FCC Test Report

FOR:

InHand Electronics

Model Name: CTC-IS IPU

Product Description: Tracking Device (Government/Military)

FCC ID: 24C4A-CTCISIPU

47 CFR Part 2, 22, 24, 27

TEST REPORT #: EMC_CONNE_034_14001_FCC22_24_27_WWAN_rev2

DATE: 2015-1-20

FCC:
A2LA Accredited

IC recognized #
3462E

***CETECOM* Inc.**

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CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686

Table of Contents

1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules parts 2, 22, 24 and 27 of Title 47 of the Code of Federal Regulations. No deviations were ascertained.

Company	Description	Model #
In Hand Electronics	Tracking device(Government/Military)	CTC-IS IPU

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2015-1-20	Compliance	Milton Ponce Deleon (Test Lab Manager)	Milton Ponce de Leon Digitally signed by Milton Ponce de Leon DN: cn=Milton Ponce de Leon, c=US, o=Cetecom Inc., ou=OTA, email=milton.deleon@cetecom.com Date: 2015.01.22 11:07:11 -08'00'

Responsible for the Report:

Date	Section	Name	Signature
2015-1-20	Compliance	Muhammad Umair Anees (EMC Engineer)	Muhammad Umair Anees Digitally signed by Muhammad Umair Anees DN: cn=Muhammad Umair Anees, c=US, o=EMC, ou=Compliance, email=Muhammad.Anees@cetecom.com Date: 2015.01.22 10:37:26 -08'00'

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 Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	6370 Nancy Ridge Drive #101 San Diego, CA 92121 U.S.A.
Telephone:	+1 (858) 362-2400
Fax:	+1 (858) 587-4809
Compliance Manager:	Milton Deleon
Responsible Project Leader:	Muhammad Anees

2.2 Identification of the Client

Applicant's Name:	InHand Electronics, Inc.
Street Address:	30 West Gude Drive Suite 550
City/Zip Code	Rockville, MD 20850
Country	United States
Contact Person:	Mark Price
Phone No.	(240) 558-2014
e-mail:	mprice@inhandelectronics.com

2.3 Identification of the Manufacturer

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

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name:	CTC-IS IPU
FCC-ID :	24C4A-CTCISIPU
Product Description:	Tracking device(Government/Military)
Technology / Type(s) of Modulation:	Sierra Wireless Integrated Radio Module: MC 7354 features: LTE,HSPA+,GSM/GPRS/EDGE, EV-DO Rev A, 1xRTT
Operating Frequency Ranges (MHz) / Channels (for US/CAN bands only):	FDD II: 826.4 - 846.6; 278 channels FDD IV: 1712.4 -1752.5; 203 channels FDD V: 1852.4 -1907.6; 103 channels
Antenna Information as declared:	External Antenna: Penta-band dipole antenna by Pulse 2dBi gain across all bands mentioned above.
Power Supply/ Rated Operating Voltage Range:	External Battery pack with a 15VDC output
Rated Operating Temperature Range:	-18°C ~ +49°C
Test Sample Status:	Prototype
Other Radios included in the device:	802.15.4 Radio module MRF24J40MA by Microchip 2.4GHz operation
Note:	GSM/GPRS/EDGE and CDMA was de-activated via CTC-IS IPU Firmware

3.2 Identification of the Equipment under Test (EUT)

EUT #	Serial Number	Sample	HW/SW Version
1	DEF0000104	Radiated/Conducted	001/002

3.3 Environmental conditions during Test

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

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

3.4 Dates of Testing

09/09/2014 – 10/01/2014

4 Subject of Investigation

The objective of the measurements applied by CETECOM Inc. was to establish compliance of the EUT as described under Ch. 3 of this Test Report, with the applicable criteria specified in

- 47 CFR Part 2: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission Frequency allocations and radio treaty matters; general rules and regulations.
- 47 CFR Part 22: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 22- Public mobile services
- 47 CFR Part 24: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 24- Personal communication services
- 47 CFR Part 27: Title 47 of the Code of Federal Regulations: Chapter I-Federal Communications Commission subchapter B- common carrier services; Part 27-Miscellaneous wireless communication services

This test report is to support a request for new equipment authorization under the FCC ID **24C4A-CTCISIPU.**

All testing was performed on the product referred to in Section 3 as EUT.

This product integrates the pre-certified WWAN module: Sierra Wireless **MC7354**

Taking into account, guidance from FCC KDB 996369 (modular approval) and where relevant test procedures did not change, conducted test results are leveraged from the test report for Sierra Wireless modem **MC7355** with FCC ID **N7NMC7355** issued by Sierra Wireless on August 16, 2012 for FCC/IC certification of WCDMA/HSPA bands.

5 Summary of Measurement Results

UMTS 850 MHz Band:

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (b)	RF Output Power	Nominal	UMTS Band V	■	☐	☐	☐	Complies
Reference only	Peak-to-average Ratio	Nominal	UMTS Band V	☐	☐	☐	■	Note 1
§2.1055 §22.355	Frequency Stability	Extreme	UMTS Band V	☐	☐	☐	■	Note 1
§2.1049 §22.917(b)	Occupied Bandwidth	Nominal	UMTS Band V	☐	☐	☐	■	Note 1
§2.1051 §22.917	Band Edge Compliance	Nominal	UMTS Band V	☐	☐	☐	■	Note 1
§2.1053 §22.917	Unwanted Emissions	Nominal	UMTS Band V	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.
Note 1: Leveraged from module certification.
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UMTS 1900 MHz Band:

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §24.232 (c)(d)	RF Output Power	Nominal	UMTS Band II	■	☐	☐	☐	Complies
§24.232 (d)	Peak-to-average Ratio	Nominal	UMTS Band II	☐	☐	☐	■	Note 1
§2.1055 §24.235	Frequency Stability	Extreme	UMTS Band II	☐	☐	☐	■	Note 1
§2.1049	Occupied Bandwidth	Nominal	UMTS Band II	☐	☐	☐	■	Note 1
§2.1051 §24.238	Band Edge Compliance	Nominal	UMTS Band II	☐	☐	☐	■	Note 1
§2.1053 §24.238	Unwanted Emissions	Nominal	UMTS Band II	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed
Note 1: Leveraged from module certification.

UMTS 1700 MHz Band:

Specifications	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §27.50(d)(4)	RF Output Power	Nominal	UMTS Band IV	■	☐	☐	☐	Complies
§27.50(d)(5)	Peak-to-average Ratio	Nominal	UMTS Band IV	☐	☐	☐	■	Note 1
§2.1055 §27.54	Frequency Stability	Extreme	UMTS Band IV	☐	☐	☐	■	Note 1
§2.1049 §27.53(h)	Occupied Bandwidth	Nominal	UMTS Band IV	☐	☐	☐	■	Note 1
§2.1051 §27.53(h)	Band Edge Compliance	Nominal	UMTS Band IV	☐	☐	☐	■	Note 1
§2.1053 §27.53(h)	Unwanted Emissions	Nominal	UMTS Band IV	■	☐	☐	☐	Note 1

Note: NA= Not Applicable; NP= Not Performed
Note 1: Leveraged from module certification.

6 Measurements

6.1 RF Power Output and Effective Radiated Power / Effective Isotropic Radiated Power

6.1.1 References

- FCC: CFR Part 2.1046, CFR Part 22.913, CFR Part 24.232, CFR Part 27.50
- FCC KDB 971168 D01 Power Meas License Digital Systems v02r02

6.1.2 Limits:

ERP/EIRP (850 MHz Band)

FCC Part 22.913 (a)

FCC: Peak ERP < 38.45 dBm (7W)
The effective radiated power (ERP) of mobile transmitters must not exceed 7 Watts.

EIRP (1900 MHz Band)

FCC Part 24.232 (c) (e)

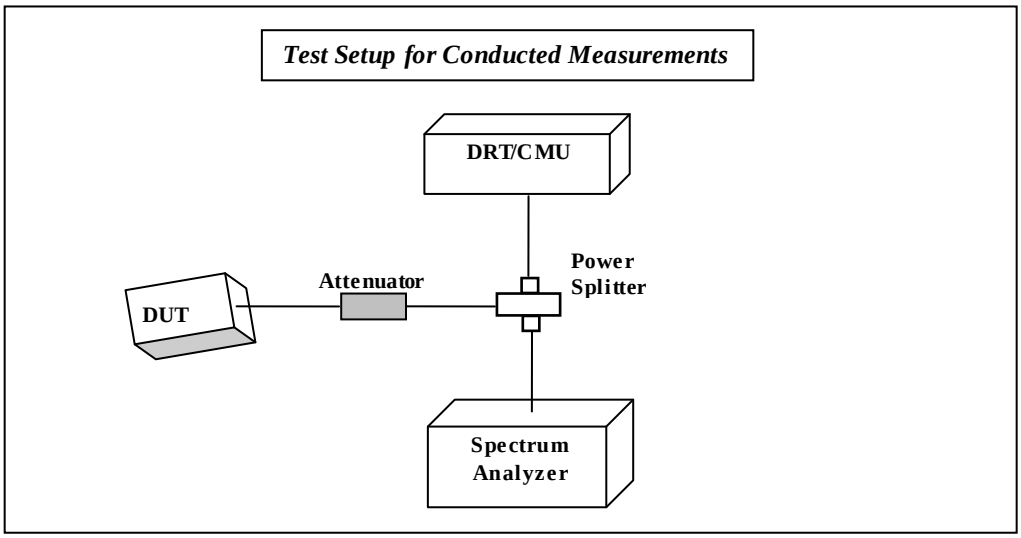
FCC: Peak EIRP < 33 dBm (2W)
(b) Mobile/portable stations are limited to 2 Watts effective isotropic radiated power (EIRP).
(c) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms equivalent voltage. The measurement results shall be properly adjusted for any 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 over the full bandwidth of the channel.

EIRP (1700 MHz Band)

FCC Part 27.50 (d) (4) (6)

FCC: Peak EIRP < 30 dBm (1W)
Fixed, mobile and portable (handheld stations) operating in the 1710-1755 MHz band are limited to 1 watt EIRP 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

6.1.3 Measurement Procedure:



1. Connect the equipment as shown in the above diagram. A Digital Radio Communication Tester (DRT: R&S CMU200 here) is used to enable the EUT to transmit and to measure the output power.
2. Adjust the settings of the CMU200 to set the EUT to its maximum power at the required channel.
3. Record the Peak and Average Output power level measured by the CMU200.
4. Correct the measured level for all losses in the RF path. The attenuation or loss of the path between the U.FL connector on the Sierra Wireless module to the external SMA connector is 1.2 dB for low bands and 2 dB for high bands
5. Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band and for all types of modulation schemes.
6. GMSK mode measurements are performed in GSM 1 uplink slot configuration.
7. UMTS mode measurements are performed in RMC 12.2K configuration

Measurement Uncertainty

+/- 0.5 dB

Test Conditions:

Tnom: 22°C; Vnom: 15 V

6.1.4 Measurement Results

6.1.5 Conducted Power Verification:

WCDMA Band V

Channel No.	Frequency (MHz)	Pre-Certified Module	Conducted Output Power Measurement Verification
		Average Power (dBm)	Average Power (dBm)
4132	826.4	23.37	22.98
4182	836.6	23.18	22.78
4233	846.6	23.37	22.91

WCDMA Band II

Channel No.	Frequency (MHz)	Pre-Certified Module	Conducted Output Power Measurement Verification
		Average Power (dBm)	Average Power (dBm)
9262	1850.2	22.87	22.4
9400	1880	23.07	22.36
9538	1909.8	23.11	22.34

WCDMA Band IV

Channel No.	Frequency (MHz)	Pre-Certified Module	Conducted Output Power Measurement Verification
		Average Power (dBm)	Average Power (dBm)
1312	1712.4	22.89	22.62
1413	1732.6	22.95	22.3
1513	1752.6	23.06	22.06

Verification Result:
All the powers measured in this testing are within the measurement tolerance and uncertainty.

6.1.6 RF Output Power Radiated Test Results:

ERP/EIRP 850 MHz band

FDD V UMTS 850: QPSK Mode Antenna Gain = 2 dBi FCC: Peak ERP < 38.45 dBm (7W)					
Frequency (MHz)	**PEAK Conducted Output Power (dBm)**	**Average Conducted Output Power (dBm)**	**Calculated Peak EIRP (dBm)**	**Calculated Peak ERP** (ERP = EIRP - 2.15 dB) **(dBm)**	**Calculated Average EIRP (dBm)**
826.4	26.38	22.98	28.38	26.23	24.98
836.6	26.24	22.78	28.24	26.09	24.78
846.6	26.44	22.91	28.44	26.29	24.91

EIRP 1900 MHz band

FDD II UMTS 1900: QPSK Mode Antenna Gain = 2 dBi FCC: Peak EIRP < 33 dBm (2W)				
Frequency (MHz)	**PEAK Conducted Output Power (dBm)**	**Average Conducted Output Power (dBm)**	**Calculated Peak EIRP (dBm)**	**Calculated Average EIRP (dBm)**
1852.4	25.86	22.4	27.86	24.4
1880	25.7	22.36	27.7	24.36
1907.6	25.76	22.34	27.76	24.34

EIRP 1700 MHz band

FDD IV UMTS 1700: QPSK Mode Antenna Gain = 2 dBi FCC: Peak EIRP < 33 dBm (2W)				
Frequency (MHz)	**PEAK Conducted Output Power (dBm)**	**Average Conducted Output Power (dBm)**	**Calculated Peak EIRP (dBm)**	**Calculated Average EIRP (dBm)**
1712.4	26.26	22.62	28.26	24.62
1732.6	25.55	22.3	27.55	24.3
1752.6	25.8	22.06	27.8	24.06

6.1.7 Test Verdict:

Passed

6.2 Spurious Emissions Radiated

6.2.1 References

FCC: CFR Part 2.1053, CFR Part 22.917, CFR Part 24.238, CFR Part 27.53
FCC KDB 971168 D01 Power Meas License Digital Systems v02r02

6.2.2 Measurement requirements:

FCC 2.1053: Field strength of spurious radiation.

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission.

6.2.3 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.

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.

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.

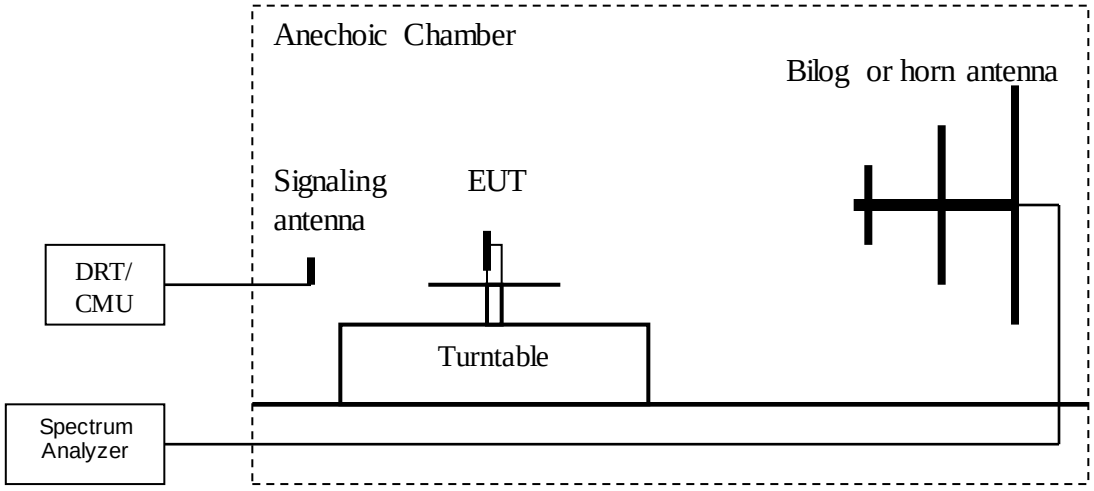
FCC 27.53 Emission limitations for AWS

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

(h) 3) Measurement procedure. i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. 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

6.2.4 Radiated out of band measurement procedure:

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



Connect the equipment as shown in the above diagram with the EUT's antenna in a horizontal orientation.

Adjust the settings of the Digital Radio Communication Tester (DRT) to set the EUT to its maximum power at the required channel.

Set the spectrum analyzer to measure peak hold with the required settings.

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.

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.

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).

Determine the level of spurious emissions using the following equation:

Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):

Repeat steps 4, 5 and 6 with all antennas vertically polarized.

Determine the level of spurious emissions using the following equation:

Spurious (dBm) = **LVL** (dBm) + **LOSS** (dB):

Measurements are to be performed with the EUT set to the low, middle and high channel of each frequency band.

(N**ote:** 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.)

6.2.5 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:

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

6.2.6 Measurement Survey:

The site is constructed in accordance with ANSI C63.4 requirements and is recognized by the FCC to be in compliance for a 3m site. The spectrum is scanned from 9 kHz to the 10th harmonic of the highest frequency generated by the EUT.
Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the 850 MHz, 1700 MHz and 1900 MHz bands of operation.
It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the GSM-850 MHz and the PCS-1900 MHz band into any of the other blocks respectively. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

Radiated emission measurements were made in GMSK (1 uplink slot) and UMTS RMC 12.2k modes.
Additional spot checks in mid channel of operation for all modes were performed with the slimmer battery option of the device.

For radiated measurements, all data in this report shows the worst case emissions data between H/V antenna polarizations and for all 3 orthogonal orientations of the EUT.

Unless mentioned otherwise, the emission signals above the limit line in the plots are from the carrier.

Radiated Measurement Uncertainty: ±3dB

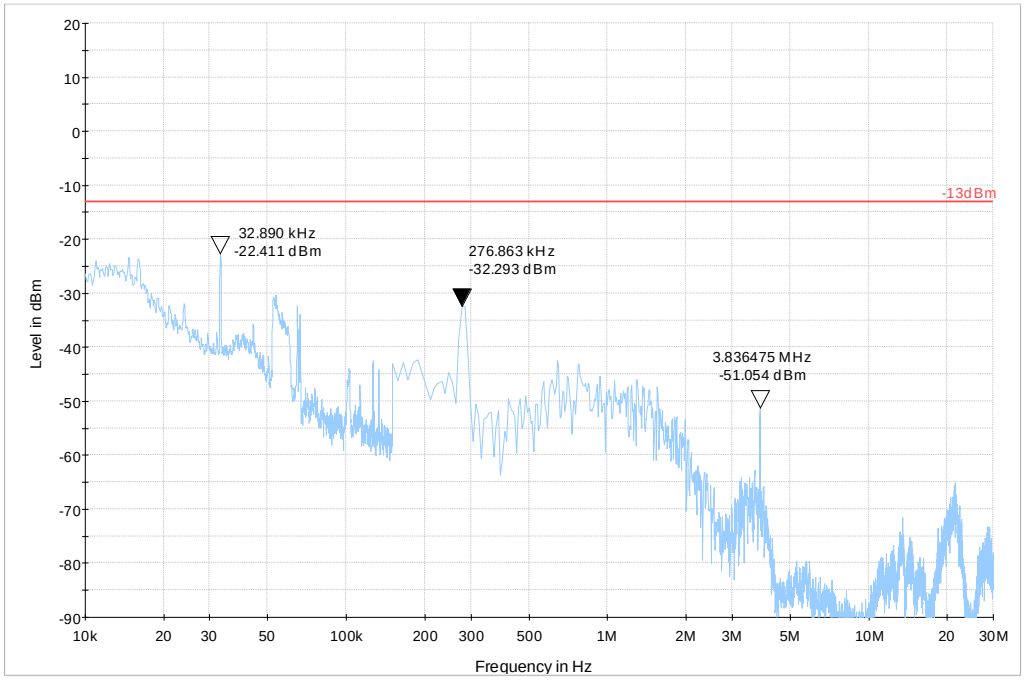
6.2.7 Test Conditions:

Tnom: 21°C; Vnom: 15 V

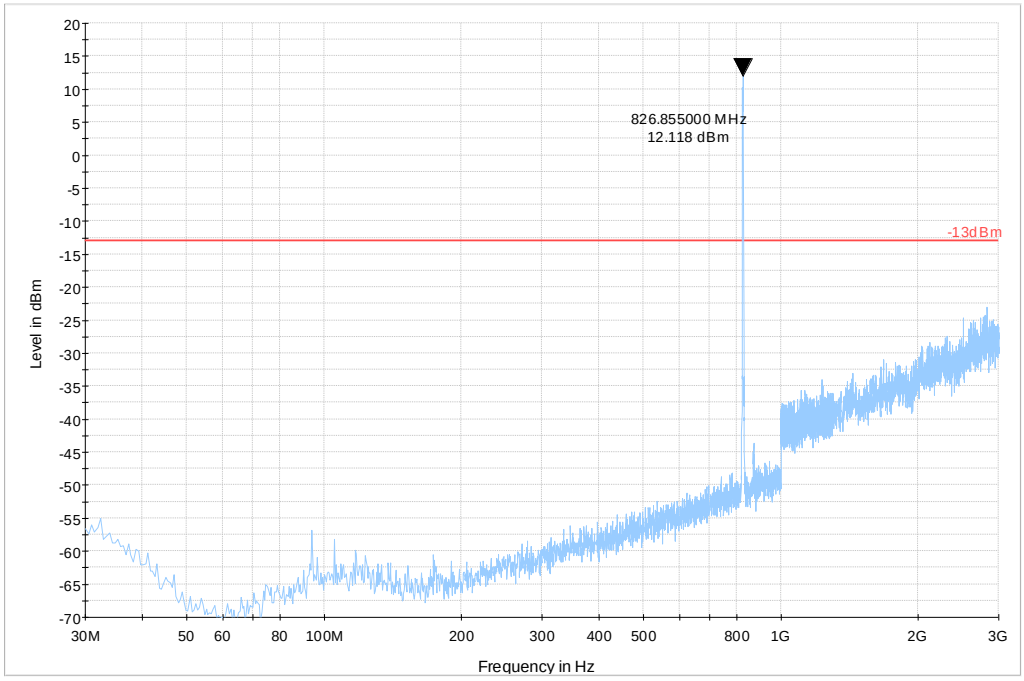
6.2.8 Test Results:

Radiated Spurious Emissions (UMTS Band 5) Tx:

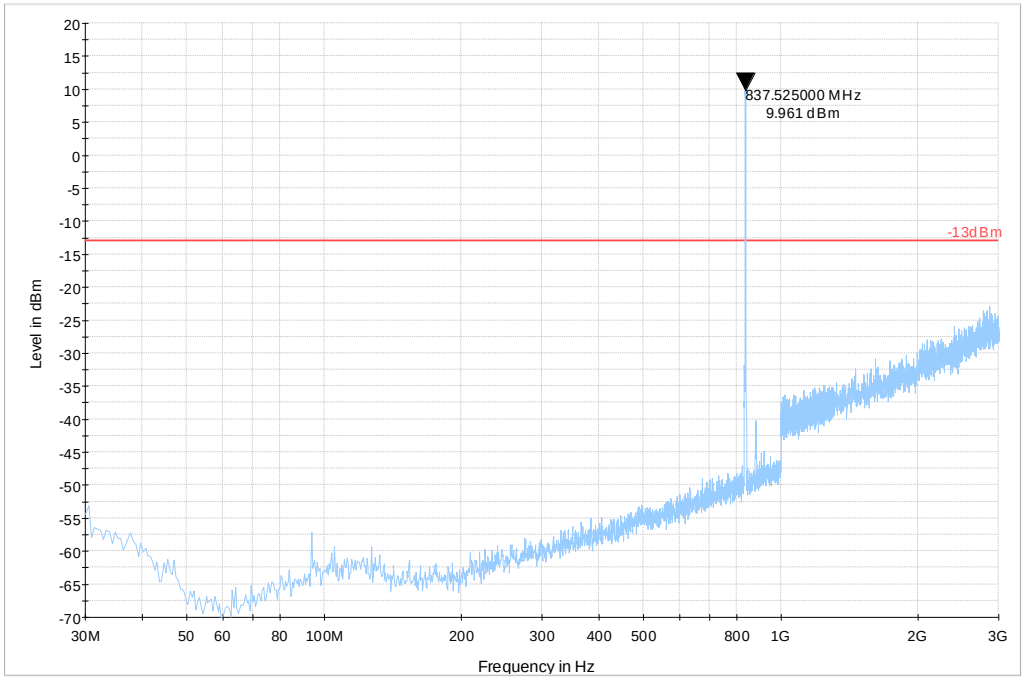
Test results 100 kHz- 30 MHz – Mid Channel (UMTS-Band 5)



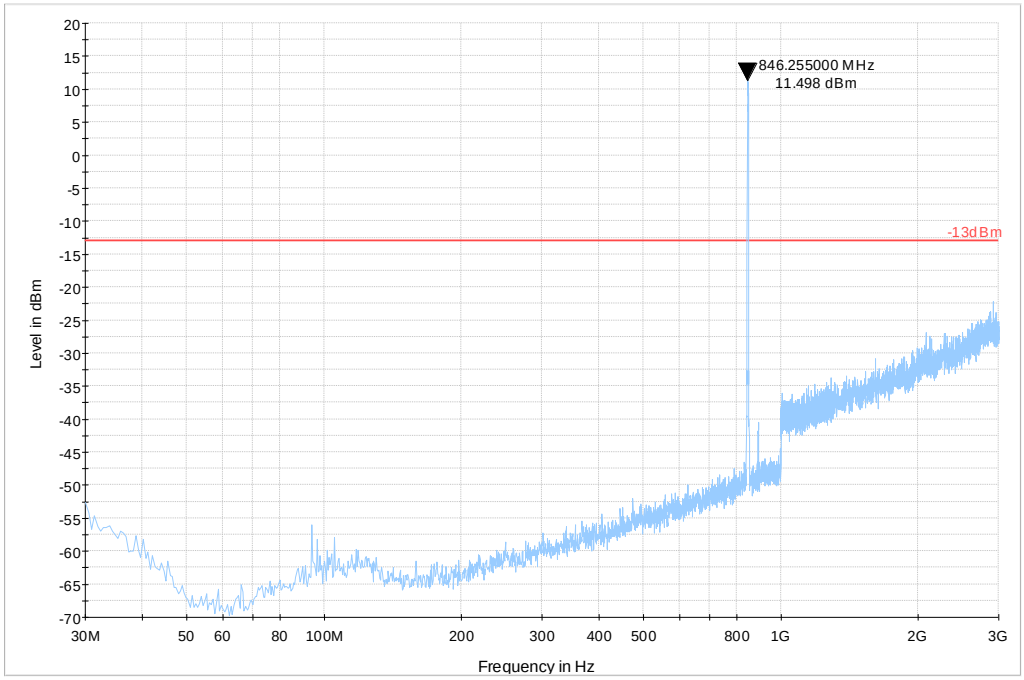
Test results 30MHz - 3GHz – Low Channel (UMTS-Band 5)



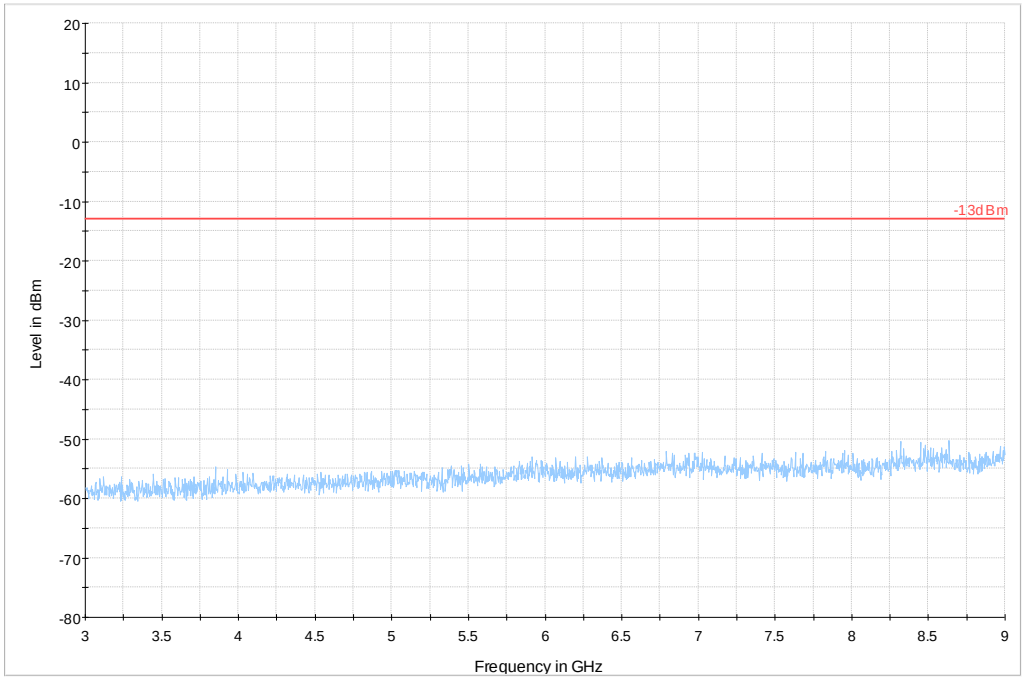
Test results 30 MHz - 3GHz – Mid Channel (UMTS-Band 5)



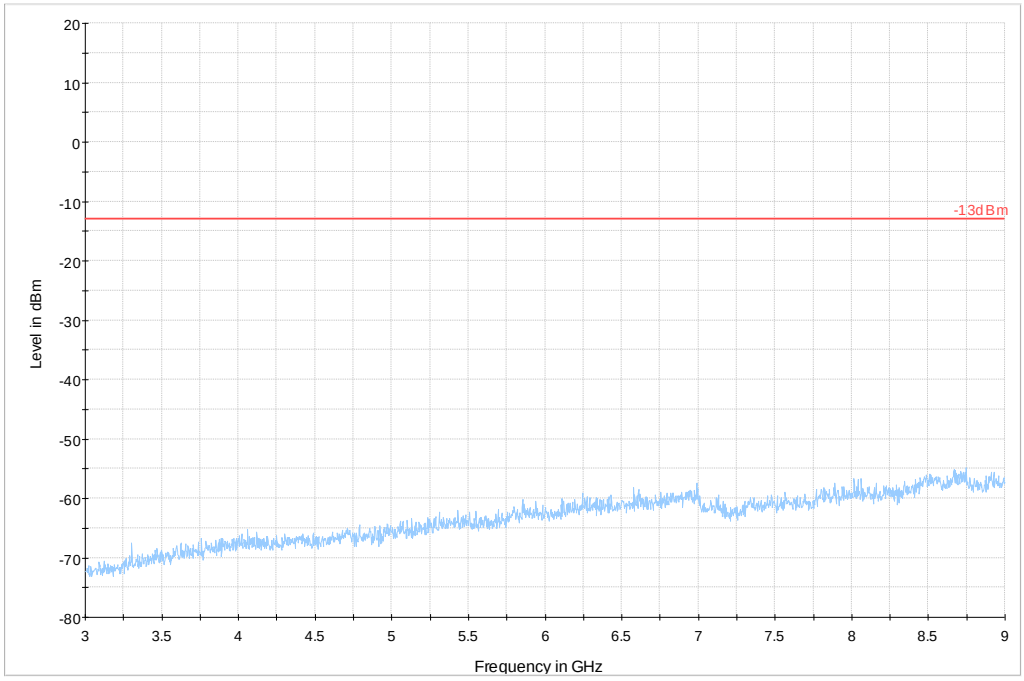
Test results 30MHz - 3GHz – High Channel (UMTS-Band 5)



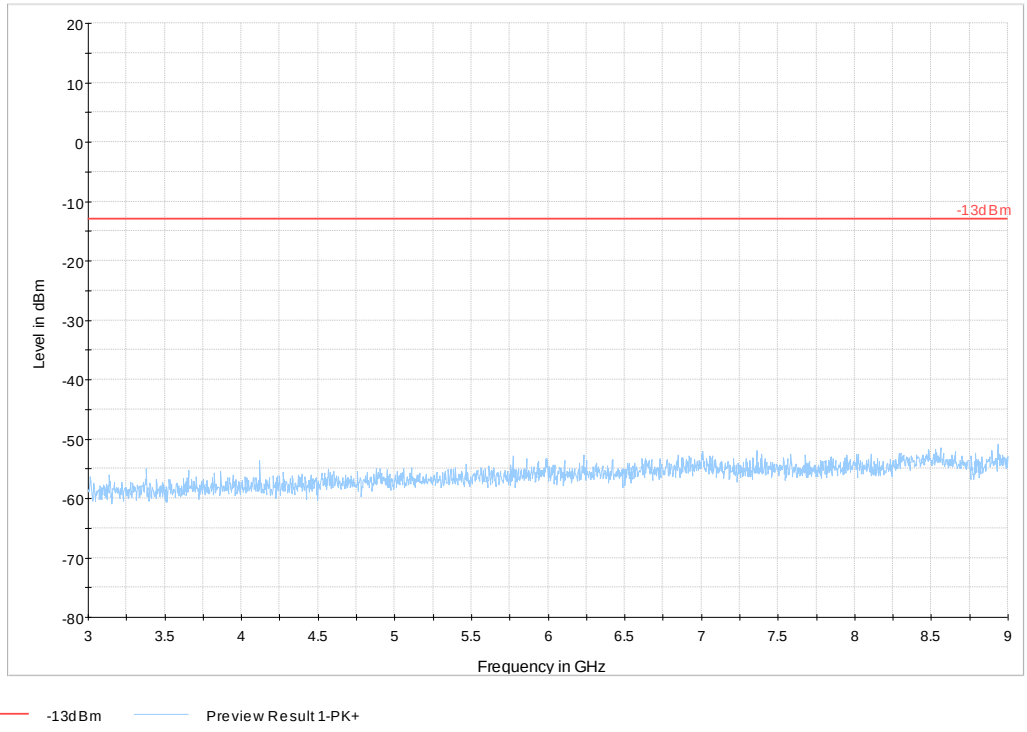
Test results 3GHz - 9GHz – Low Channel (UMTS-Band 5)



Test results 3GHz - 9GHz – Mid Channel (UMTS-Band 5)

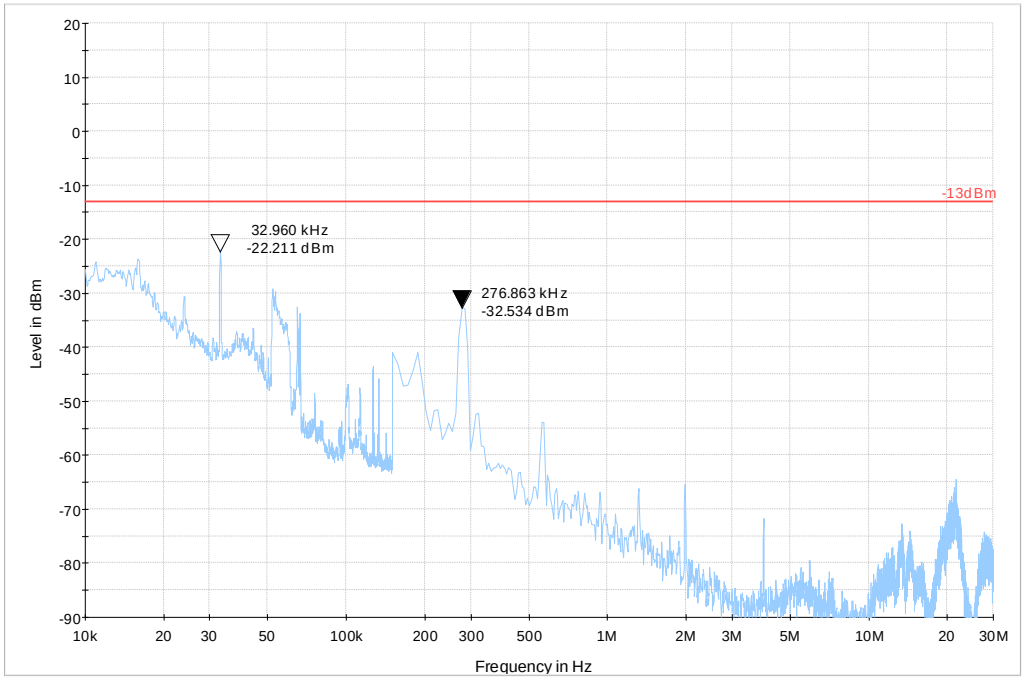


Test results 3GHz - 9GHz – High Channel (UMTS-Band 5)

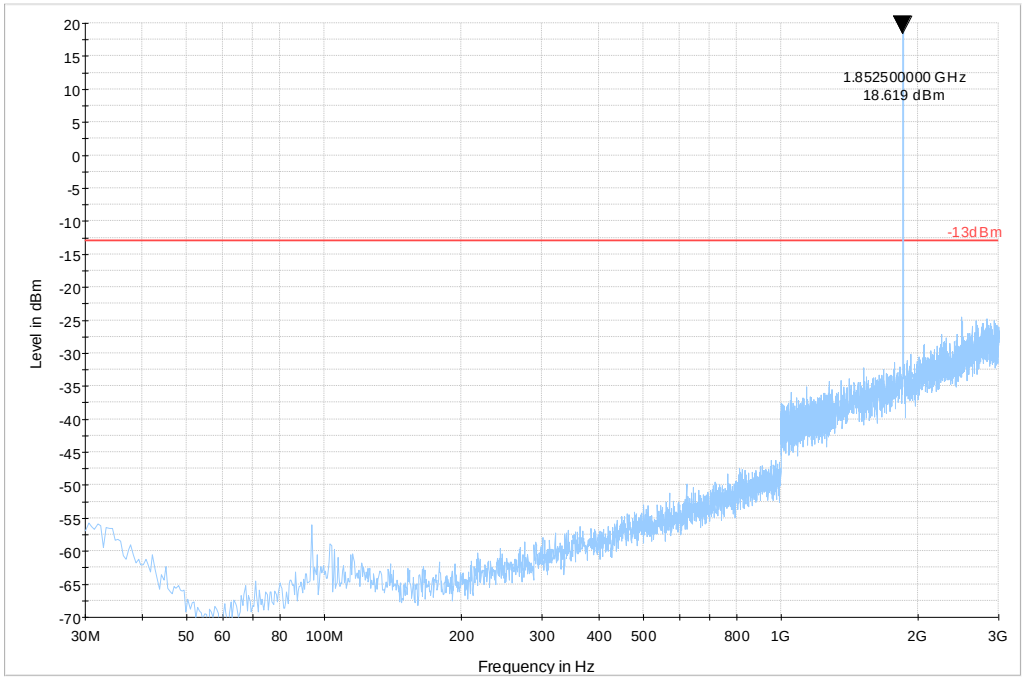


Radiated Spurious Emissions (UMTS Band 2) Tx:

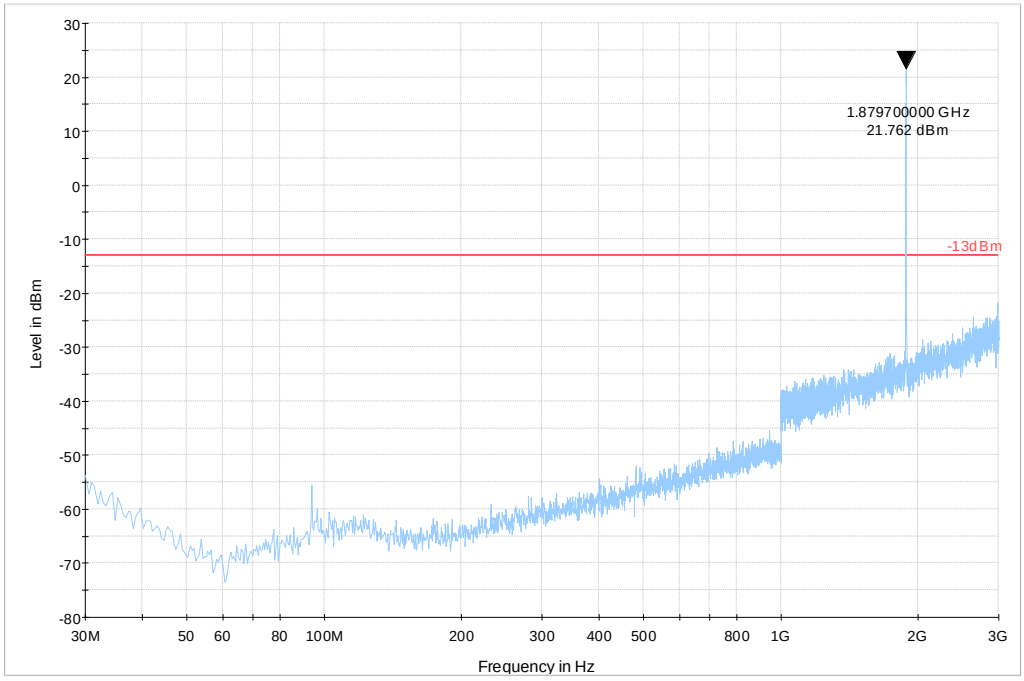
Test results 9 kHz-30 MHz – Mid Channel (UMTS-Band 2)



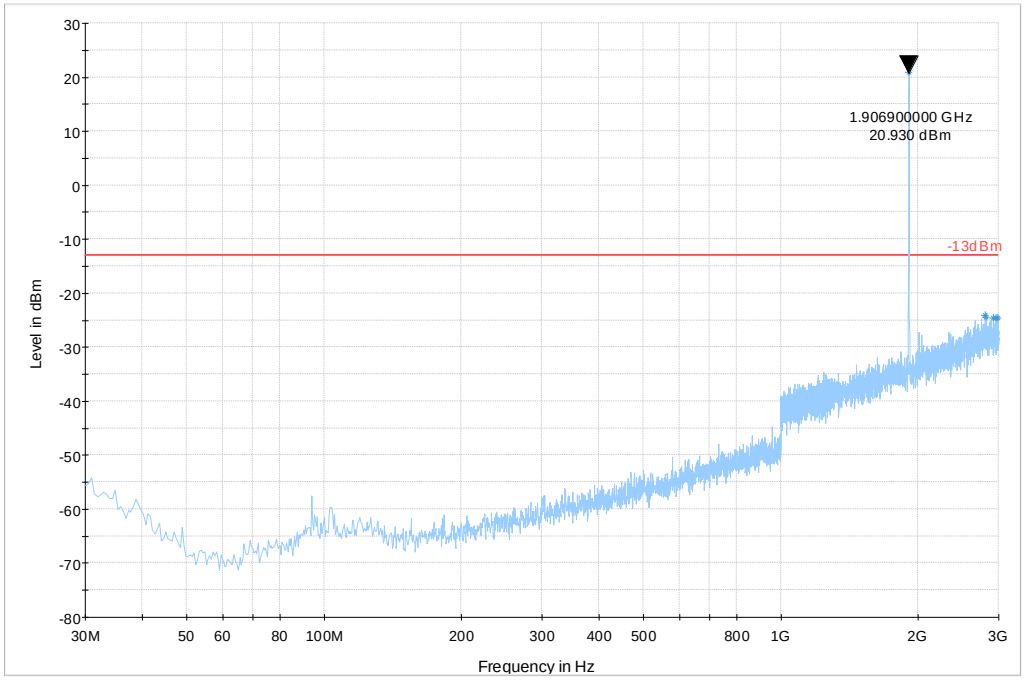
Test results 30MHz - 3GHz – Low Channel (UMTS-Band 2)



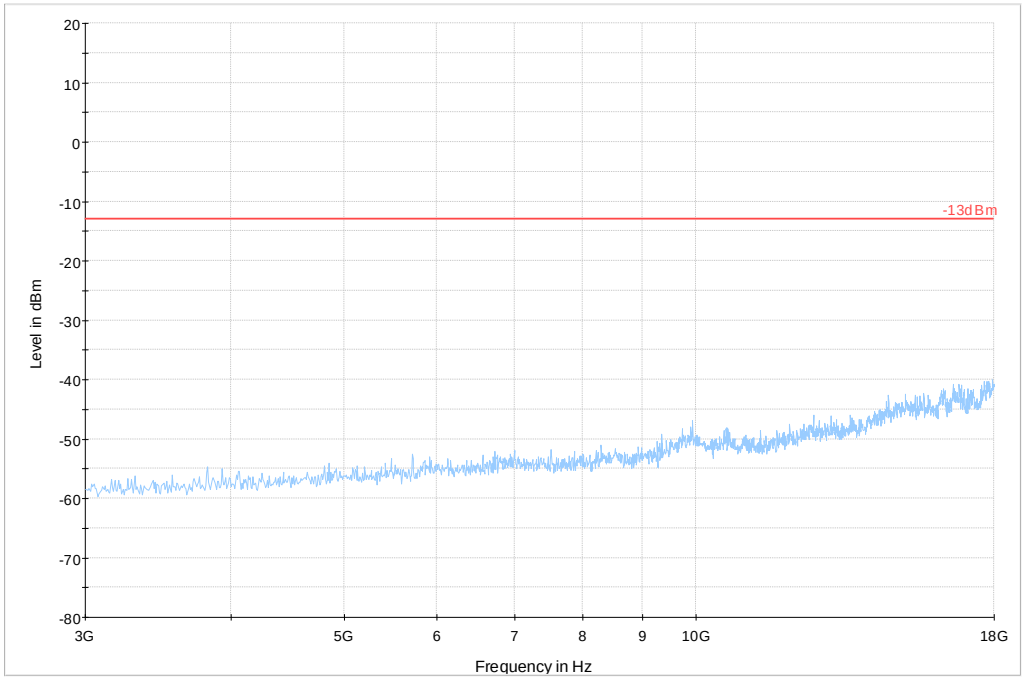
Test results 30MHz - 3GHz – Mid Channel (UMTS-Band 2)



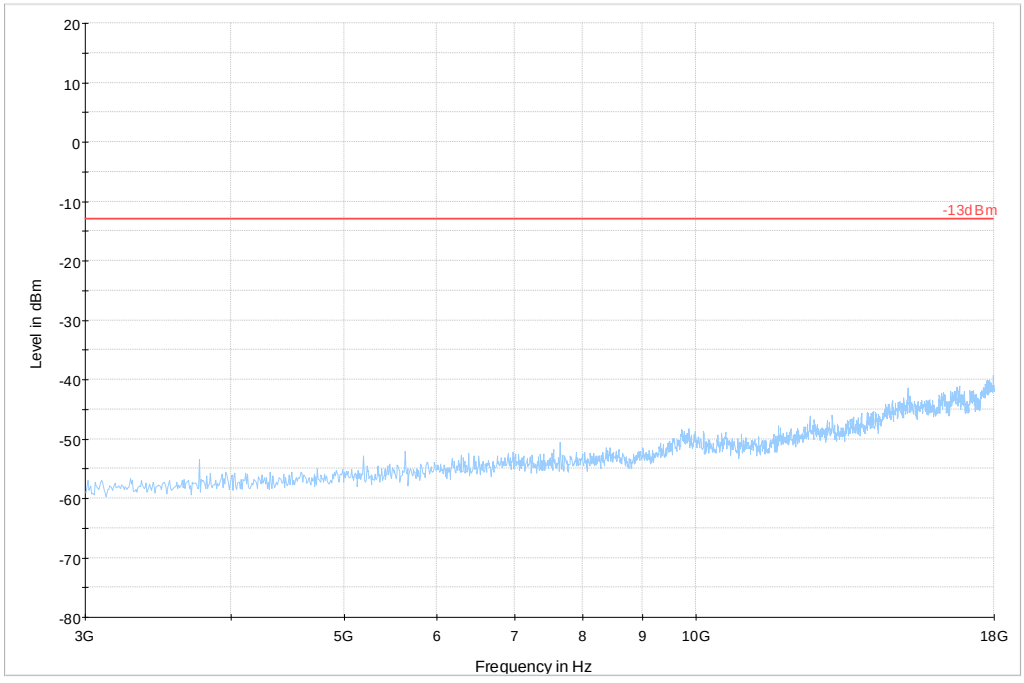
Test results 30MHz - 3GHz – High Channel (UMTS-Band 2)



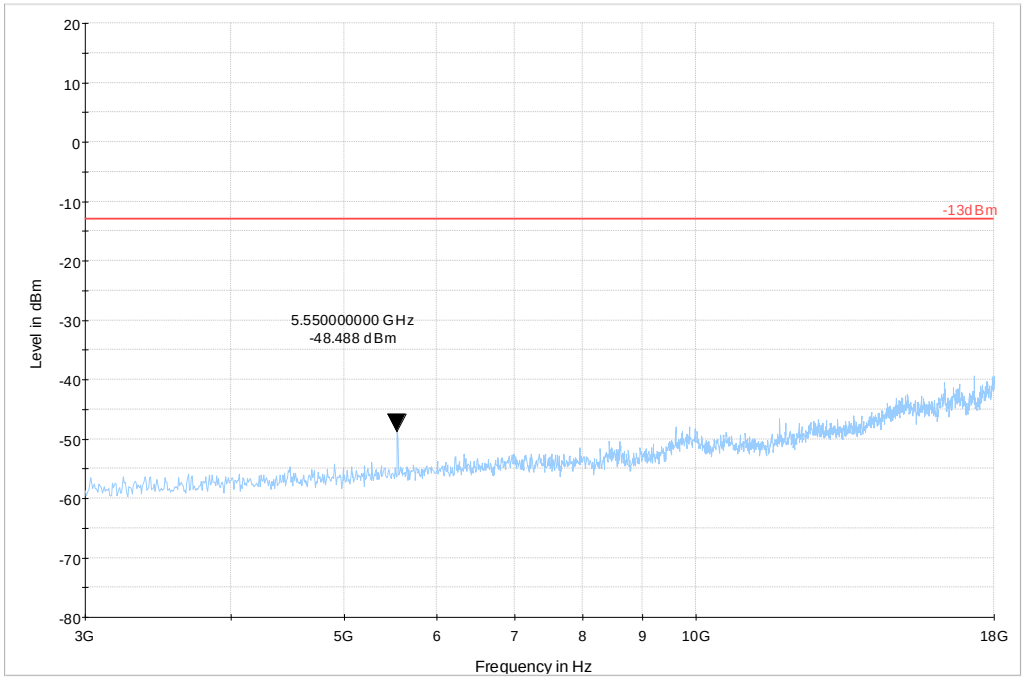
Test results 3GHz - 18GHz – Low Channel (UMTS-Band 2)



Test results 3GHz - 18GHz – Mid Channel (UMTS-Band 2)

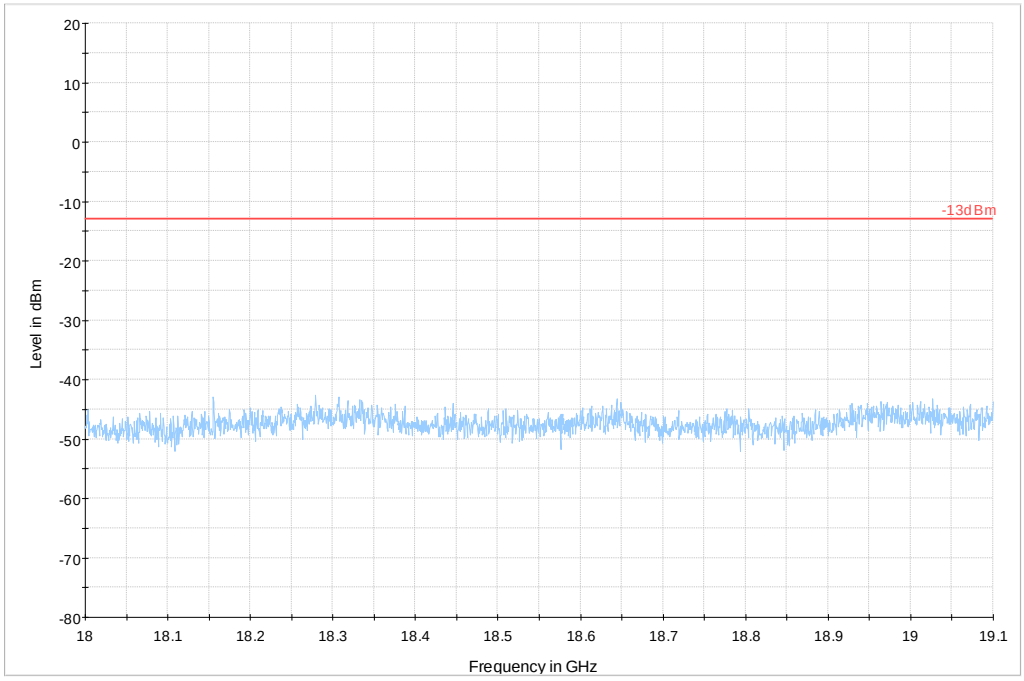


Test results 3GHz-18GHz – High Channel (UMTS-Band 2)



-13dBm Preview Result 1-PK+

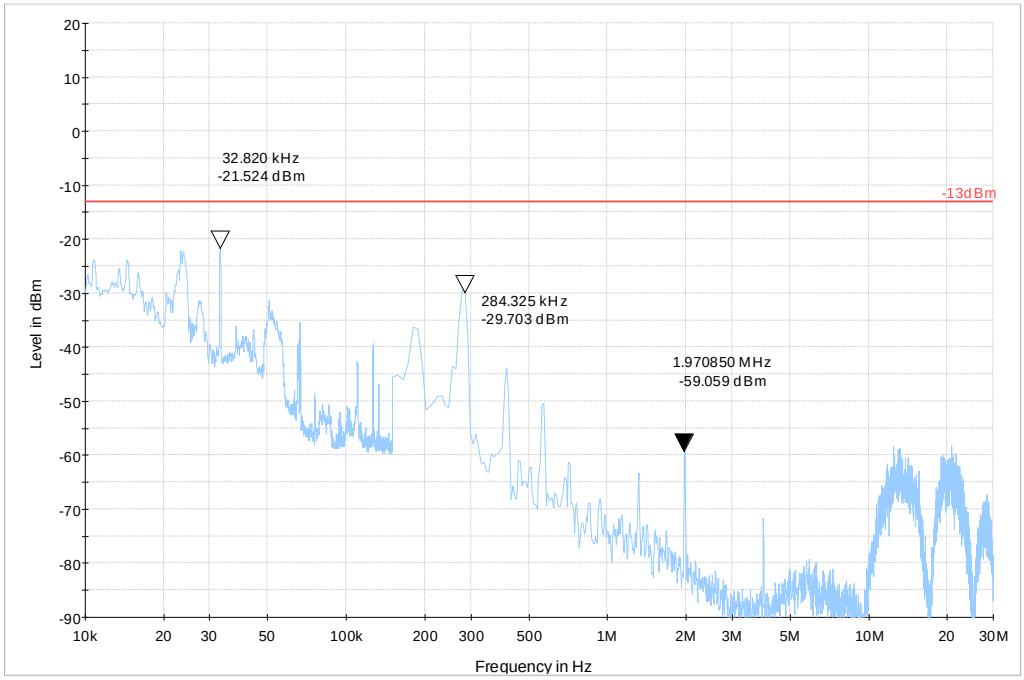
Test results 18GHz – 19.1GHz– Mid Channel (UMTS-Band 2)



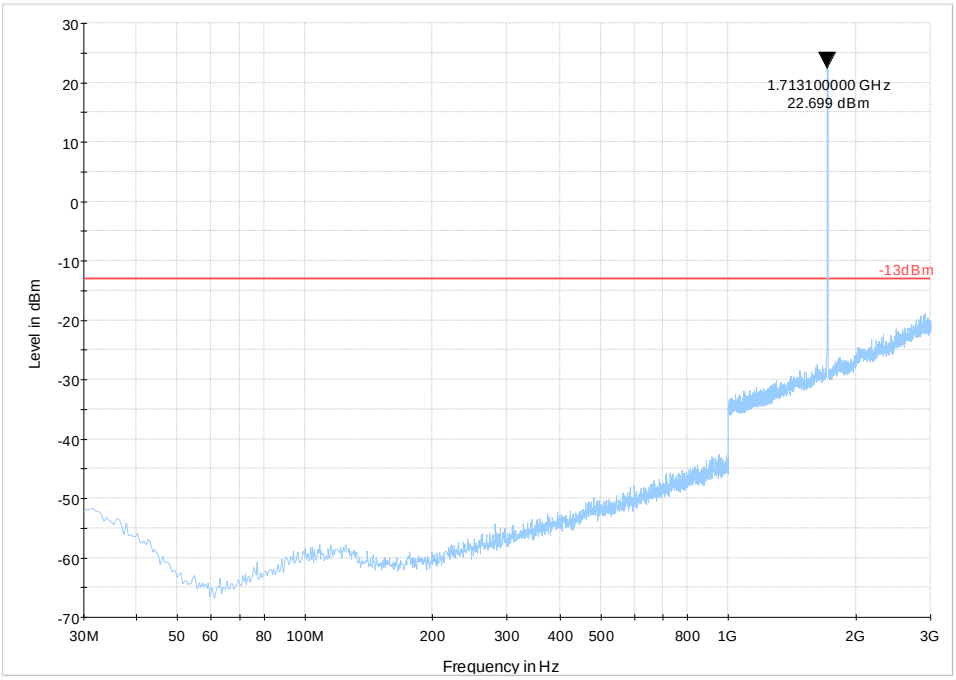
-13dBm Preview Result 1-PK+

Radiated Spurious Emissions (UMTS Band 4) Tx:

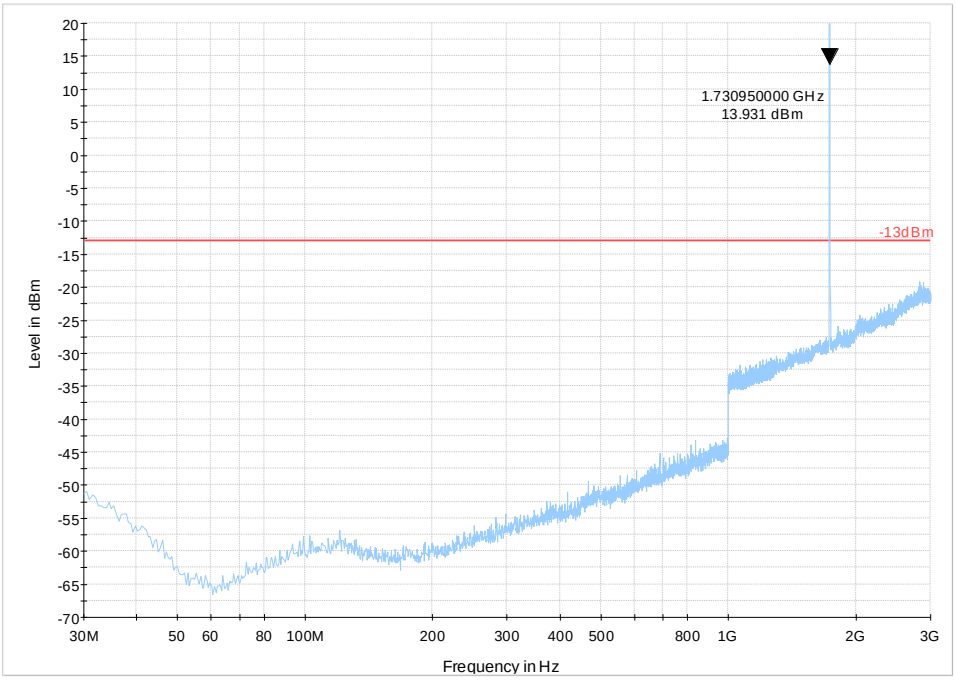
Test results 9 kHz-30 MHz – Mid Channel (UMTS-Band 4)



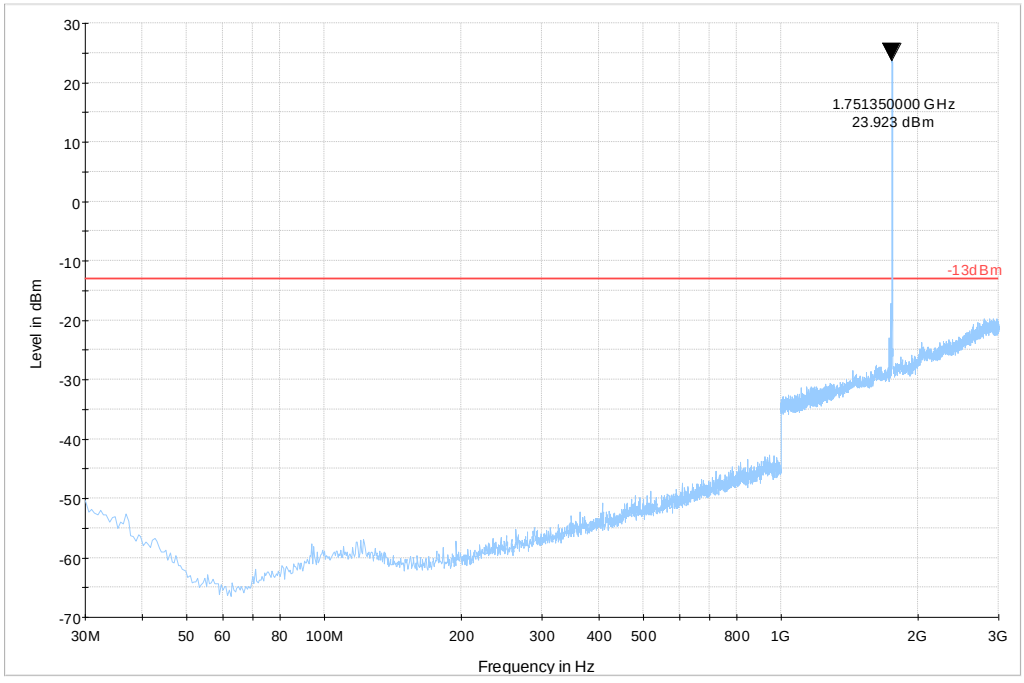
Test results 30MHz - 3GHz – Low Channel (UMTS-Band 4)



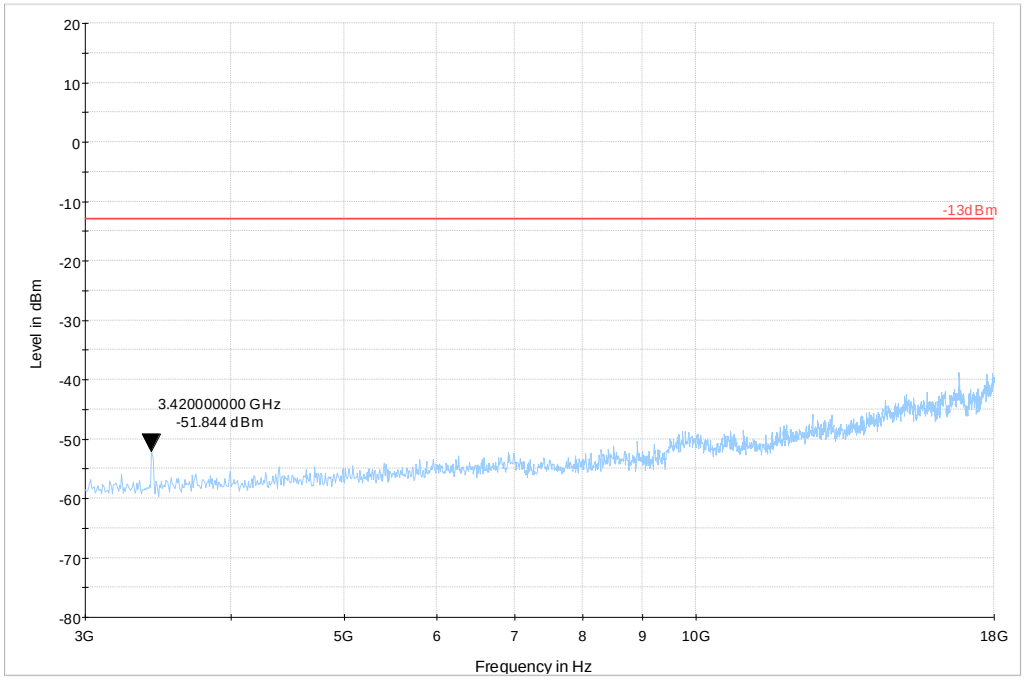
Test results 30MHz - 3GHz – Mid Channel (UMTS-Band 4)



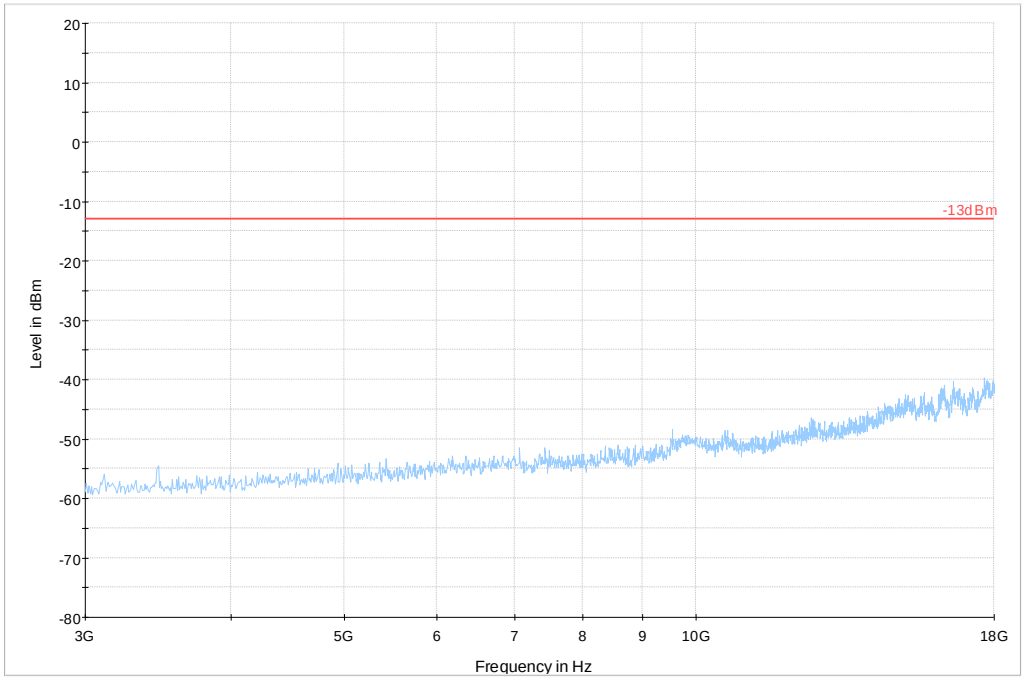
Test results 30MHz - 3GHz – High Channel (UMTS-Band 4)



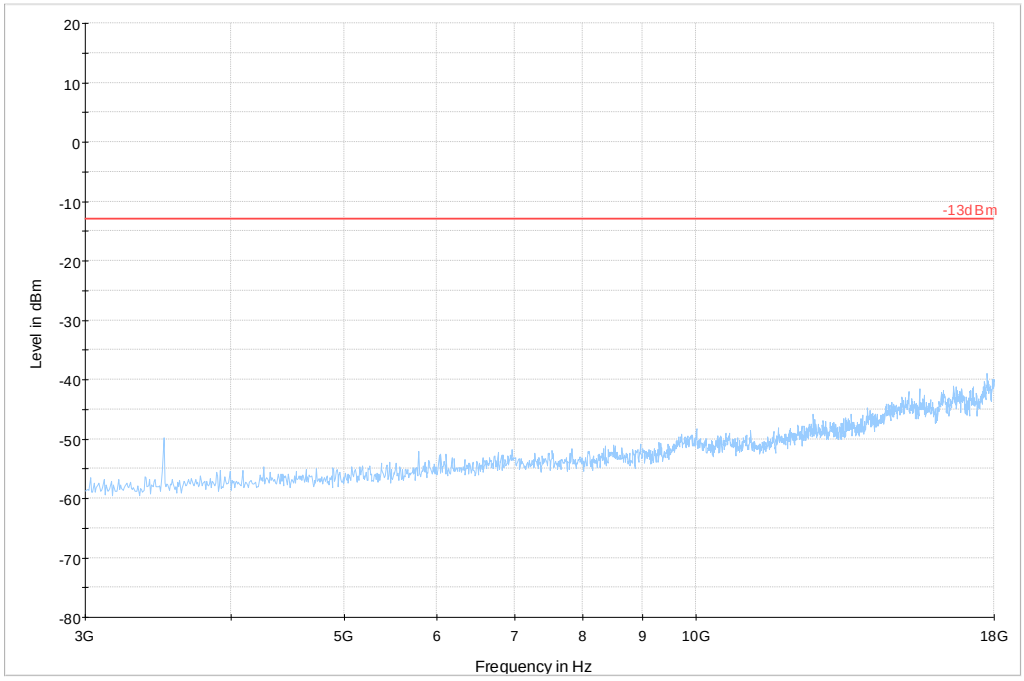
Test results 3GHz - 18GHz – Low Channel (UMTS-Band 4)



Test results 3GHz - 18GHz – Mid Channel (UMTS-Band 4)



Test results 3GHz-18GHz – High Channel (UMTS-Band 4)

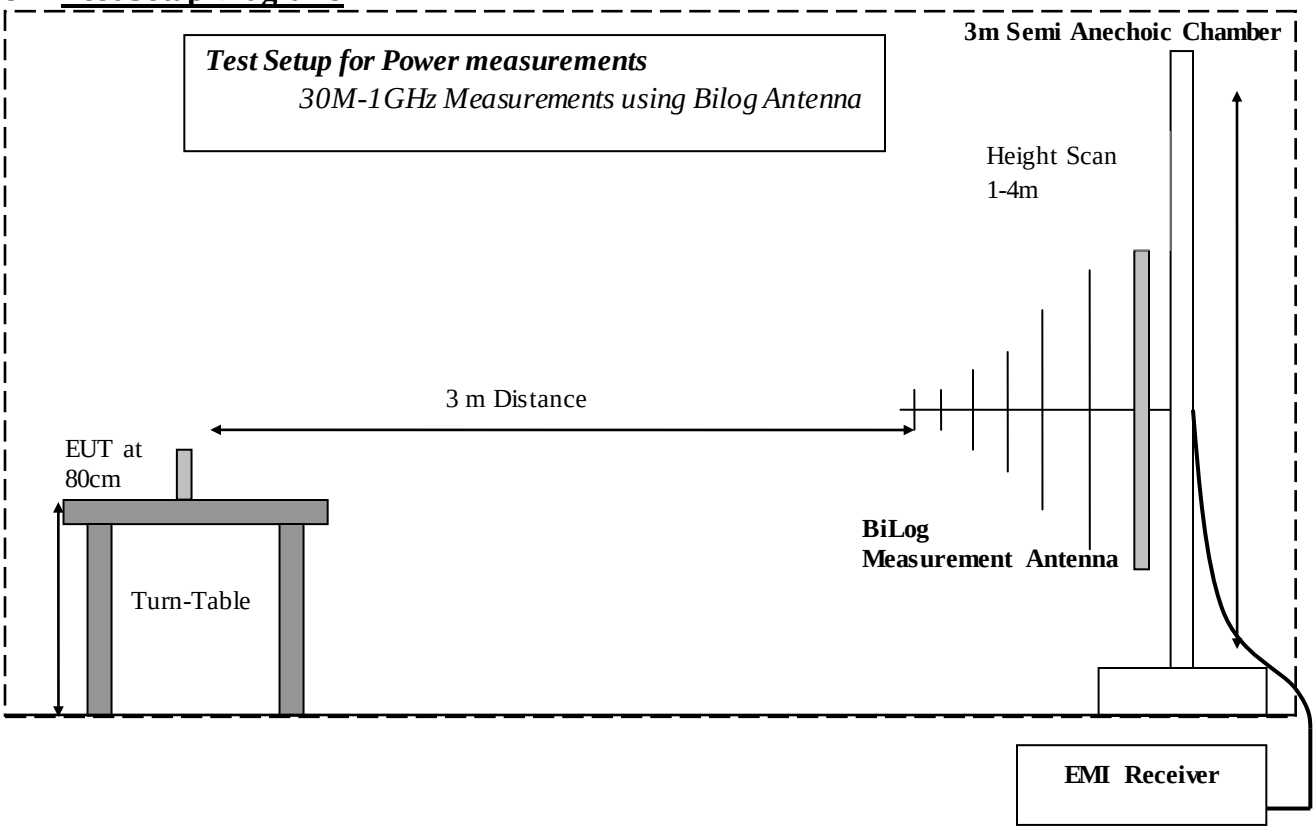


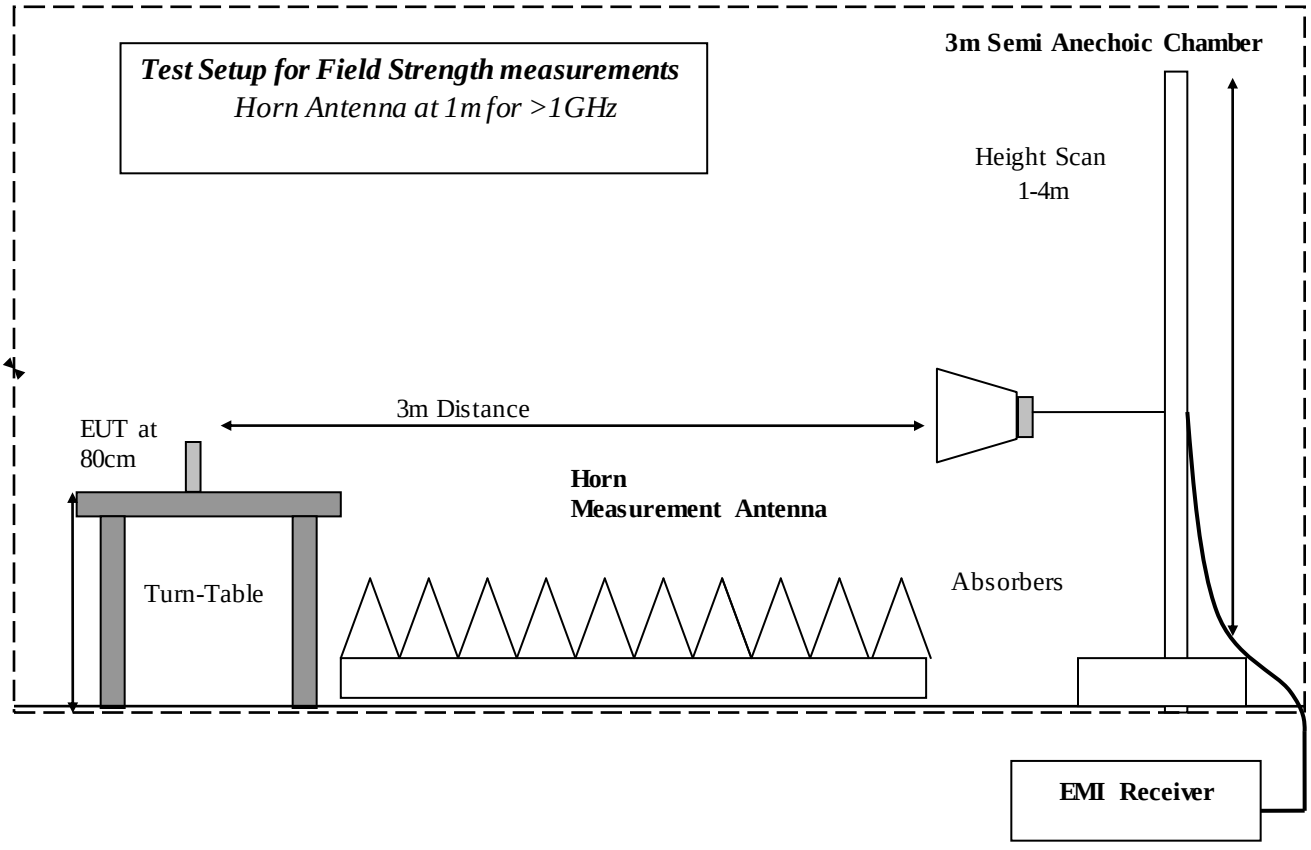
7 Test Equipment and Ancillaries used for tests

Equipment Name	Manufacturer	Type/Model	Serial No.	Cal Date	Cal Interval	Next cal date
3m Semi- Anechoic Chamber:						
Spectrum Analyzer	Rohde und Schwarz	FSU 26	200302	6/2013	2 years	6/2015
Spectrum Analyzer	Rohde und Schwarz	FSV 40	0547	7/2014	2 years	7/2016
Receiver	Rohde und Schwarz	ESR3	101663	2/2013	2 years	2/2015
LISN	Rohde und Schwarz	ESV 216	101129	1/2013	2 years	1/2015
Radio Communications Tester	Rohde and Schwarz	CMU 200	121672	7/2013	2 years	7/2015
Log Periodic Antenna	Rohde and Schwarz	HL 050	100515	4/2013	3 year	4/2016
Ultralog Antenna	Rohde and Schwarz	HL 562	100495	2/2012	3 year	2/2015
Double-ridge Horn Antenna (1G-18G)	ETS-Lindgren	3117-PA	00167061	7/2014	3 year	7/2017
Double-ridge Horn Antenna (18G-40G)	ETS-Lindgren	3116C-PA	00166821	7/2014	3 year	7/2017
Loop Antenna	ETS-Lindgren	6512	00164698	7/2014	3 year	7/2017
Open Switch Control Unit	Rohde and Schwarz	OPS 130	10085	n/a		
Extention Unit Open Switch Control Unit	Rohde and Schwarz	OSP 150	10086	n/a		
Turn Table TT	Maturo	1.5 SI	TT 1.5SI/204/60709 10	n/a		
Compact antenna Mast	Maturo	CAM 4.0-P	CAM4.0-P/067/6000910	n/a		
Multiple Control Unit	Maturo	MCU	2140910	n/a		
Pre-Amplifier	Rohde and Schwarz	TS-PR 18	100072	Part of the system calibration		
High Pass Filter	Mini-Circuits	SHP-1200+	RUU11201224			
High Pass Filter	Wainwright Instr.	WHKX 3.0/18	109			

Calibration status valid at the time of testing.
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.

8 Test Setup Diagrams





9 Revision History

Date	Report Name	Changes to report	Report prepared by
11-03-2014	EMC_EMBED_034_14001_FCC22_24_WWAN	First version	M.Anees
11-13-2014	EMC_EMBED_034_14001_FCC22_24_WWAN_rev1	Removed references to IC/RSS. Added part 27 to the report name	M.Anees
1-20-2015	EMC_EMBED_034_14001_FCC22_24_WWAN_rev2	Added RF cable loss for UFL to SMA (manufacturer specified) to power readings.	M.Anees