4]-PK+

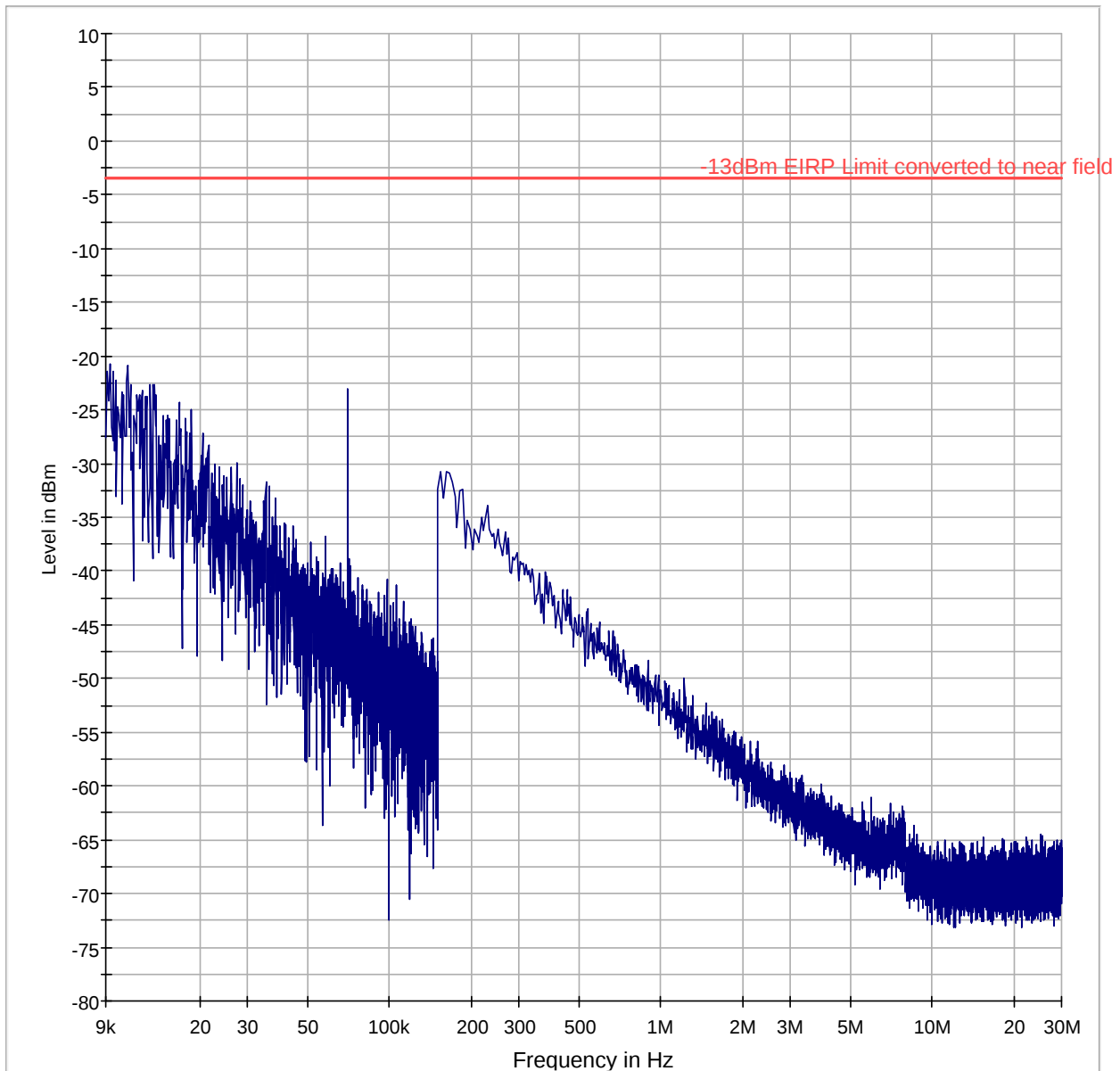
8.5.10 18 - 26 GHz, Ch. Mid (LTE Band 2) co Tx. with Wi-Fi Tx on mid channel



— -13dBm — Preview Result 1-PK+ * Data Reduction Result 1 [4]-PK+

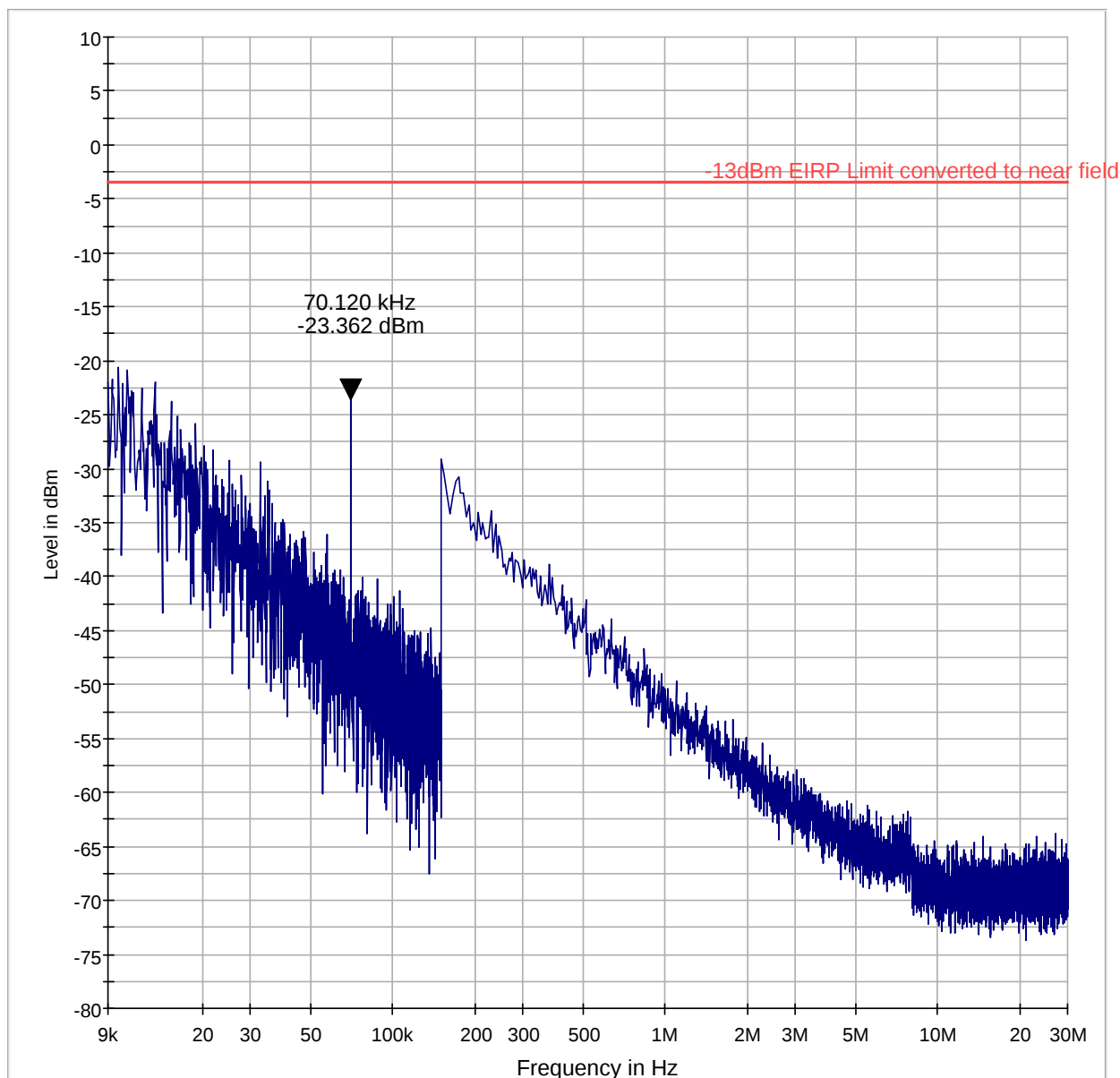
8.6 Measurement Plots UMTS/LTE co. Tx with Wi-Fi on mid channel

8.6.1 9 kHz – 30 MHz, Ch. Mid (LTE Band 4) co Tx. with Wi-Fi Tx on mid channel



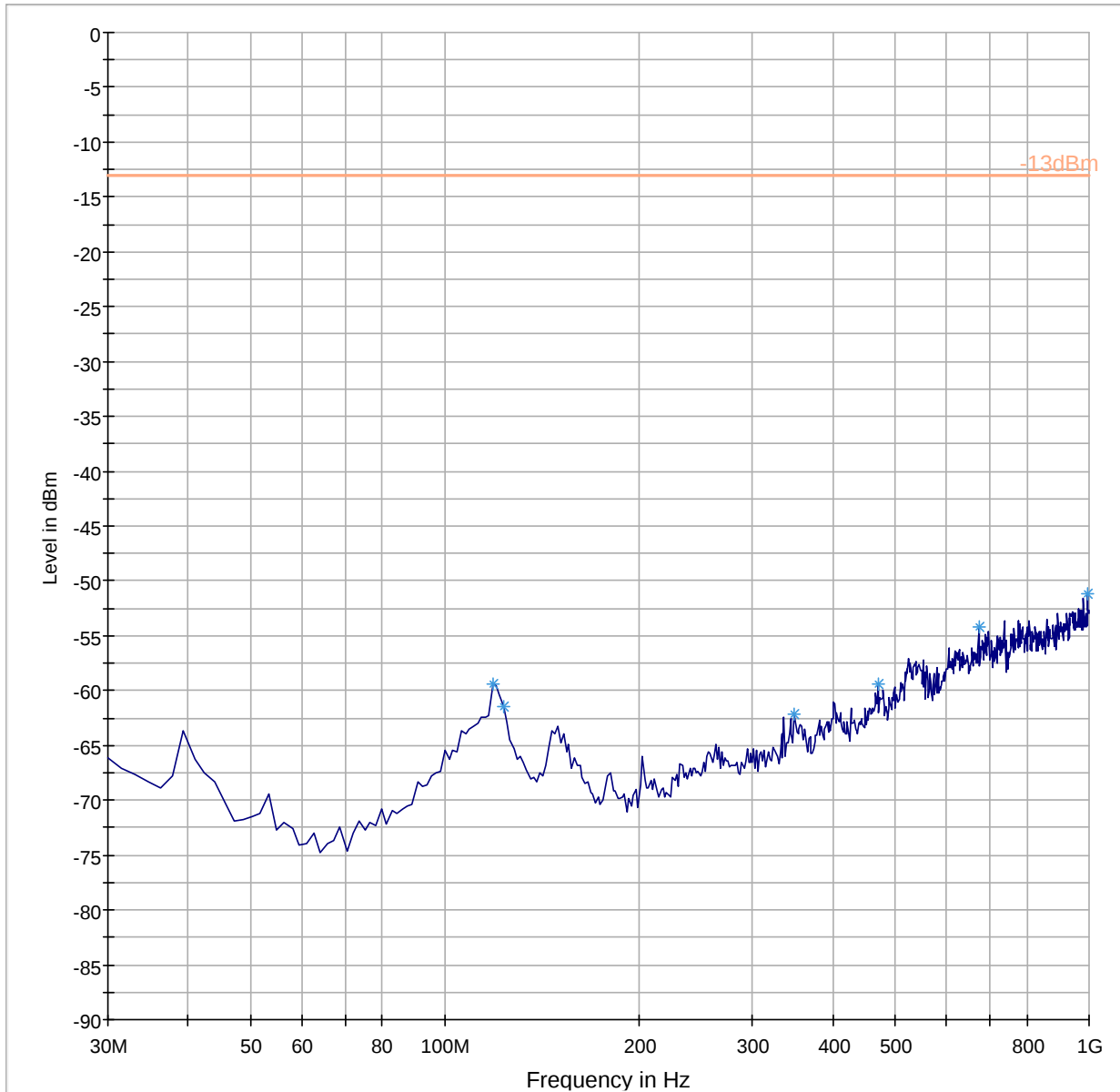
— -13dBm EIRP Limit converted to near field — Preview Result 1-PK+

8.6.2 9 kHz – 30 MHz, Ch. Mid (LTE Band 12) co Tx. with Wi-Fi Tx on mid channel



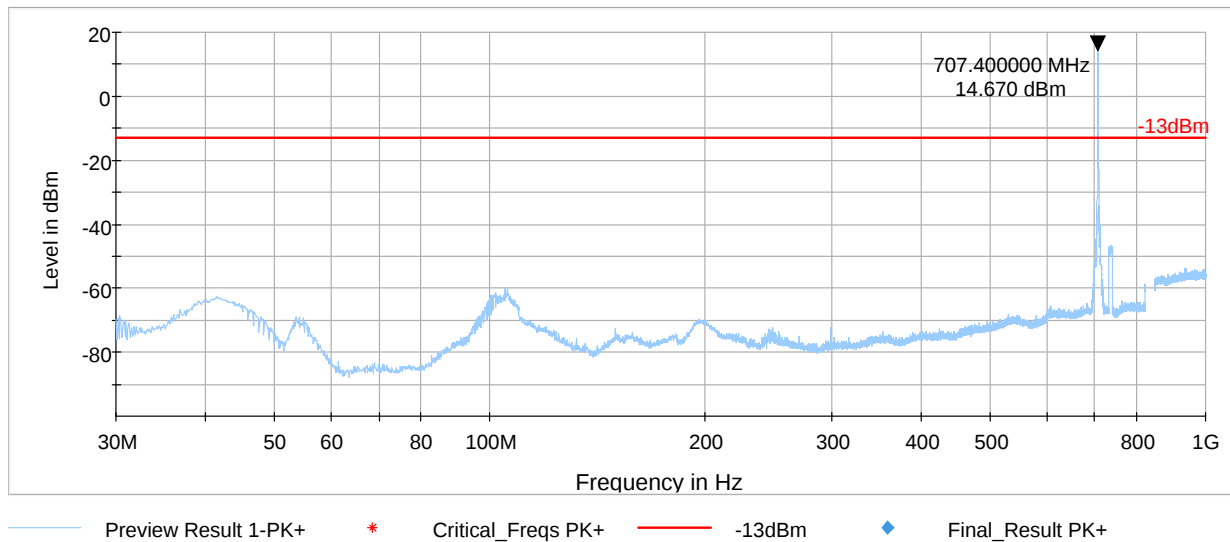
— -13dBm EIRP Limit converted to near field — Preview Result 1-PK+

8.6.3 30 MHz – 1000 MHz, Ch. Mid (LTE Band 4) co Tx. with Wi-Fi Tx on mid channel

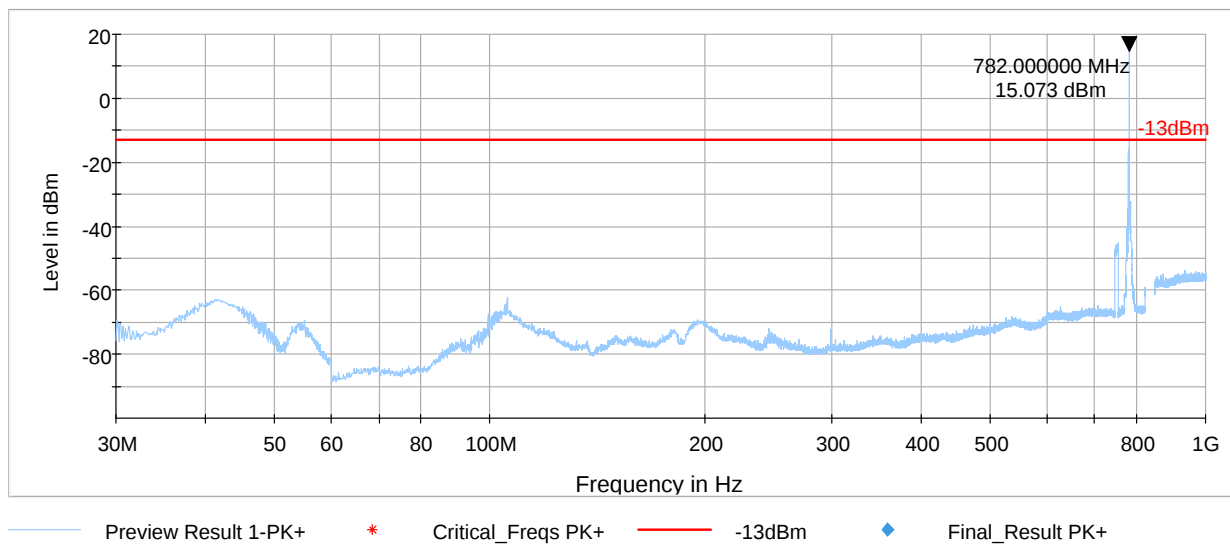


— -13dBm.LimitLine — Preview Result 1-PK+ * Data Reduction Result 1 [1]-PK+

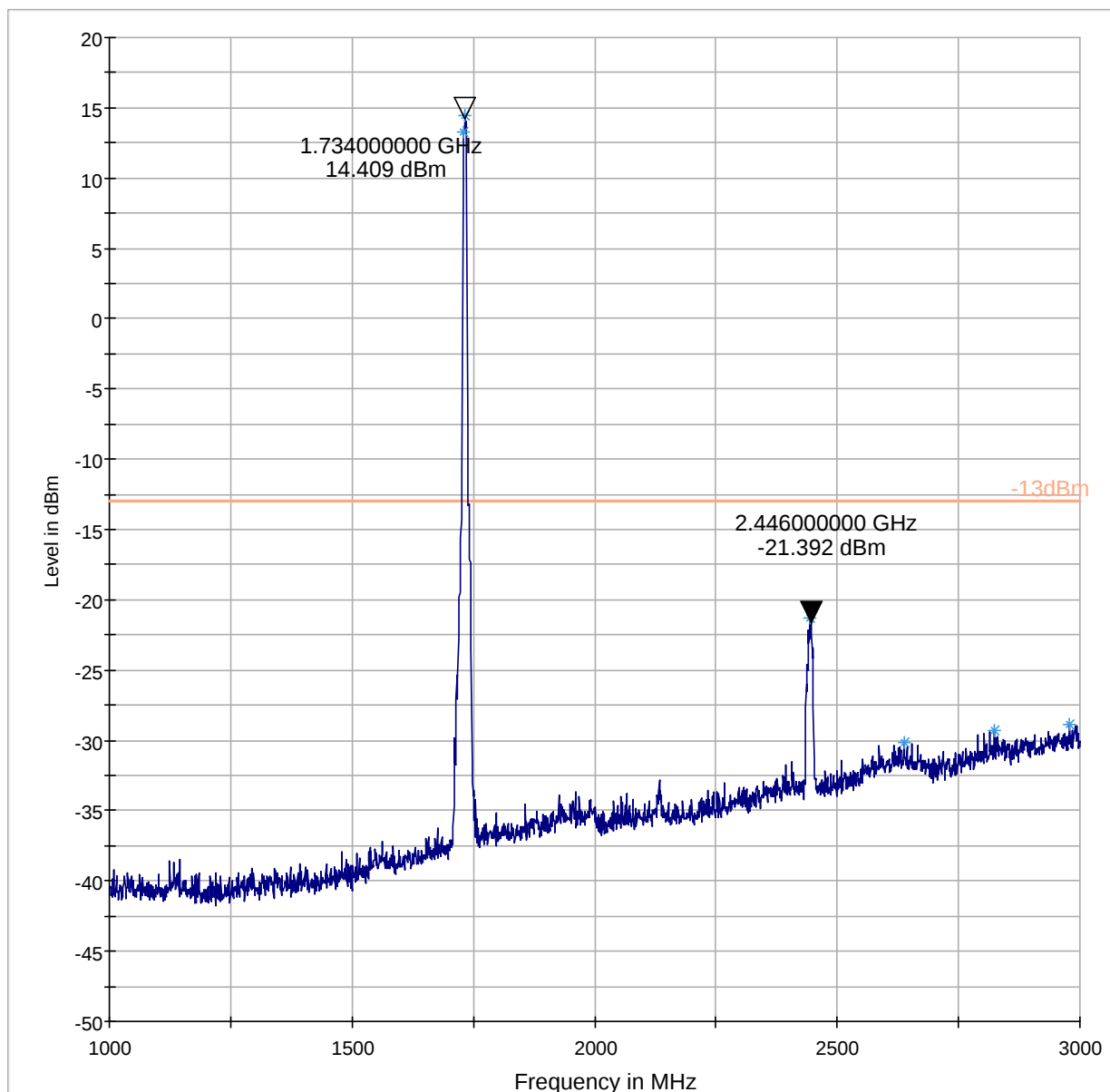
8.6.4 30 MHz – 1000 MHz, Ch. Mid (LTE Band 12) co Tx. with Wi-Fi Tx on mid channel



8.6.5 30 MHz – 1000 MHz, Ch. Mid (LTE Band 13) co Tx. with Wi-Fi Tx on mid channel

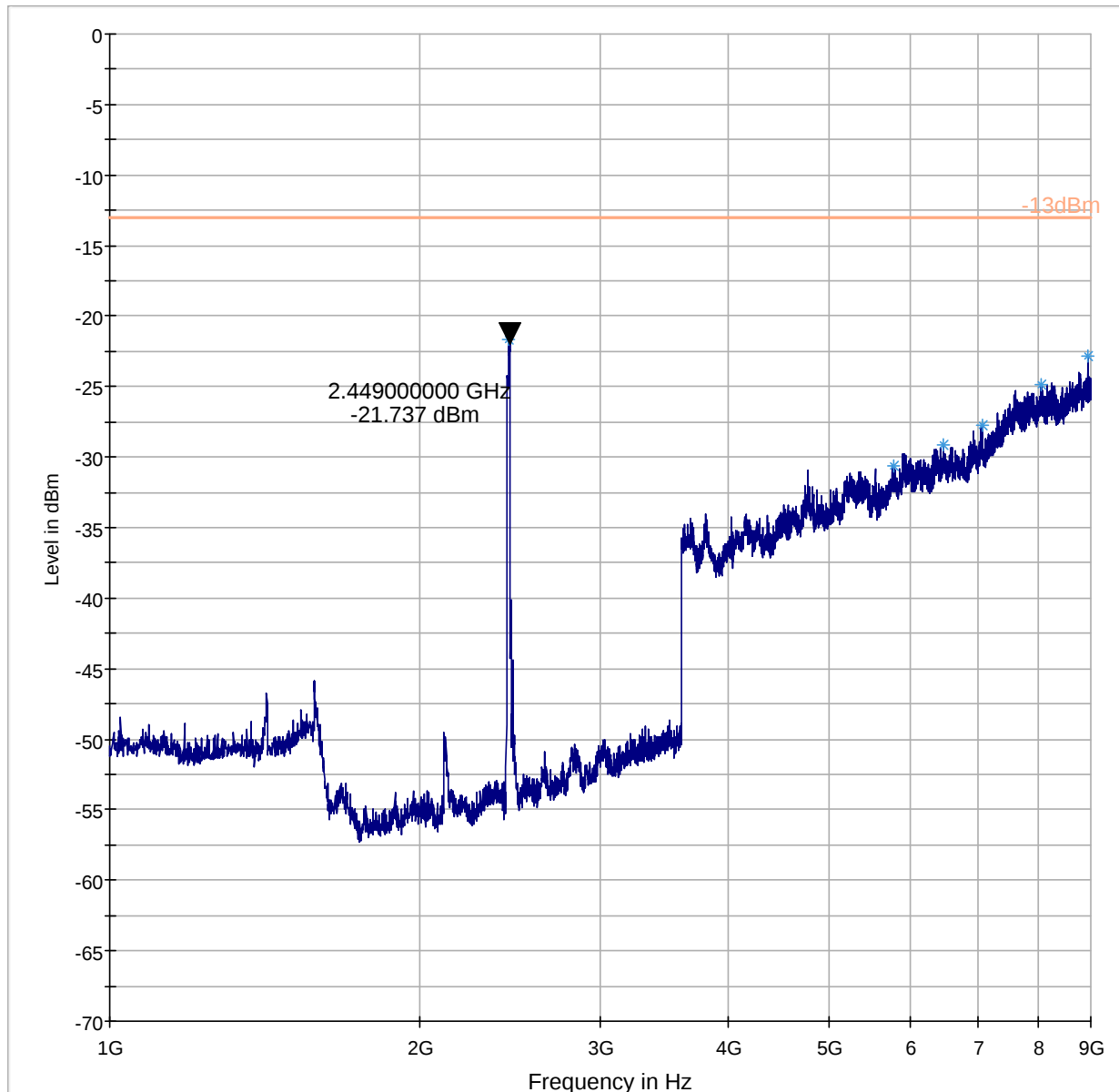


8.6.6 1 – 3 GHz, Ch. Mid (LTE Band 4) co Tx. with Wi-Fi Tx on mid channel



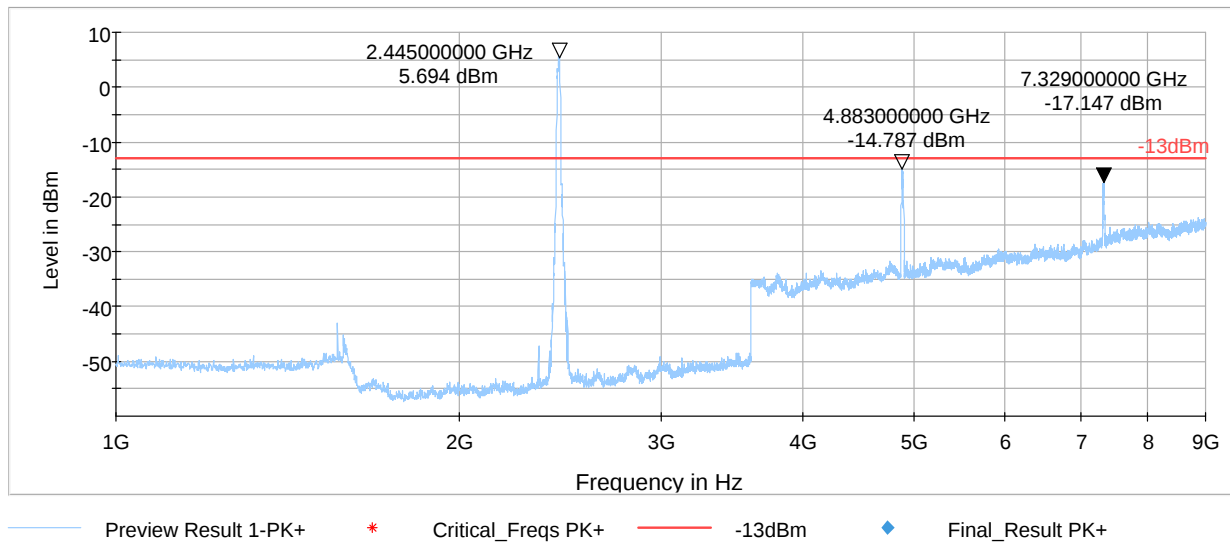
— -13dBm.LimitLine — Preview Result 1-PK+ * Data Reduction Result 1 [2]-PK+

8.6.7 1 – 9 GHz, Ch. Mid (LTE Band 12) co Tx. with Wi-Fi Tx on mid channel

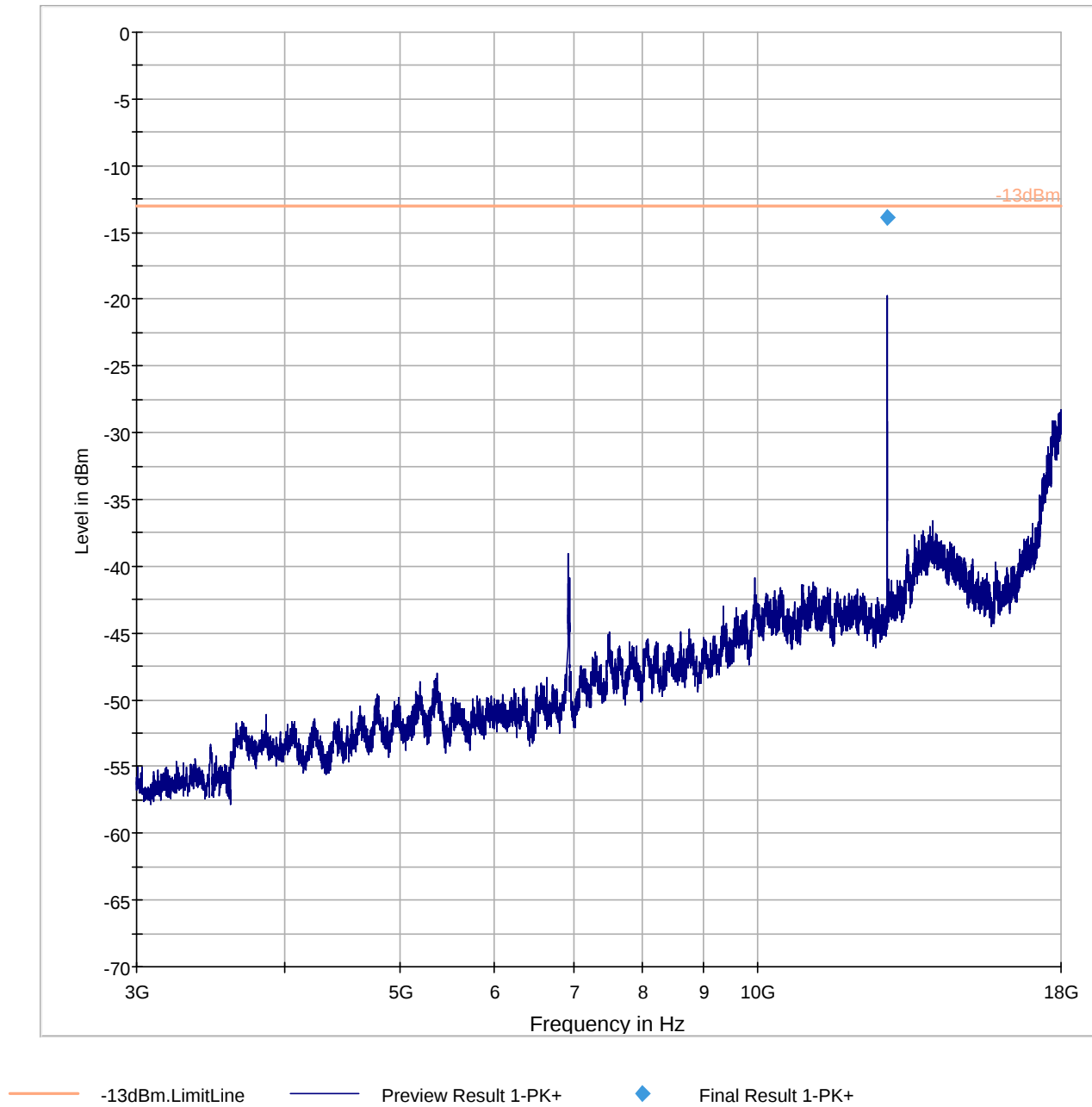


— -13dBm — Preview Result 1-PK+ * Data Reduction Result 1 [2]-PK+

8.6.8 1 – 9 GHz, Ch. Mid (LTE Band 13) co Tx. with Wi-Fi Tx on mid channel

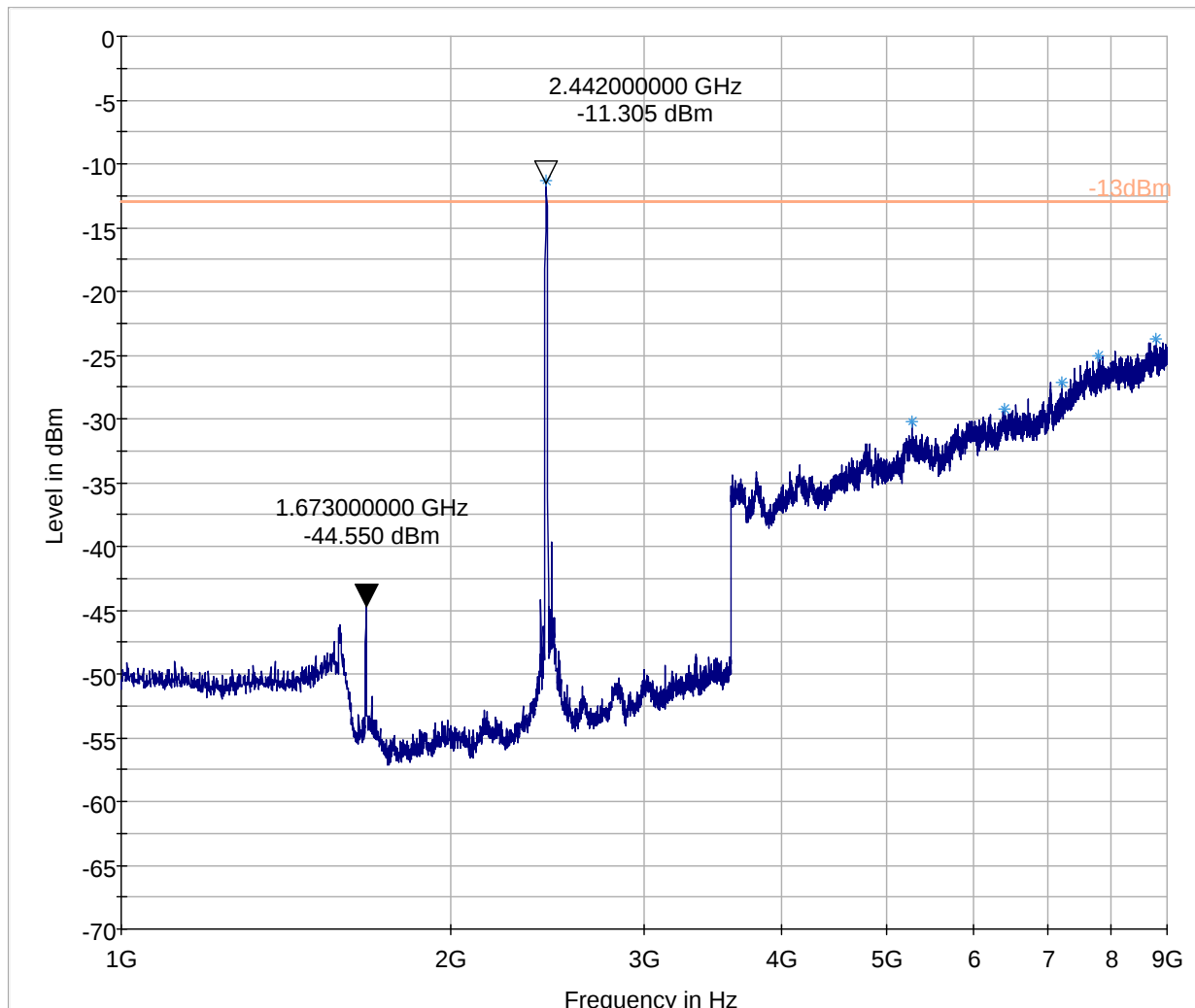


8.6.9 3 – 18 GHz, Ch. Mid (LTE Band 4) co Tx. with Wi-Fi Tx on mid channel



8.7 Measurement Plots LTE Band 5

8.7.1 1 GHz - 9 GHz, Ch. Mid (LTE Band 5) co Tx. with Wi-Fi Tx on mid channel



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

9 Test Setup Photos

Setup photos are included in supporting file name: "EMC_GARMIN-047-17001_TestSetupPhotos.pdf"

10 Test Equipment And Ancillaries Used For Testing

Item Name	Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
Antenna Biconilog 3142E	BiconiLog Antenna	EMCO	3142E	166067	3 years	6/27/2017
Magnetic Loop Antenna	Loop Antenna	ETS Lindgren	6512	0004983 8	3 years	7/28/2017
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
Digital Barometer, Temperature, Humidity	Compact Digital Barometer	Control Company	35519-055	9111954 7	1 Years	06/08/2017
FSU26	Spectrum Analyzer	R&S	FSU26	200256	2 years	07/04/2017
LISN	Line Impedance Stabilization Network	FCC	FCC-LISN-50-25-2-08	8014	1 Year	11/10/2016

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.

11 Revision History

Date	Report Name	Changes to report	Report prepared by
2017-10-31	EMC-GARMIN-047-17001-FCC-22-24-27	Initial Report	Elijah Garcia
2017-11-03	EMC-GARMIN-047-17001-FCC-22-24-27_Rev1	Correcting the customer info	Elijah Garcia