



FCC Test Report

FOR:

Respironics, Inc.

Model Name:

1116426

Product Description:

Bluetooth Module

FCC ID: THO1116426

Per:

47 CFR: Part 22, Part 24, Part 27

Report #: EMC-PHIL4-035-17001-FCC-22-24-27

Date: June 26, 2017



CETECOM Inc.

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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 #
Respironics Inc.	Bluetooth Module	1116426

Specifically this report shows that the product fulfills the radiated emission requirements when operating in co-transmission mode when plugged into a common host together with the following radio modules.

Company Name	Product Description	Model #
Respironics Inc.	Philips DreamStation Modem Accessory	200601C, 200602C

Responsible for Testing Laboratory:

June 26, 2017	Compliance	Peter Nevermann (Director RC&E)	CETECOMCA1 \\PNevermann 2017.09.01 17:53:26 -07'00'
Date	Section	Name	Signature

Responsible for the Report:

June 26, 2017	Compliance	Elijah Garcia (EMC Engineer)	Elijah Garcia Digitally signed by Elijah Garcia DN: cn=Elijah Garcia, o=Cetecom Inc., ou=RC&E, email=elijah.garcia@cetecom.com, c=US Date: 2017.08.25 17:58:42 -07'00'
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:	Peter Nevermann
Project Engineer:	Michael Lin

2.2 Identification of the Client

Applicant's Name:	Jerry Shore
Street Address:	1740 Golden Mile Highway
City/Zip Code	Monroeville, PA 15146
Country	USA

2.3 Identification of the Manufacturer

Manufacturer's Name:	Respironics Inc.
Manufacturers Address:	1010 Murry Ridge Lane
City/Zip Code	Murrysville, PA 15668
Country	USA

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model #:	1116426
HW Version:	Rev 0
SW Version:	v1.0.30
FCC-ID:	THO1116426
IC-ID:	N/A
Product Description	Bluetooth Module
Co-transmitting radio information:	Cinterion EHS5 FCC ID: QIPEHS5-US
Co-transmitting radio Transceiver Technology / Type(s) of Modulation	WCDMA/UMTS Band II, V GSM / GMSK (GSM) / GMSK (GPRS) / 8PSK (Edge EGPRS)
Co-transmitting radio Operating Frequency Ranges (MHz):	WCDMA/UMTS FDD BAND II: 1852 - 1908 MHz; WCDMA/UMTS FDD BAND V: 826 - 847 MHz; GSM 850: 824 - 849 MHz; GSM 1900: 1850 - 1910 MHz;
Sample Revision	☐ Prototype ☒ Production ☐ Pre-Production

3.2 EUT Sample details

EUT #	Module	Description	Serial Number
1	Cinterion EHS5	Bluetooth Module	1124507J4415000UQ

3.3 Co-transmitting radio sample details

EUT #	Module	Description	Serial Number
2	Cinterion EHS5-US	Cellular Modem	S30960-S2810-A300-1

3.4 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	Serial Number
1	Humidifier	DSXH	Philips Respironics Inc.	HPP10019330E7
2	AC/DC Adapter	MDS-080AAS12 A	Delta Electronics, Inc.	70HW46H00LK
3	CPAP device	700X110	Philips Respironics Inc.	JPP200867FE92

3.5 Test Sample Configuration

Set-up #	EUT / AE used for set-up	Comments
1	EUT 1 & 2 + AE 1, 2, 3	Radiated

4 Measurement

4.1 Date of Testing:

June 21, 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

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

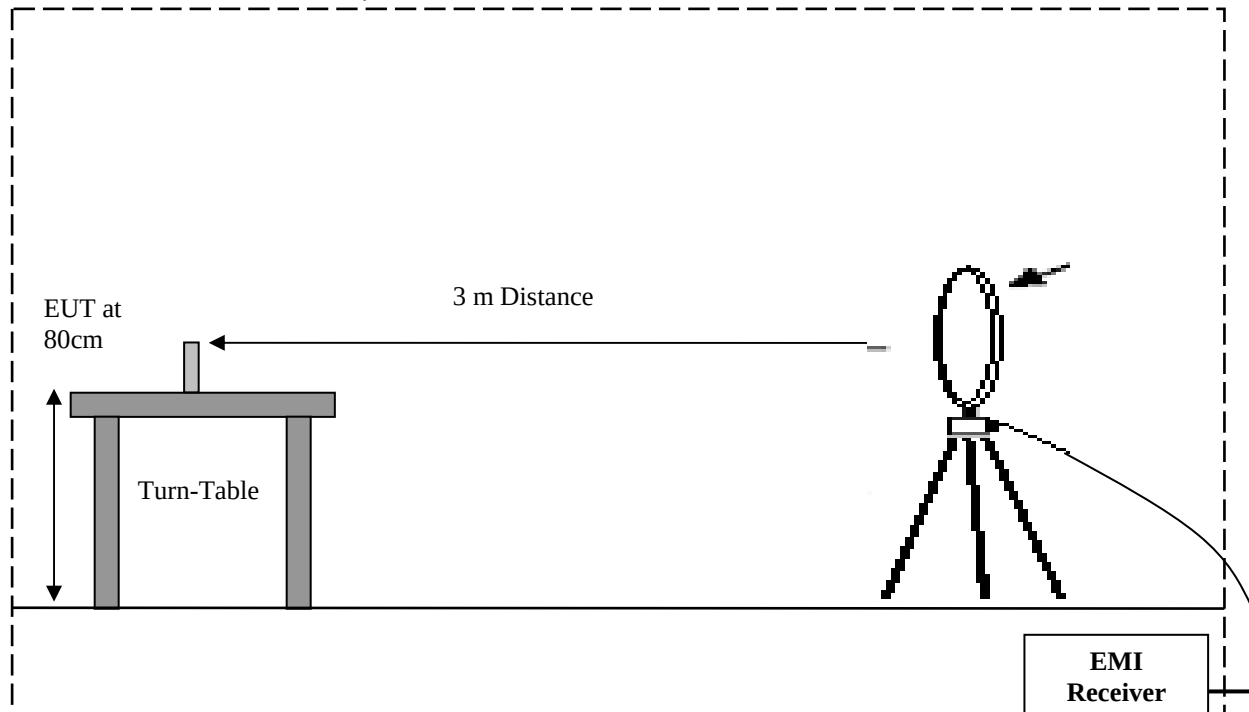
The following environmental conditions were maintained during the course of testing:

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

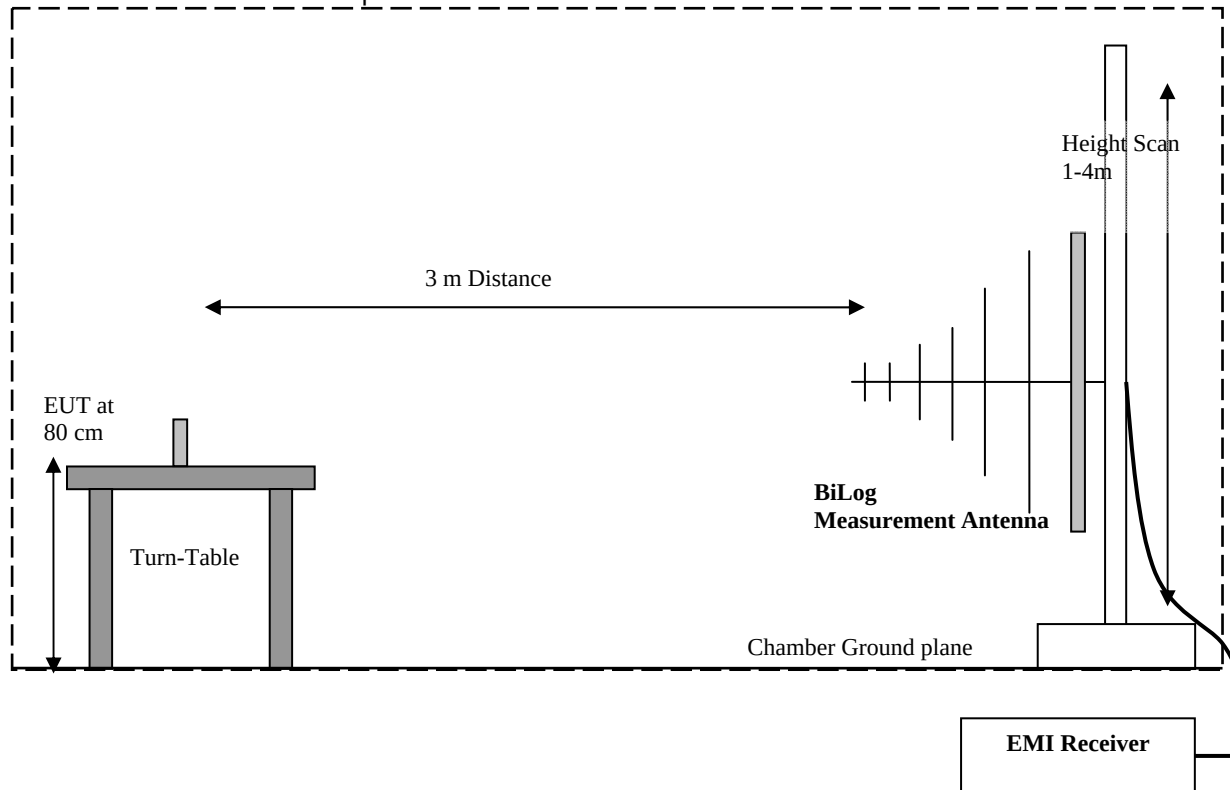
4.4 Radiated Measurement

- 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.

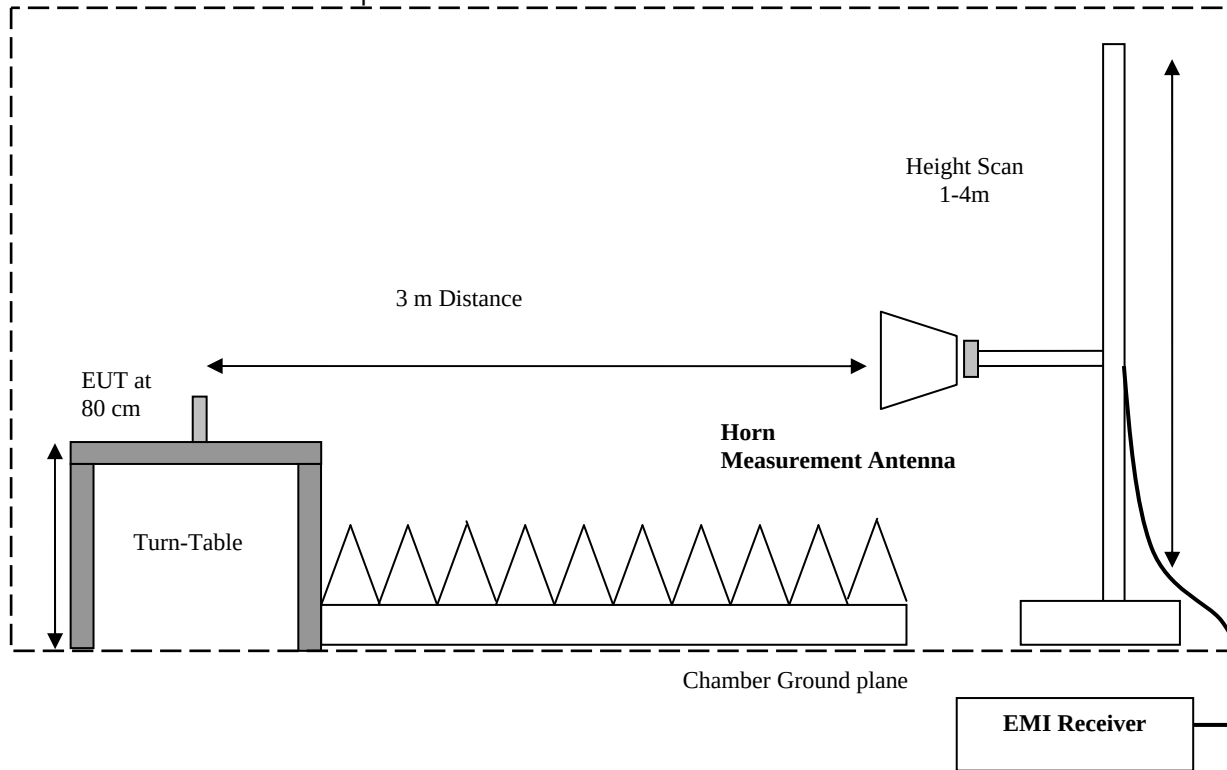
Radiated Emissions Test Setup below 30MHz Measurements



Radiated Emissions Test Setup 30MHz-1GHz Measurements



Radiated Emissions Test Setup above 1GHz Measurements



4.5 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

5 Measurement Results Summary

5.1 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	☐	☐	☐	☒	Complies
§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 simultaneous transmission with BT	☒	☐	☐	☐	Complies

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

Note 2: Leveraged from module certification.

5.2 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	☐	☐	☐	☒	Complies
§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 simultaneous transmission with BT	☒	☐	☐	☐	Complies

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

Note 2: Leveraged from module certification.

6 Radiated Spurious Emissions

6.1 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

6.2 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.

6.2.1 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.

6.2.2 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.

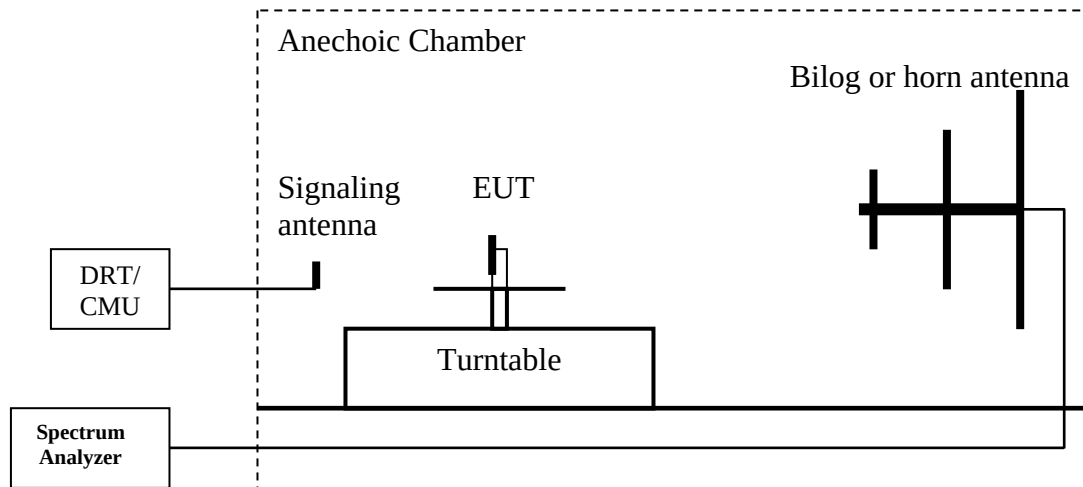
6.2.3 RSS-132 Section 5.5.1.1 and RSS-133 Section 6.5.1

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.

6.3 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). $LOSS = \text{Generator Output Power (dBm)} - \text{Analyzer reading (dBm)}$.
7. Determine the level of spurious emissions using the following equation:

$$\text{Spurious (dBm)} = \text{LVL (dBm)} + \text{LOSS (dB)}$$
8. Repeat steps 4, 5 and 6 with all antennas vertically polarized.
9. Determine the level of spurious emissions using the following equation:

$$\text{Spurious (dBm)} = \text{LVL (dBm)} + \text{LOSS (dB)}$$
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.)

6.3.1 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

6.3.2 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

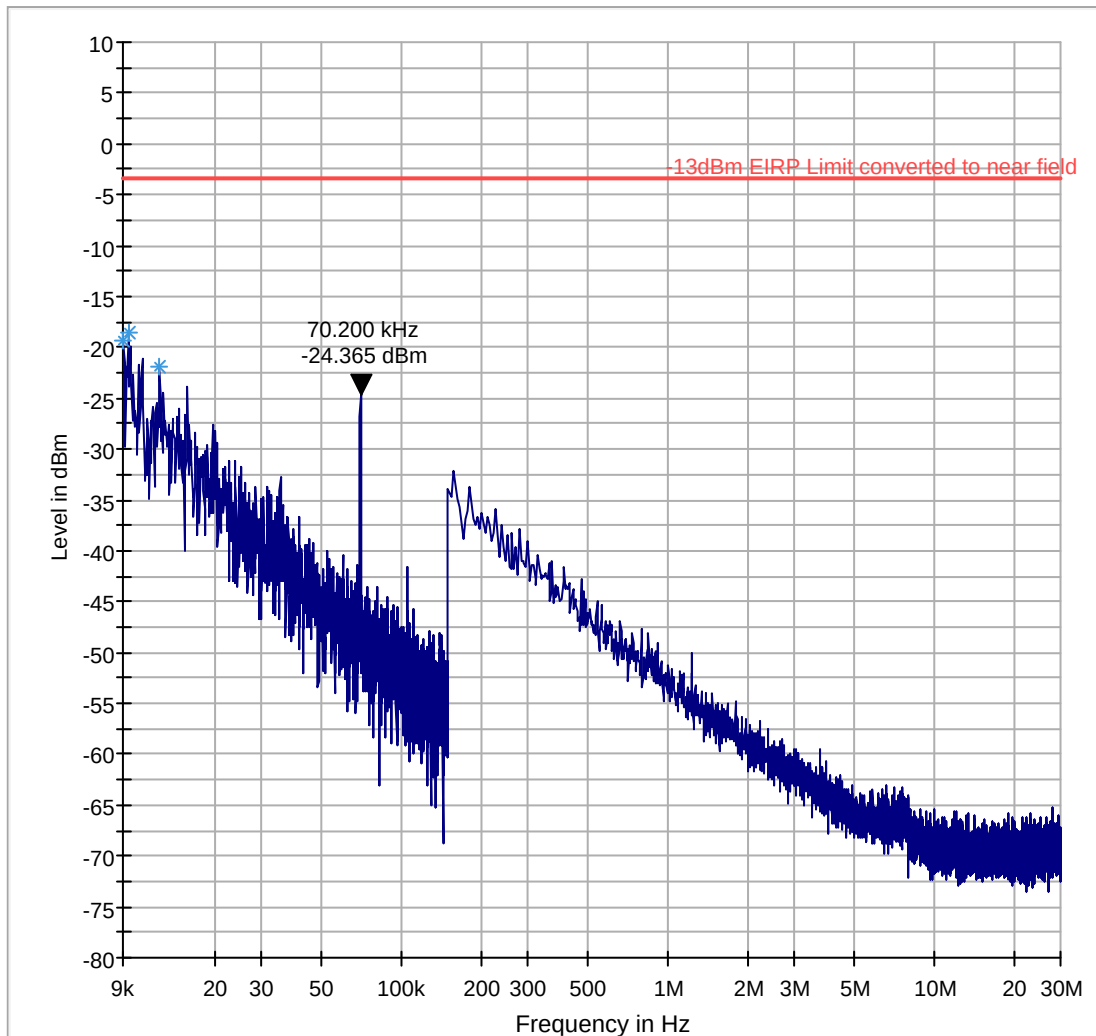
6.4 Summary Measurement result:

Channel	EUT Operating Mode	Scan Frequency	Limit (dBm)	Result	Note
Mid	UMTS FDD II	9 kHz – 26 GHz	-13	Pass	
Mid	UMTS FDD V	9 kHz – 9 GHz	-13	Pass	
Mid	GSM 850	9 kHz – 9 GHz	-13	Pass	
Mid	GSM 1900	9 kHz – 26 GHz	-13	Pass	

6.5 Measurement Plots WCDMA/UMTS FDD II

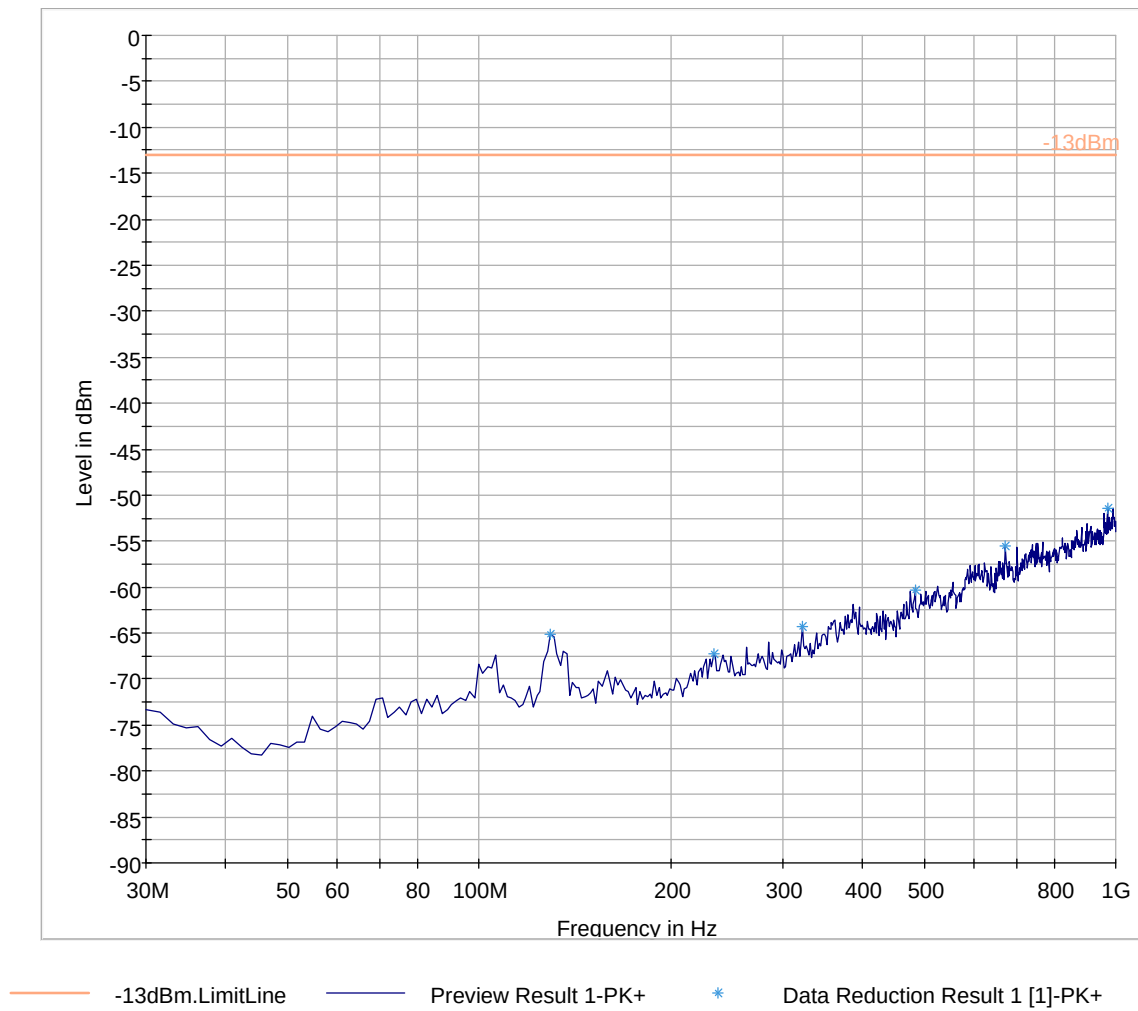
6.5.1 9 kHz - 30 MHz, Ch. Mid

FCC LICENSED 9kHz-30 MHz

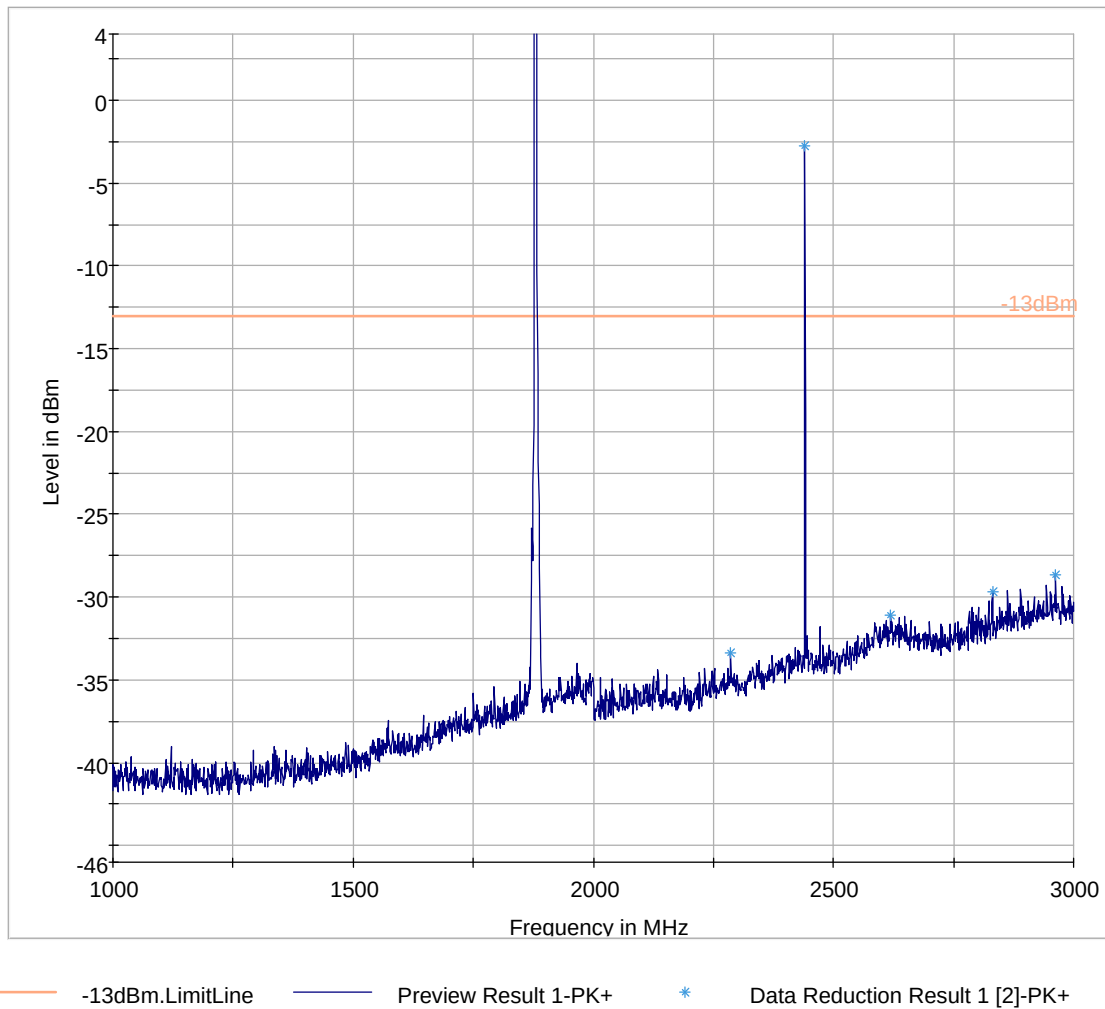


— -13dBm EIRP Limit converted to near field — Preview Result 1-PK+
* Data Reduction Result 1 [1]-PK+

6.5.2 30 MHz - 1000 MHz, Ch. Mid

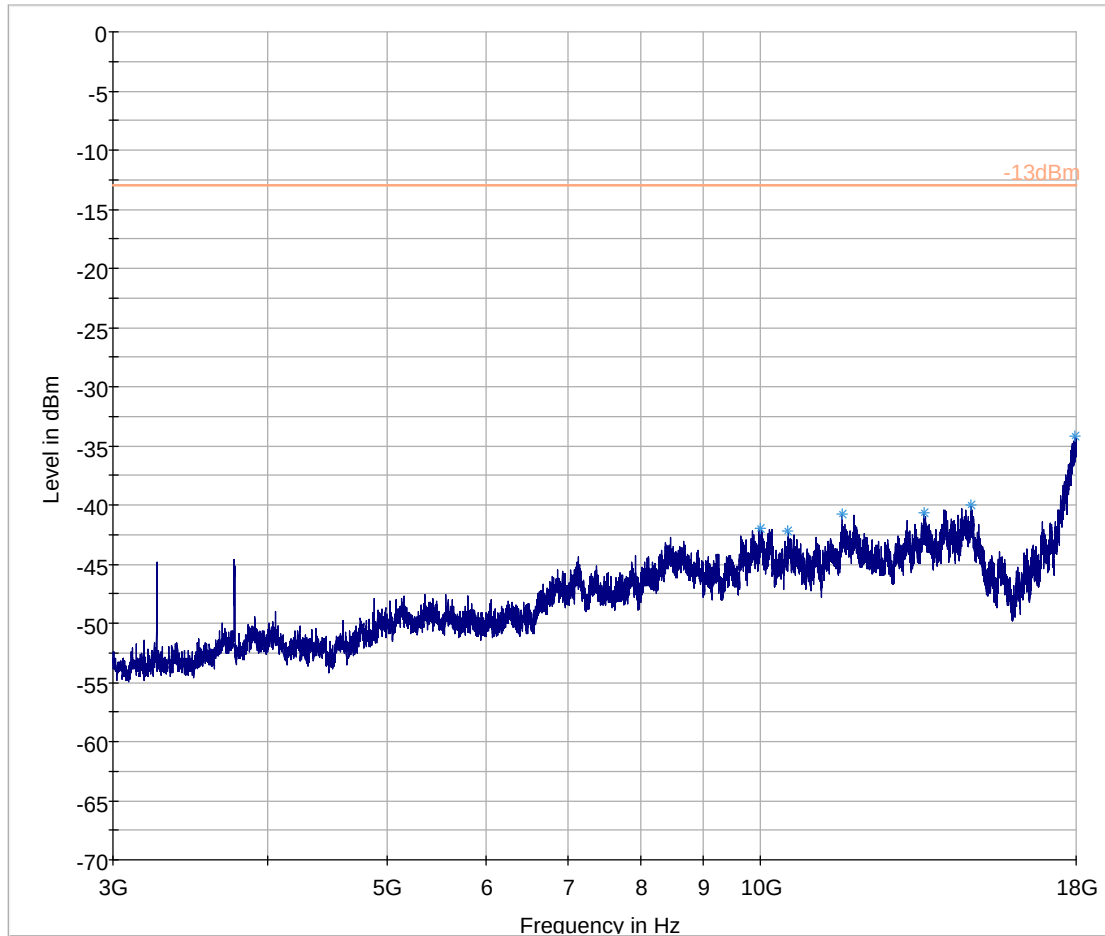


6.5.3 1 - 3 GHz, Ch. Mid



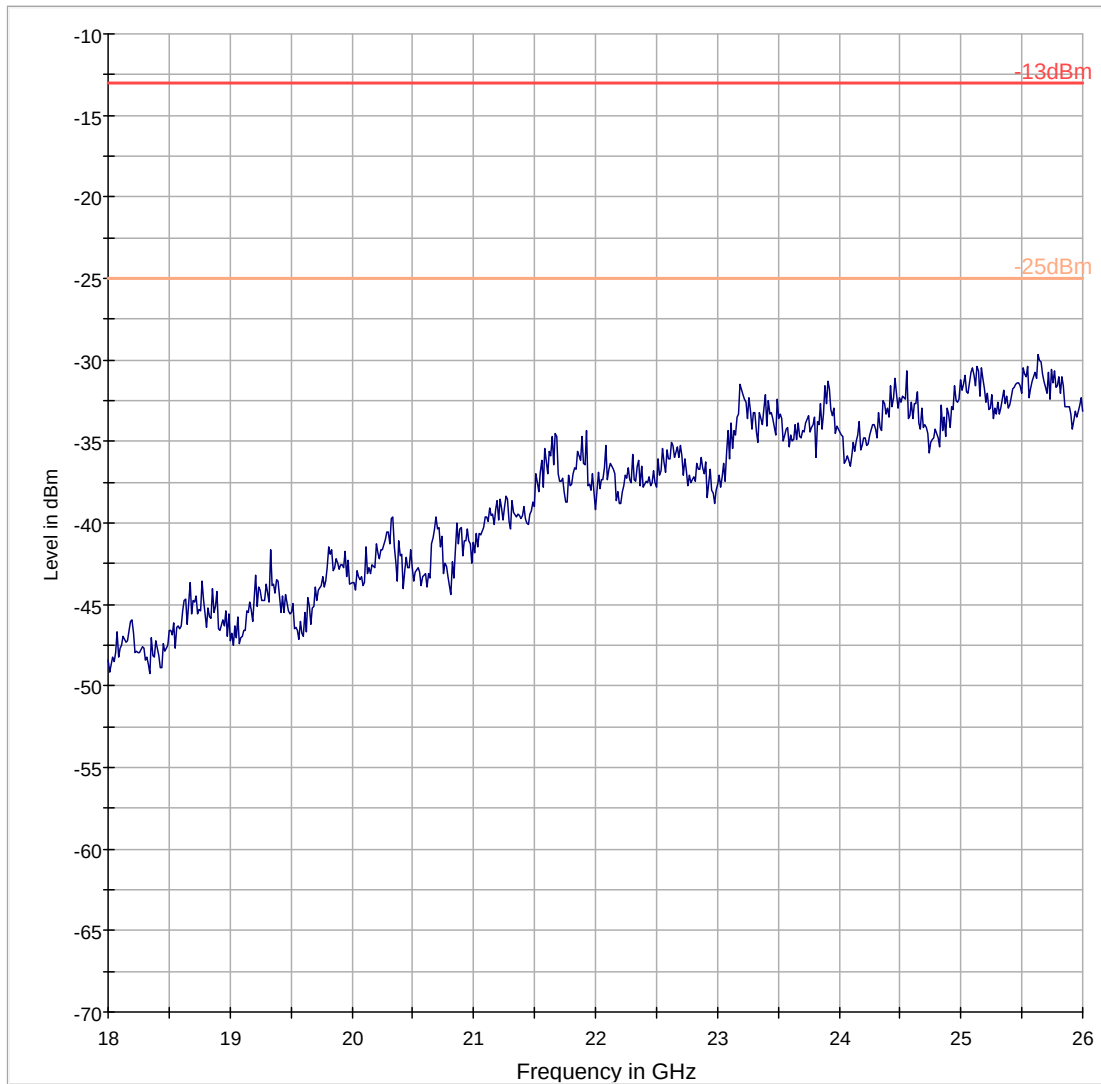
Note: The emissions exceeding the limit line are the intentional emissions of the co-transmitting radios.
1880 MHz - UMTS Mid channel Tx
2441 MHz - Bluetooth Mid channel Tx

6.5.4 3 - 18 GHz, Ch. Mid



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

6.5.5 18 - 26 GHz, Ch. Mid

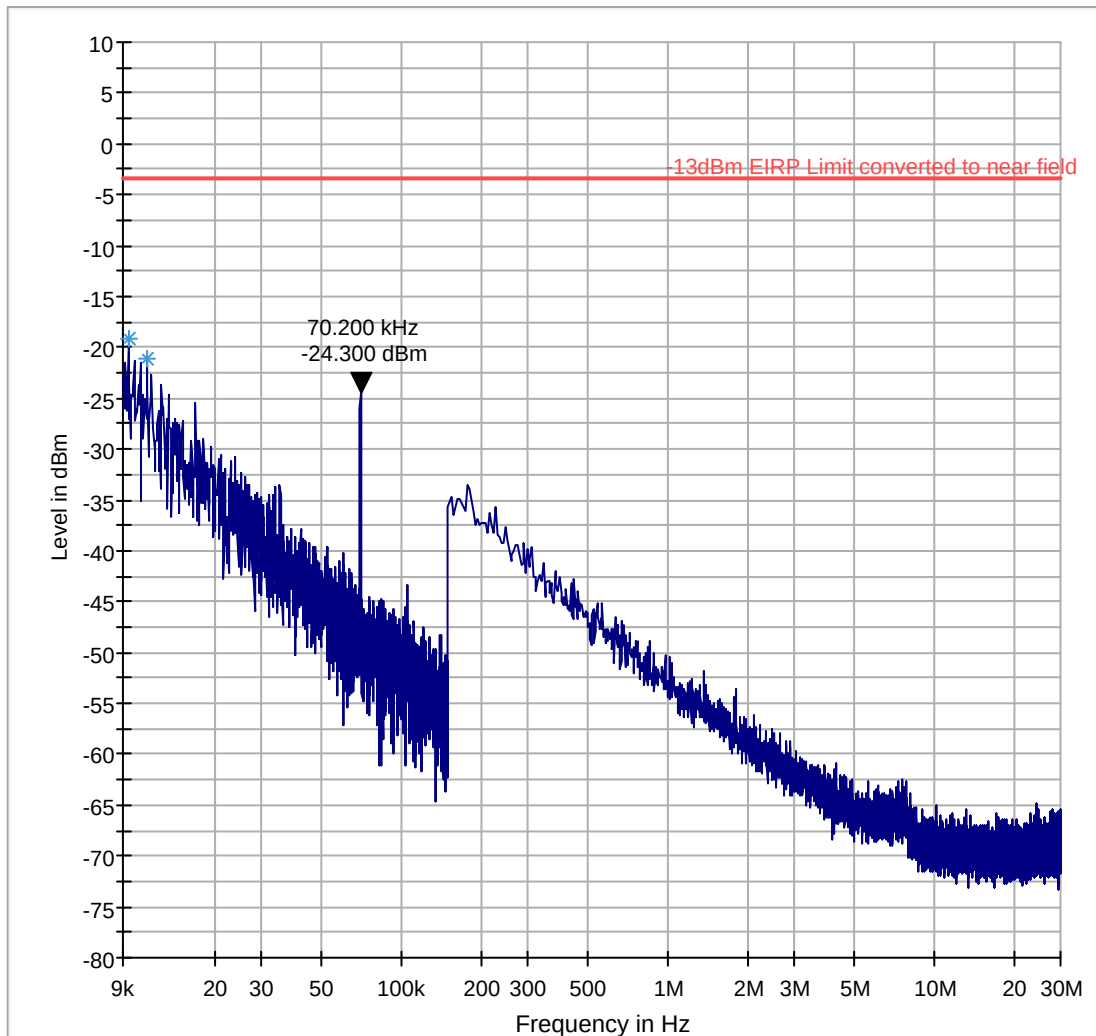


— -13dBm — -25dBm.LimitLine — Preview Result 1-PK+

6.6 Measurement Plots WCDMA/UMTS FDD V:

6.6.1 9 kHz – 30 MHz, Ch. Mid

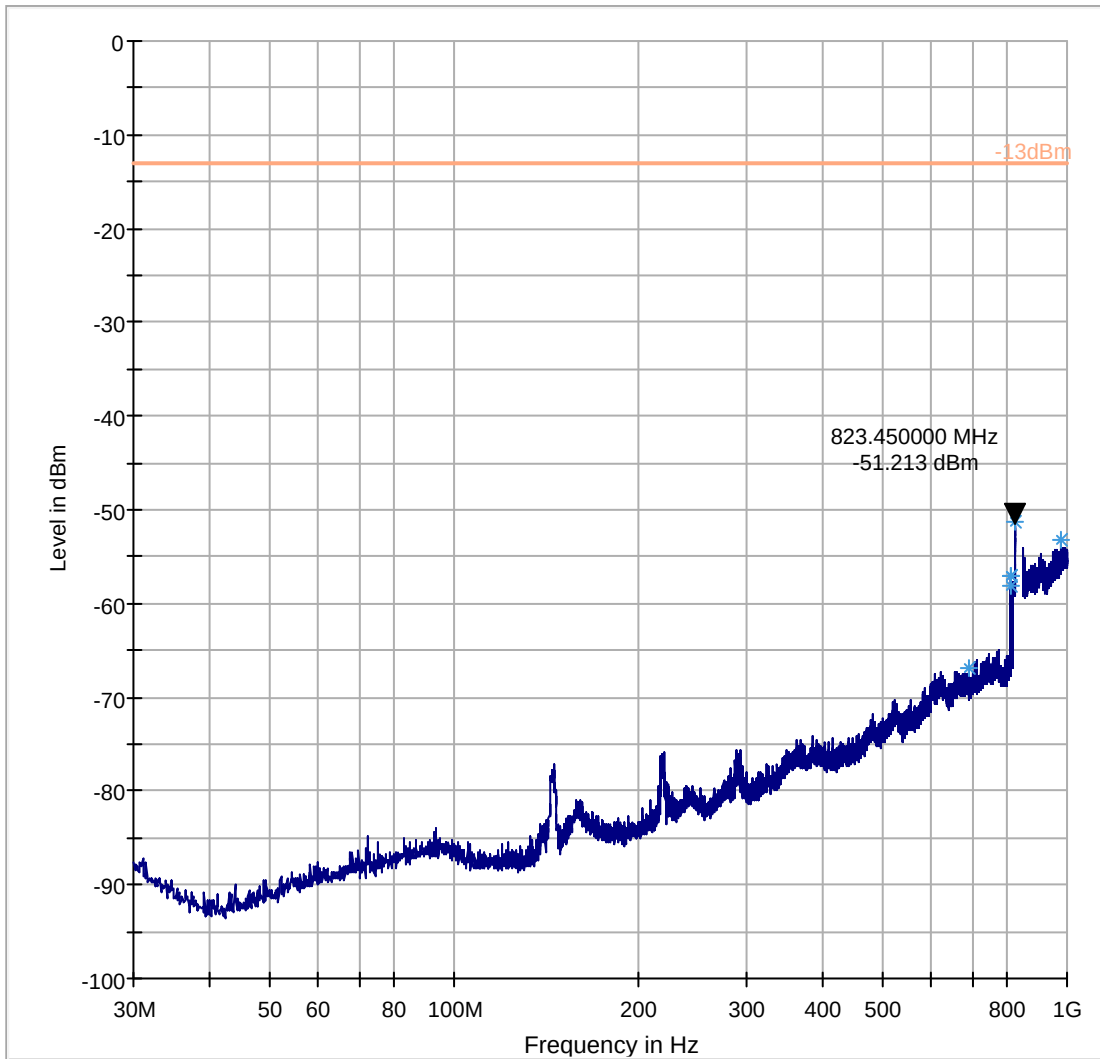
FCC LICENSED 9kHz-30 MHz



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

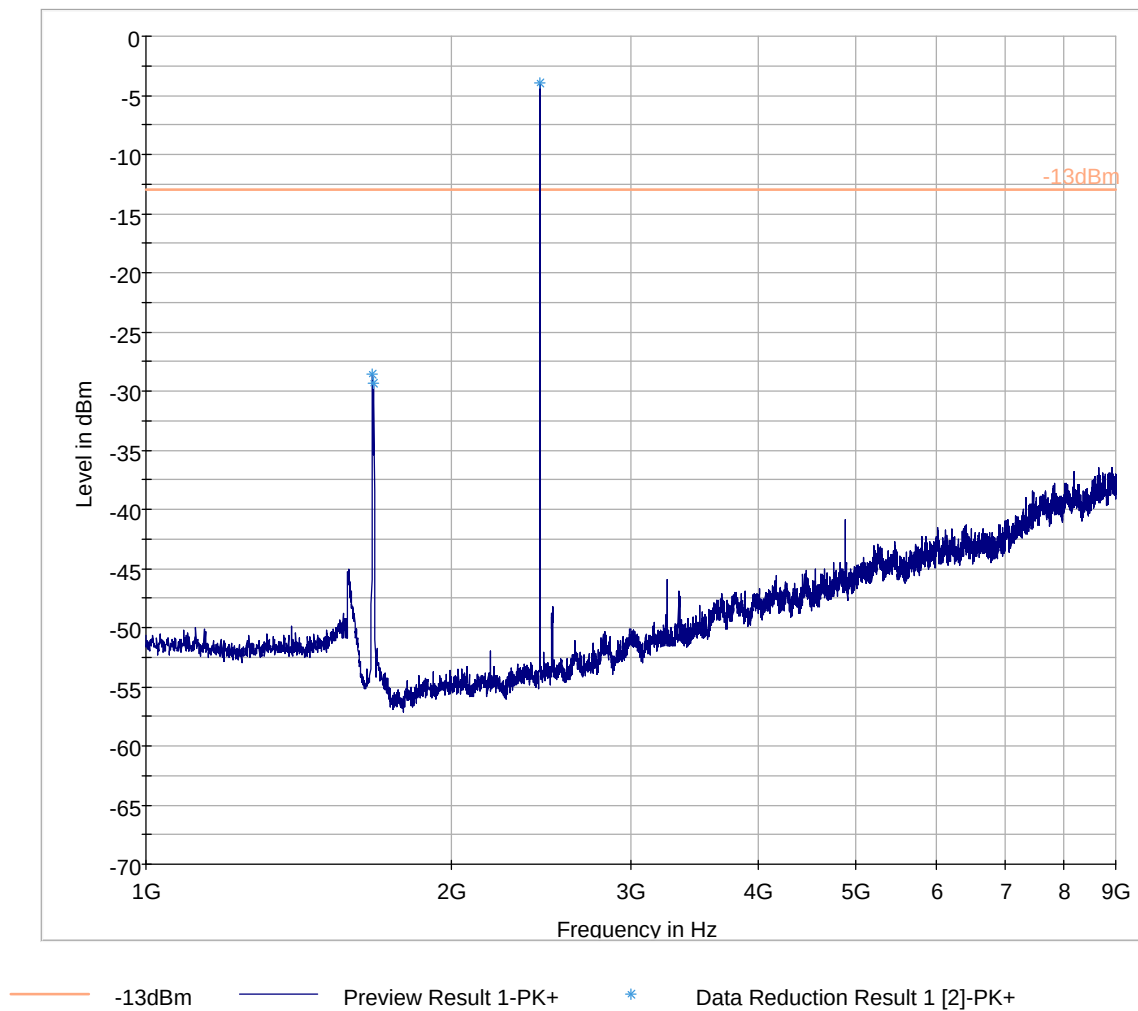
6.6.2 30 MHz – 1000 MHz, Ch. Mid

FCC 22 30-1000MHz UMTS-LTE



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

6.6.3 1 – 9 GHz, Ch. Mid

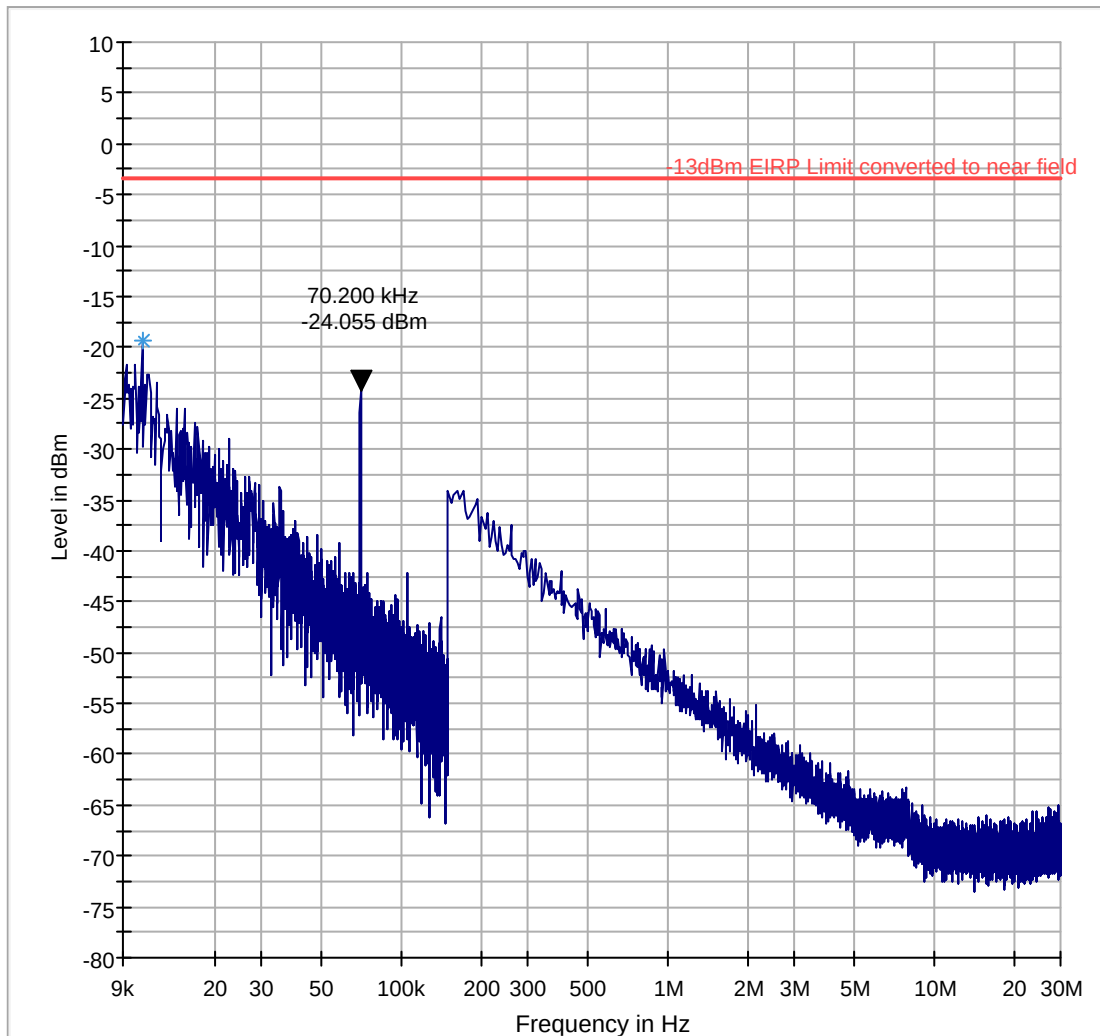


Note: The emissions exceeding the limit line are the intentional emissions of the co-transmitting radios.

6.7 Measurement Plots GSM 850

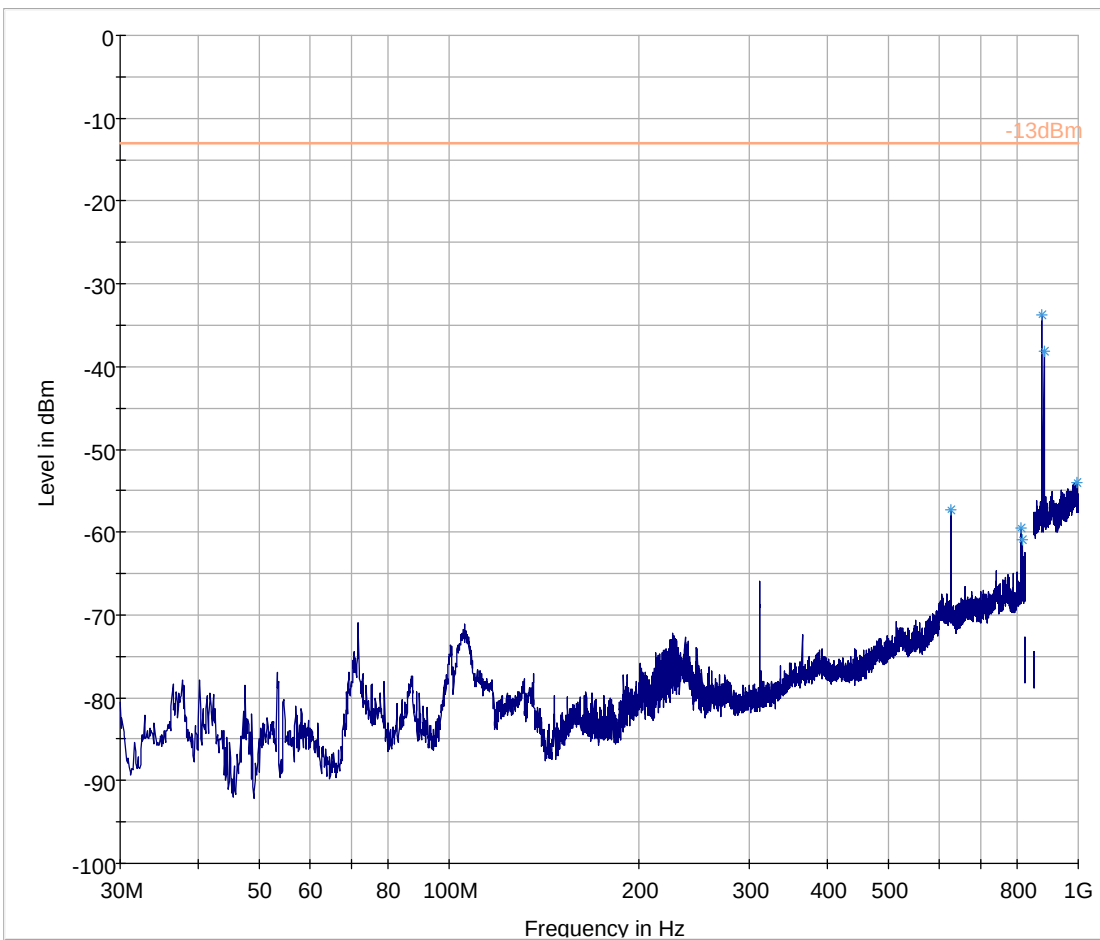
6.7.1 9 kHz - 30 MHz, Ch. Mid

FCC LICENSED 9kHz-30 MHz



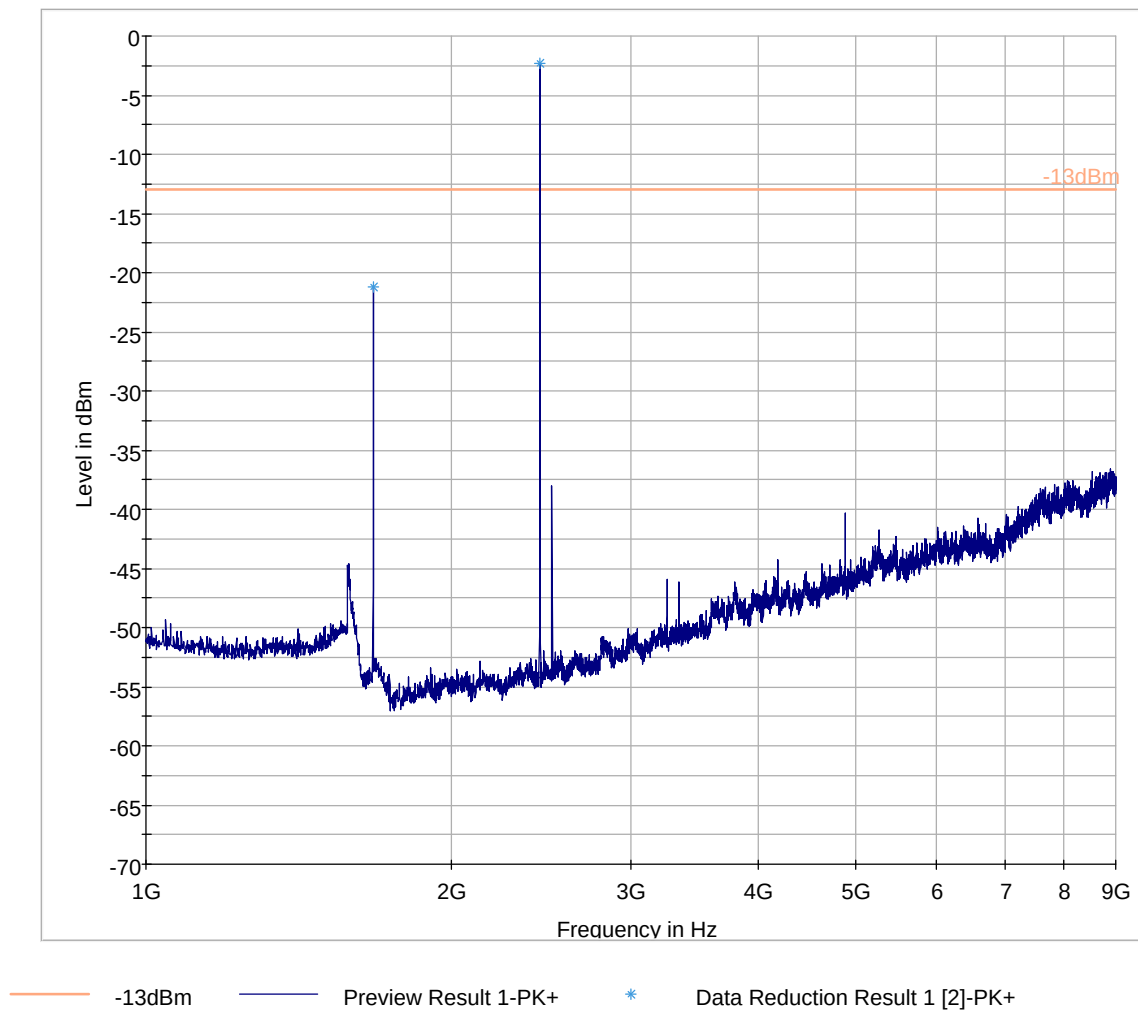
— -13dBm EIRP Limit converted to near field — Preview Result 1-PK+
* Data Reduction Result 1 [1]-PK+

6.7.2 30 MHz - 1000 MHz, Ch. Mid



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

6.7.3 1 - 9 GHz, Ch. Mid

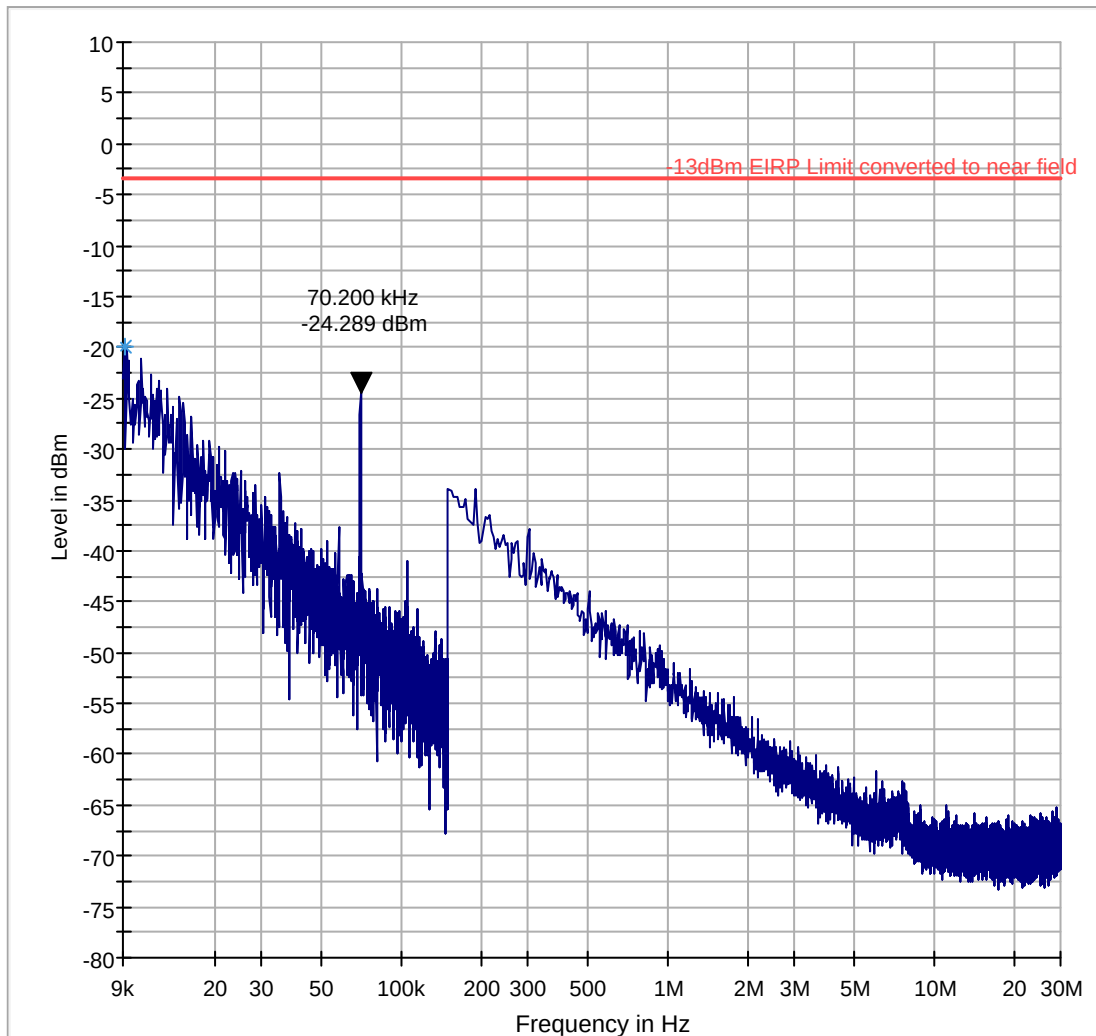


Note: The emissions exceeding the limit line are the intentional emissions of the co-transmitting radios.

6.8 Measurement Plots GSM 1900

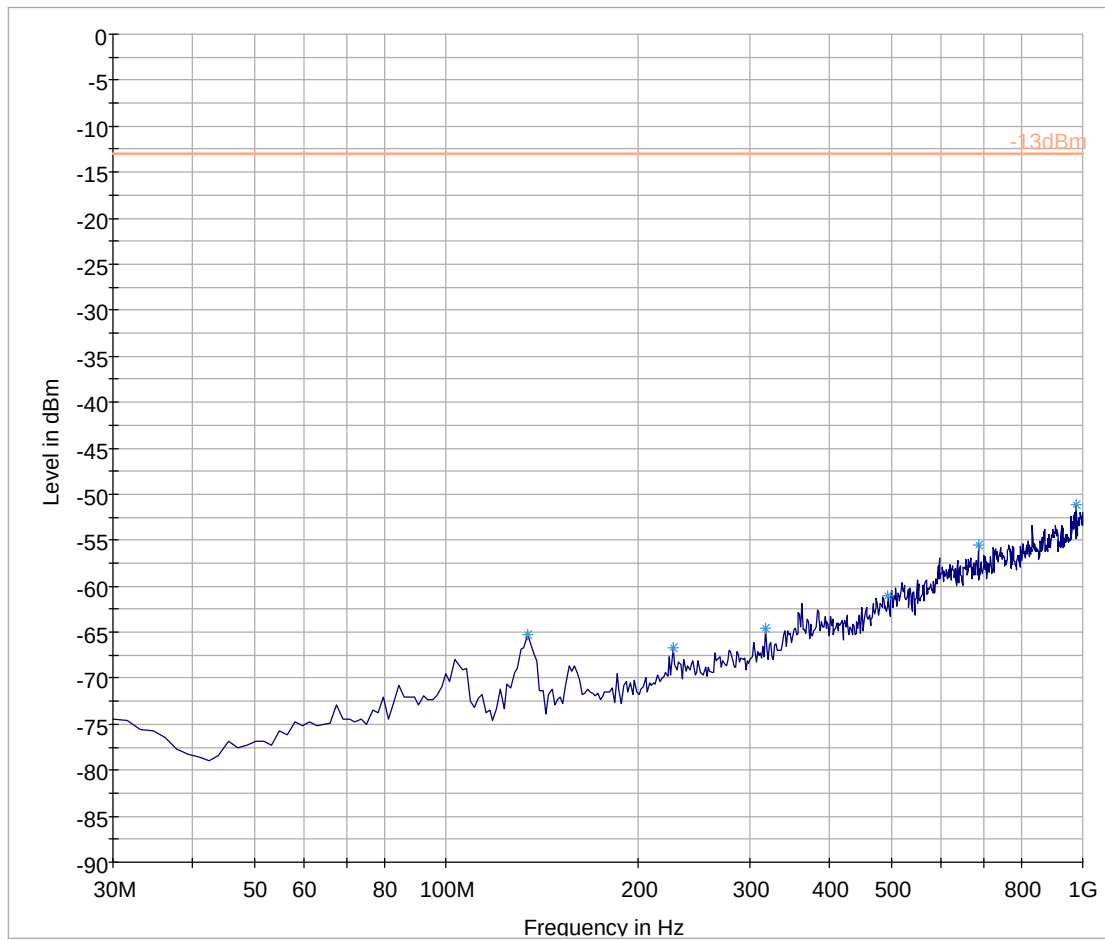
6.8.1 9 kHz - 30 MHz, Ch. Mid

FCC LICENSED 9kHz-30 MHz



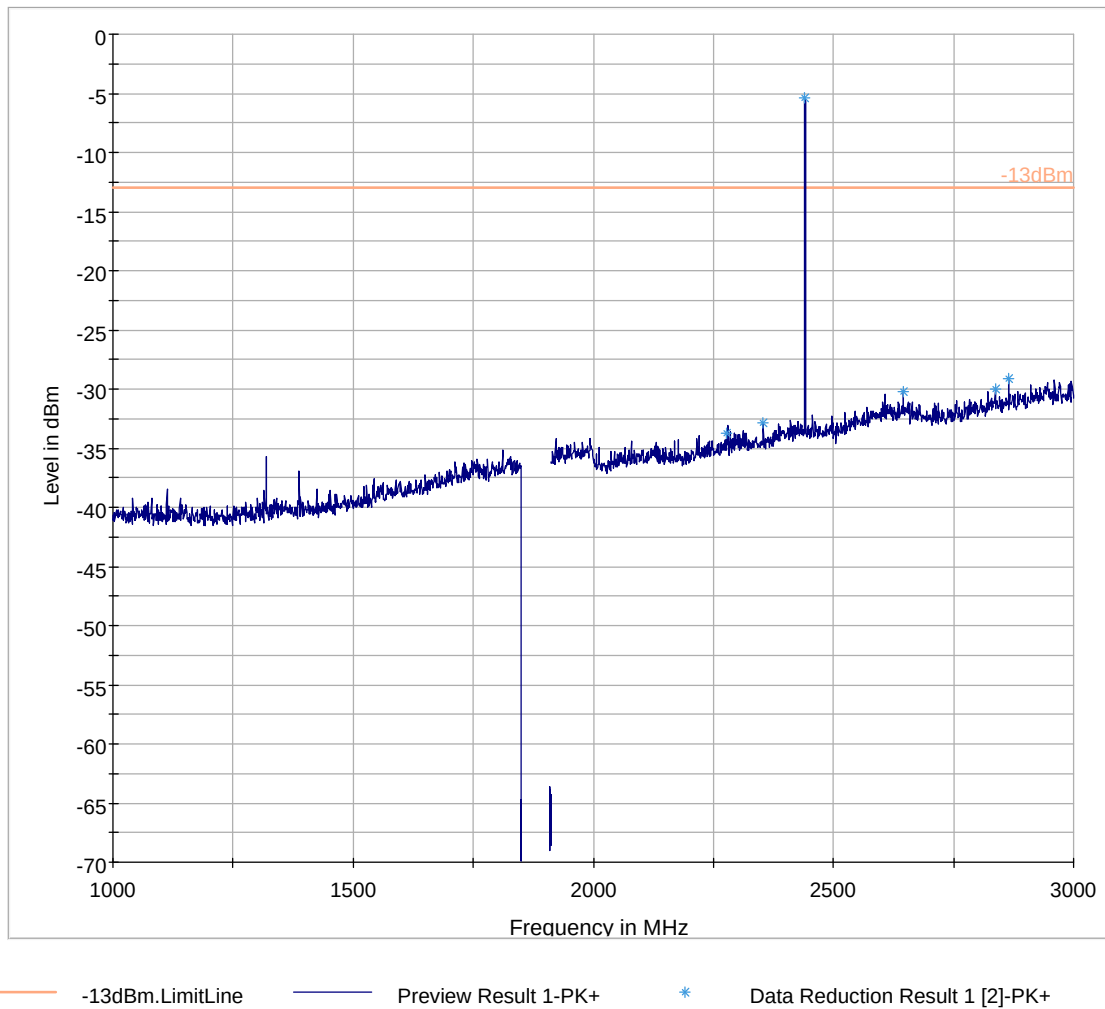
— -13dBm EIRP Limit converted to near field — Preview Result 1-PK+
* Data Reduction Result 1 [1]-PK+

6.8.2 30 - 1000 GHz, Ch. Mid



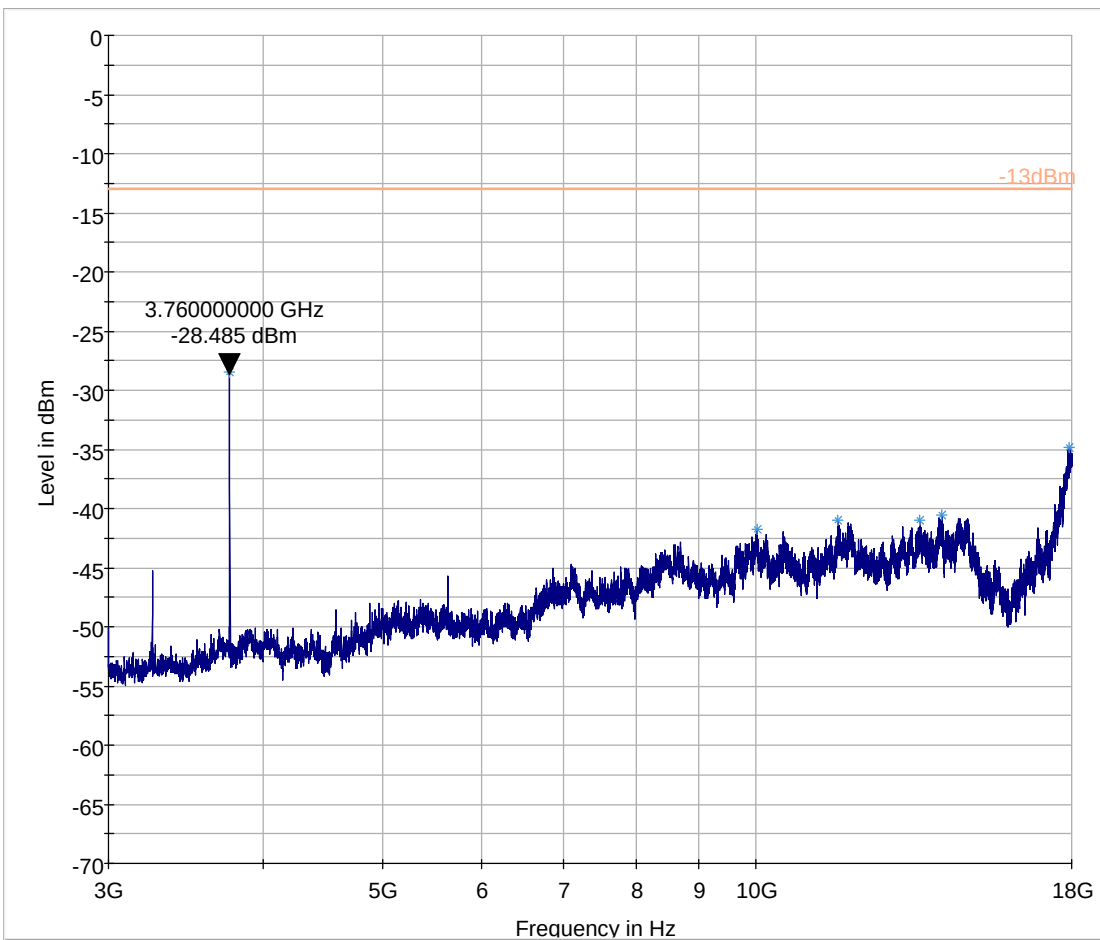
— -13dBm.LimitLine — Preview Result 1-PK+ * Data Reduction Result 1 [1]-PK+

6.8.3 1 - 3 GHz, Ch. Mid



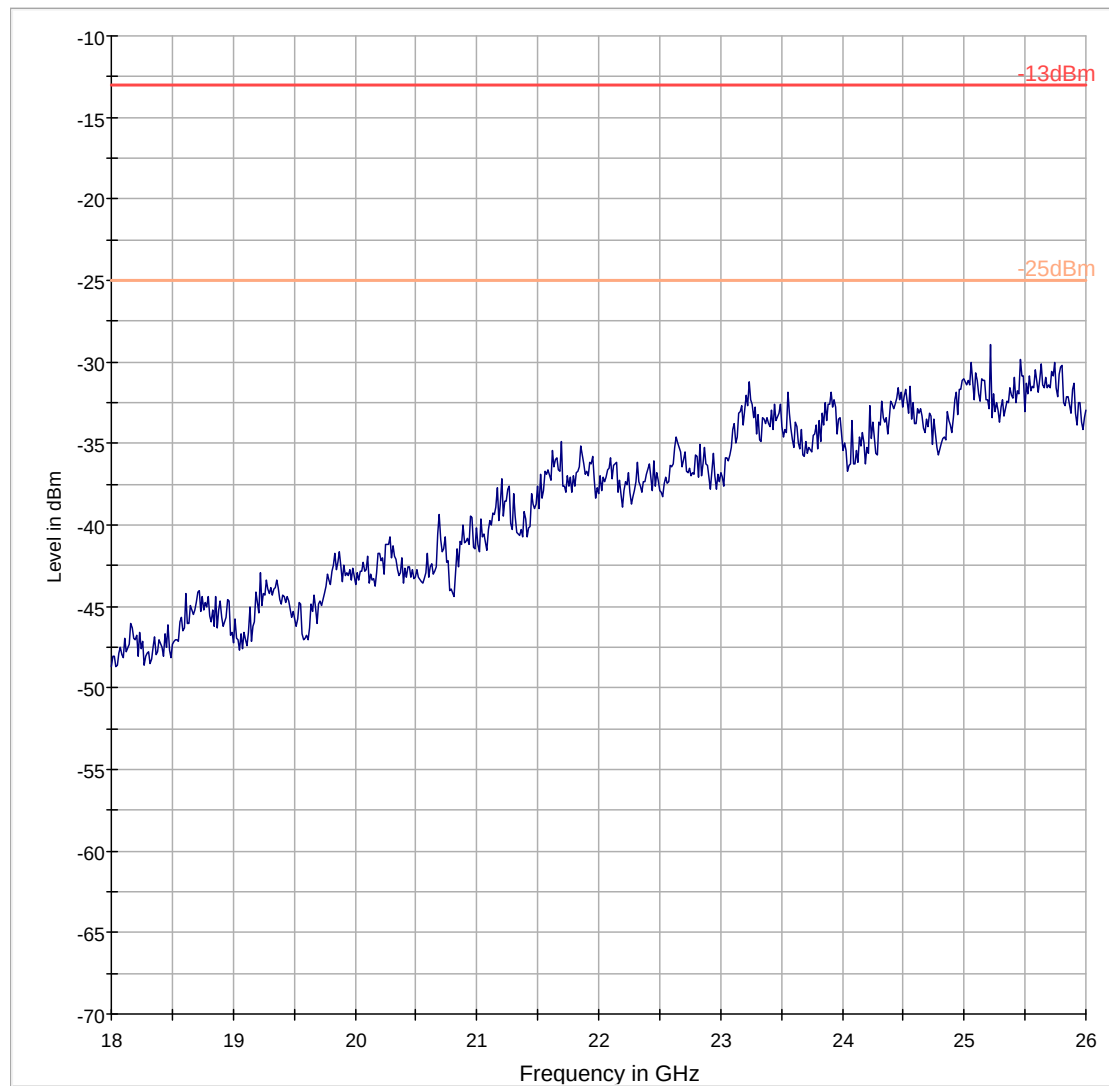
Note: The emissions exceeding the limit line are the intentional emissions of the co-transmitting radios.

6.8.4 3 - 18 GHz, Ch. Mid



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

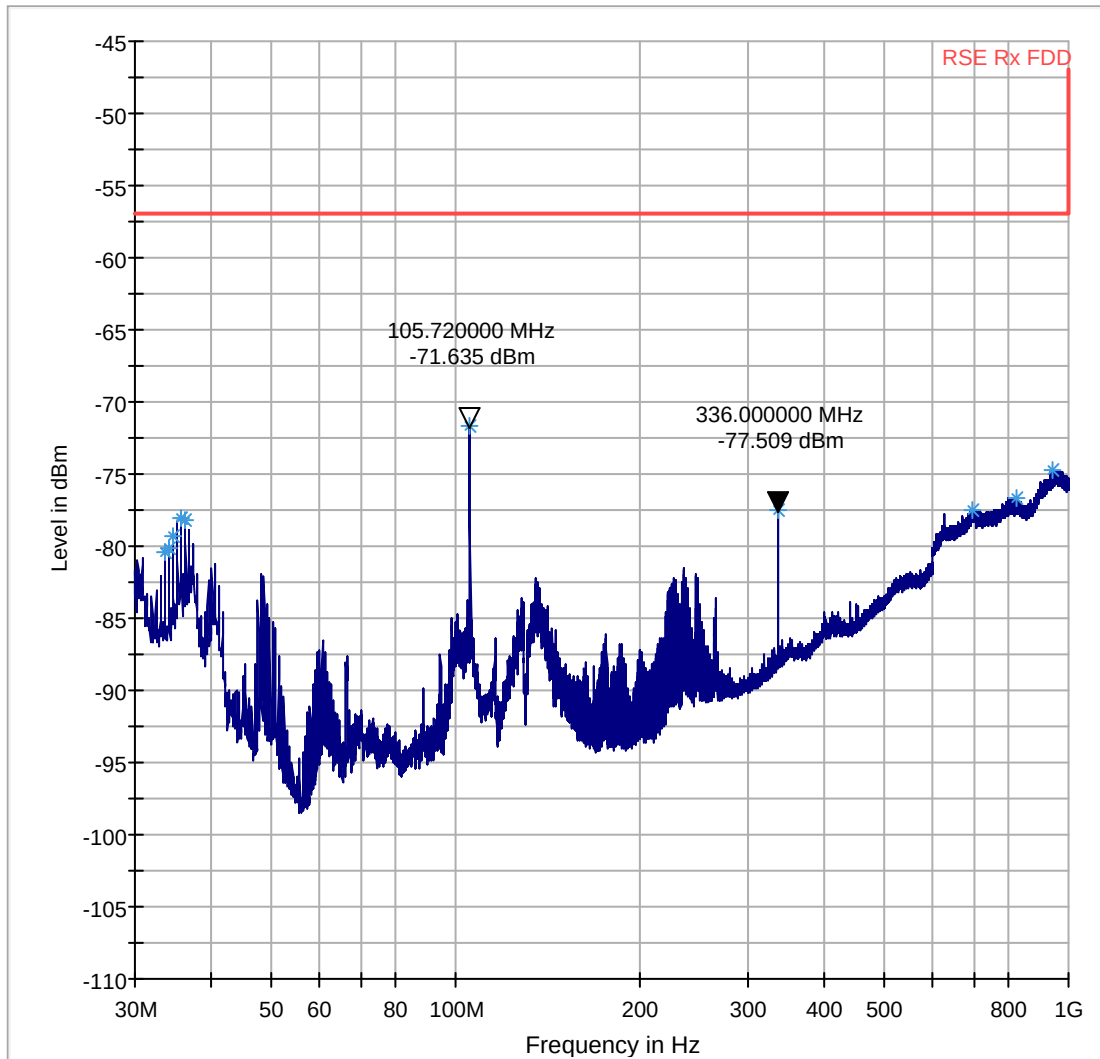
6.8.5 18 – 26 GHz, Ch. Mid



— -13dBm — -25dBm.LimitLine — Preview Result 1-PK+

6.1 Measurement Plots UMTS Band II (200612C)
6.1.1 30 – 1 GHz, Ch. Mid (Tx mode)

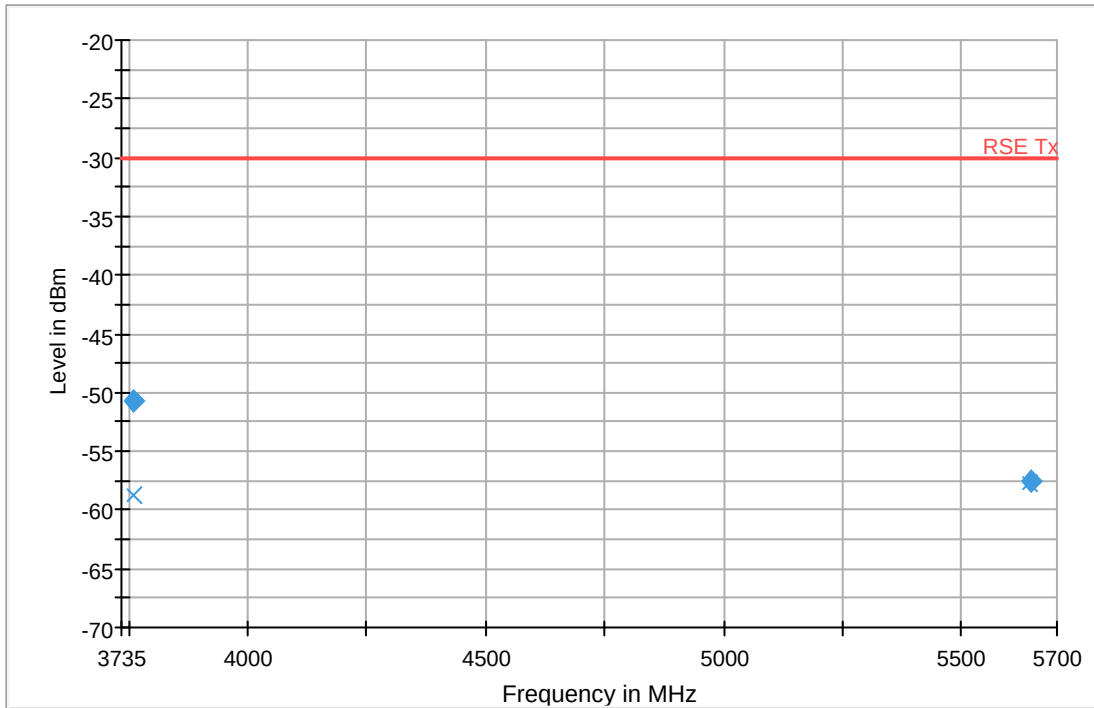
RSE RX UMTS_LTE 30-1000MHz



— RSE Rx FDD — Preview Result 1-RMS * Data Reduction Result 1 [2]-RMS

6.1.2 UMTS Band II, Ch. Mid (Harmonics)

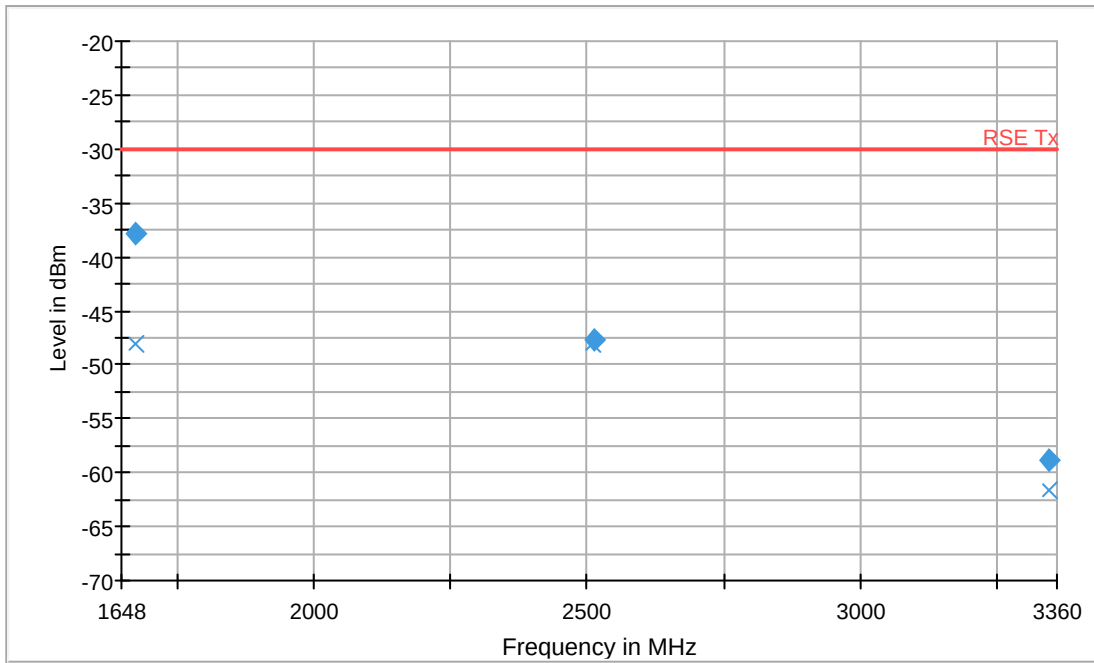
RSE UMTS_LTE Band 2 (1900 Band) Harmonics



— RSE Tx × Maximization Result 1 [4]-RMS ◆ Final Result 1-RMS

6.1 Measurement Plots UMTS Band V (200612C)

RSE UMTS_LTE Band 5 (850 Band) Harmonics



— RSE Tx × Maximization Result 1 [3]-RMS ◆ Final Result 1-RMS

7 Test Setup Photos

Setup photos are included in supporting file name: "EMC_PHIL4-035-17001_TestSetupPhotos.pdf"

8 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	3141	0005-1186	3 years	5/13/2017
Antenna Loop 6512	Loop Antenna	ETS Lindgren	6512	49838	3 years	3/13/2014
Antenna Horn 3115 SN 35111	Horn Antenna	EMCO	3115	35111	3 years	7/24/2015
Antenna Horn 3116	Horn Antenna	ETS Lindgren	3116	70497	3 years	7/22/2015
LISN FCC-LISN-50-25-2-08	LISN	FCC	FCC-LISN-50-25-2-08	8014	2 Years	3/26/2015
Digital Barometer	Compact Digital Barometer	Control Company	35519-055	91119547	1 Years	6/8/2017
Digital Radio Comm. Tester CMU 200 #1	Digital Radio Comm. Tester	R&S	CMU 200 #1	121673-9E	2 Years	7/7/2015
Spectrum Analyzer FSU26	Spectrum Analyzer	R&S	FSU26	200256	3 years	7/5/2015
Thermometer Humidity TM320	Thermometer Humidity	Dickson	TM320	5280063	1 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.

9 Revision History

Date	Report Name	Changes to report	Report prepared by
June 26	EMC-PHIL4-035-17001-FCC-22-24-27	Initial report	Elijah Garcia