



FCC/IC Test Report

FOR:

Model Name: TL2603GR, 3G2060R, TL2603G, 3G2060

Alarm communicator for DSC Power Series Panels

FCC ID: F53123G260R

IC ID: 160A-3G260R

47 CFR Part 2, 22, 24

RSS-132 Issue 2

RSS-133 Issue 5

TEST REPORT #: EMC_TYCO_043_12001_WWAN

DATE: 2012-04-18



**FCC listed:
A2LA Accredited**

**IC recognized #
3462B-1**

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

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1 Assessment

The following device was tested against the applicable criteria specified in FCC rules Parts 2, 22 and 24 of Title 47 of the Code of Federal Regulations and Industry Canada Standards RSS 132 and RSS 133 and no deviations were ascertained during the course of the tests performed.

Company	Description	Model #
Tyco Safety Products	Alarm communicator for DSC Power Series Panels	TL2603GR, 3G2060R, TL2603G, 3G2060

Responsible for Testing Laboratory:

2012-04-18	Compliance	Sajay Jose (Test Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2012-04-18	Compliance	Tunji Yusuf (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 Test Report

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Department:	Compliance
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Telephone:	+1 (408) 586 6200
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Test Lab Director:	Heiko Strehlow
Responsible Project Leader:	Tunji Yusuf

2.2 Identification of the Client

Applicant's Name:	Tyco Safety Products
Street Address:	3301 Langstaff Road
City/Zip Code	Concord ON L4K 4L2
Country	Canada
Contact Person:	Dan Nita
Phone No.	905-760-3000
Fax:	905-760-3020
e-mail:	dnita@dsc.com

2.3 Identification of the Manufacturer

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

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name:	TL2603GR, 3G2060R, TL2603G, 3G2060
Model No:	TL2603GR, 3G2060R, TL2603G, 3G2060
Product Type:	Alarm communicator for DSC Power Series Panels. Includes IP interface for redundant/back-up communication over 10/100BaseT Ethernet and RS422 Interface for connection to 3rd party equipment.
Hardware Revision :	UA601 Rev 03
Software Revision :	3.0
FCC-ID:	F53123G260R
IC-ID:	160A-3G260R
Frequency:	GSM 850: 824.2-848.8MHz; PCS 1900: 1850.2-1909.8MHz FDD V: 826.4-846.6MHz; FDD II: 1852.4-1907.6MHz
Type(s) of Modulation:	GMSK; 8-PSK; QPSK; 16QAM
Number of channels:	GSM850: 125 and PCS 1900: 300 FDD II: 278/ FDD V: 103
Antenna Type:	GSM quad band (824MHz-960MHz, 1710MHz-1990MHz) 1-3dBi Gain
Power Supply:	DC Battery (Min: 9.5 Nom: 13.8 Max: 14.5)
Temperature Range:	-10°C to 55°C

3.2 Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	Model	HW Version	SW Version
1	EUT1	TL2603GR	UA601 Rev 03	3.0

4 Subject of Investigation

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT as specified by requirements listed in the following test standards:

- 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
- RSS 132- Issue 2: Spectrum management and telecommunication policy- Radio Standards Specifications Cellular telephones employing new technologies operating in the bands 824-849MHz and 869-894MHz
- RSS 133- Issue 5: Spectrum management and telecommunication policy- Radio Standards Specifications- 2GHz personal communication services

This test report is to support a request for new equipment authorization for modular approval under the FCC ID: **F53123G260R** and IC ID: **160A-3G260R**.

There are 4 models under this FCC/IC ID- TL2603GR, 3G2060R, TL2603G and 3G2060. They're all identical in hardware (UA601 Rev. 03) and software Ver 3.0.

The only differences between the four different marketing model names are:

- Model TL2603GR is equipped with an IP and a 3G alarm communication channel and can connect to a third party application through an RS-422 interface,
- Model 3G2060R is similar to TL2603GR model but it is equipped only with 3G communication channel (IP circuitry is depopulated),
- Model TL2603G is equipped with an IP and a 3G alarm communication channel identical to the TL2603GR model but it does not have the RS-422 interface populated.
- Model 3G2060 is similar to TL2603GR model but it is equipped only with a 3G communication channel and it does not have the RS-422 interface populated.

Since the models are identical in terms of RF behavior, only the most populated version, TL2603GR was tested.

The EUT carries a pre-certified GSM/EDGE/UMTS module with FCC ID: RI7HE863NA. Since the module design is not modified and is only integrated in the EUT, only radiated measurements were performed at Cetecom Inc. This test report contains full radiated testing as per FCC 22H/24E and RSS-132/133.

All FCC 22H/24E and RSS-132/133 conducted measurements are covered under the module certification data.

5 Summary of Measurement Results

850 Band:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §22.913 (a) RSS132 4.4	RF Output Power	Nominal	GSM 850	■	□	□	□	Complies
			UMTS Band V	■	□	□	□	Complies
§2.1055 §22.355 RSS132 4.3	Frequency Stability	Nominal	GSM 850	□	□	□	■	-
			UMTS Band V	□	□	□	■	-
§2.1049 §22.917(b) RSS132 4.2	Occupied Bandwidth	Nominal	GSM 850	□	□	□	■	-
			UMTS Band V	□	□	□	■	-
§2.1051 §22.917 RSS132 4.5	Band Edge Compliance	Nominal	GSM 850	□	□	□	■	-
			UMTS Band V	□	□	□	■	-
§2.1051 §22.917 RSS132 4.5	Conducted Spurious Emissions	Nominal	GSM 850	□	□	□	■	-
			UMTS Band V	□	□	□	■	-
§2.1053 §22.917 RSS132 4.5	Radiated Spurious Emissions	Nominal	GSM 850	■	□	□	□	Complies
			UMTS Band V	■	□	□	□	Complies

Note: NA= Not Applicable;

NP= Not Performed. Since leveraged from module certification data.

1900 Band:

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§2.1046 §24.232 (a) RSS133 6.4	RF Output Power	Nominal	GSM 1900	■	□	□	□	Complies
			UMTS Band II	■	□	□	□	Complies
§2.1055 §24.235 RSS133 6.3	Frequency Stability	Nominal	GSM 1900	□	□	□	■	-
			UMTS Band II	□	□	□	■	-
§2.1049 §24.238(b) RSS133 6.2	Occupied Bandwidth	Nominal	GSM 1900	□	□	□	■	-
			UMTS Band II	□	□	□	■	-
§2.1051 §24.238 RSS133 6.5	Band Edge Compliance	Nominal	GSM 1900	□	□	□	■	-
			UMTS Band II	□	□	□	■	-
§2.1051 §24.238 RSS133 6.5	Conducted Spurious Emissions	Nominal	GSM 1900	□	□	□	■	-
			UMTS Band II	□	□	□	■	-
§2.1053 §24.238 RSS133 6.5	Radiated Spurious Emissions	Nominal	GSM 1900	■	□	□	□	Complies
			UMTS Band II	■	□	□	□	Complies

Note: NA= Not Applicable;
 NP= Not Performed. Since leveraged from module certification data.

6 Measurements

6.1 RF Power Output

6.1.1 References

FCC: CFR Part 2.1046, CFR Part 22.913, CFR Part 24.232
IC: RSS-Gen Section 4.8; RSS 132 Section 4.4; RSS 133 Section 6.4

6.1.2 Measurement requirements:

6.1.2.1 FCC 2.1046: RF power output.

Power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on circuit elements as specified. The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

6.1.2.2 RSS-Gen 4.8: RF power output.

Transmitter output power measurements shall be carried out before the unwanted emissions test. The transmitter output power value, obtained from this test, serves as the reference level used to determine the unwanted emissions.

6.1.3 Limits:

6.1.3.1 FCC 22.913 (a) Effective radiated power limits.

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

6.1.3.2 FCC 24.232 (b)(c) Power limits.

(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.

6.1.3.3 RSS-132 Section 4.4

The transmitter output power shall not exceed the limits given in SRSP-503.
SRSP-503: The maximum EIRP shall be 11.5W for mobile stations.

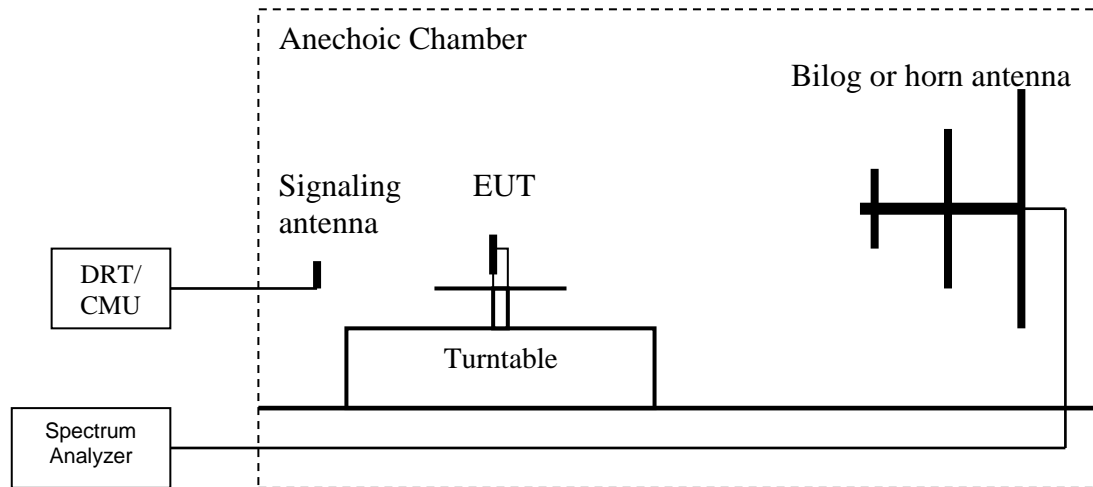
6.1.3.4 RSS-133 Section 6.4

The average equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510.

SRSP-510: Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p. In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

6.1.4 Radiated Output Power Measurement procedure

Ref: TIA-603C 2004 -2.2.17.2 Effective Radiated Power (ERP) or Effective Isotropic Radiated Power (EIRP)



1. Connect the equipment as shown in the above diagram with the EUT's antenna in center of the turn table.
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 the channel frequency. Set the analyzer to measure peak hold with the required settings.
4. Rotate the EUT 360°. Record the peak level in dBm (**LVL**).
5. Replace the EUT with a vertically 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 ERP using the following equation:
ERP (dBm) = LVL (dBm) + LOSS (dB)
8. Determine the EIRP using the following equation:
EIRP (dBm) = ERP (dBm) + 2.14 (dB)
9. 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, 7 and 8 above are performed with test software.)

6.1.5 RF Power Output 850MHz band

Limit: FCC: Nominal Peak Output Power < 38.45 dBm (7W)
IC: Nominal Peak Output Power < 40.60 dBm (11.5W)
Measurement Uncertainty (Radiated): ±3.0 dB

GSM Cellular 850 (GMSK Mode)	
Frequency (MHz)	Radiated Power
	ERP (dBm)
824.2	33.42
836.6	33.38
848.8	33.98

GSM Cellular 850 (8PSK Mode)	
Frequency (MHz)	Radiated Power
	ERP (dBm)
824.2	29.34
836.6	29.63
848.8	31.24

FDD V 850 (UMTS Mode)	
Frequency (MHz)	Radiated Power
	ERP (dBm)
826.2	27.37
836.6	27.82
846.6	29.10

6.1.5.1 Measurement Result

Pass.

6.1.6 RF Power Output 1900MHz band

Limit: Nominal Peak Output Power < 33 dBm (2W)

Measurement Uncertainty (Radiated): ±3.0 dB

GSM PCS 1900 (GMSK Mode)	
Frequency (MHz)	Radiated Power
	EIRP (dBm)
1850.2	30.73
1880	30.92
1909.8	30.90

GSM PCS 1900 (8PSK Mode)	
Frequency (MHz)	Radiated Power
	EIRP (dBm)
1850.2	30.18
1880	30.13
1909.8	31.21

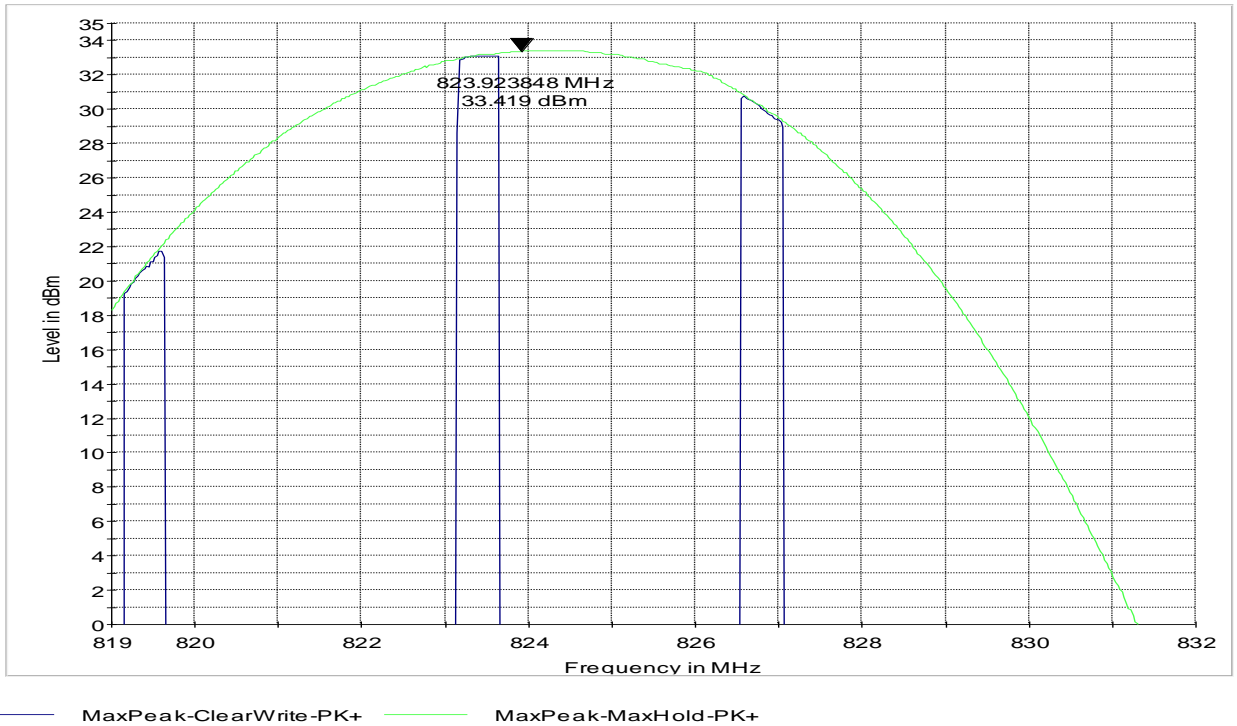
FDD II 1900 (UMTS Mode)	
Frequency (MHz)	Radiated Power
	EIRP (dBm)
1852.4	28.79
1880	28.25
1907.6	28.33

6.1.6.1 Measurement Result

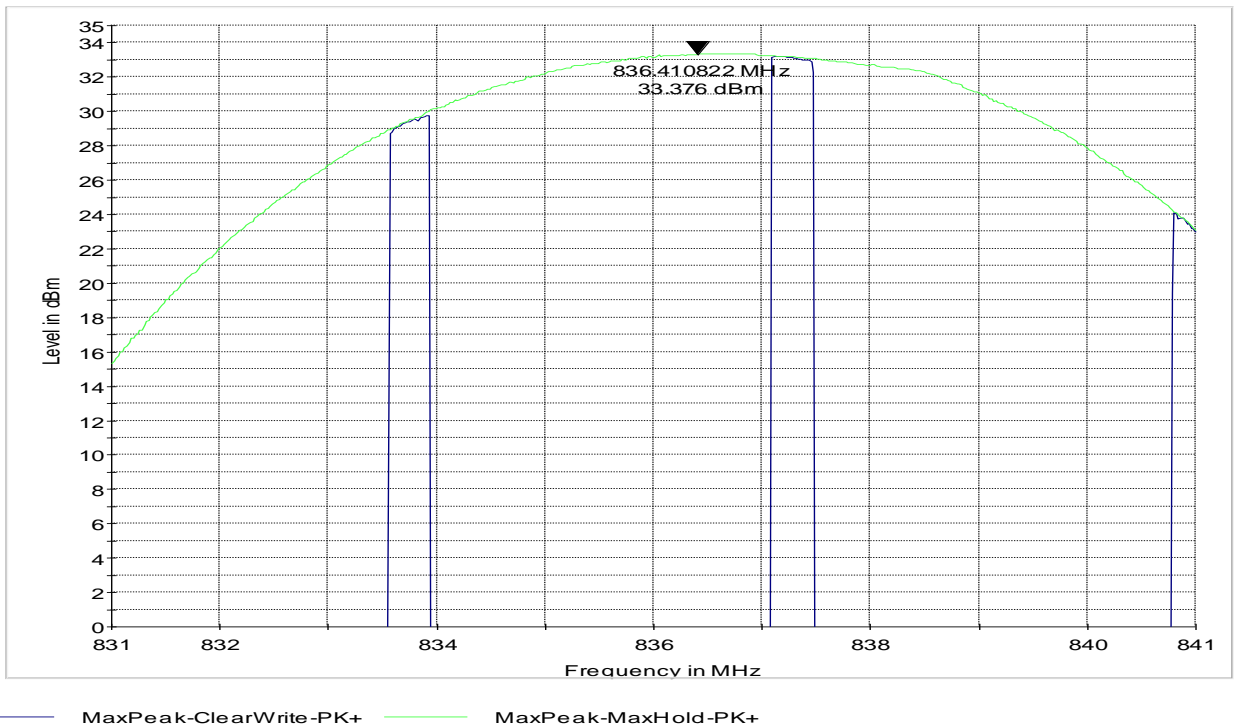
Pass.

6.1.7 Results

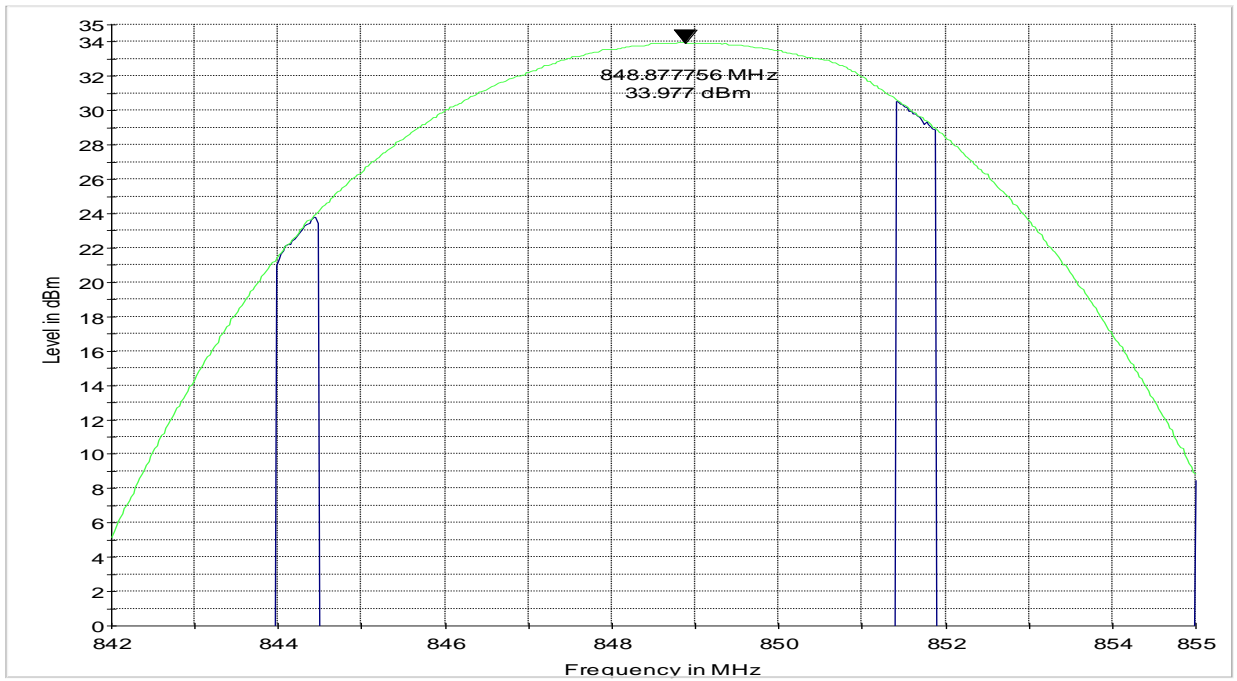
ERP (GSM 850) CHANNEL 128



ERP (GSM 850) CHANNEL 190

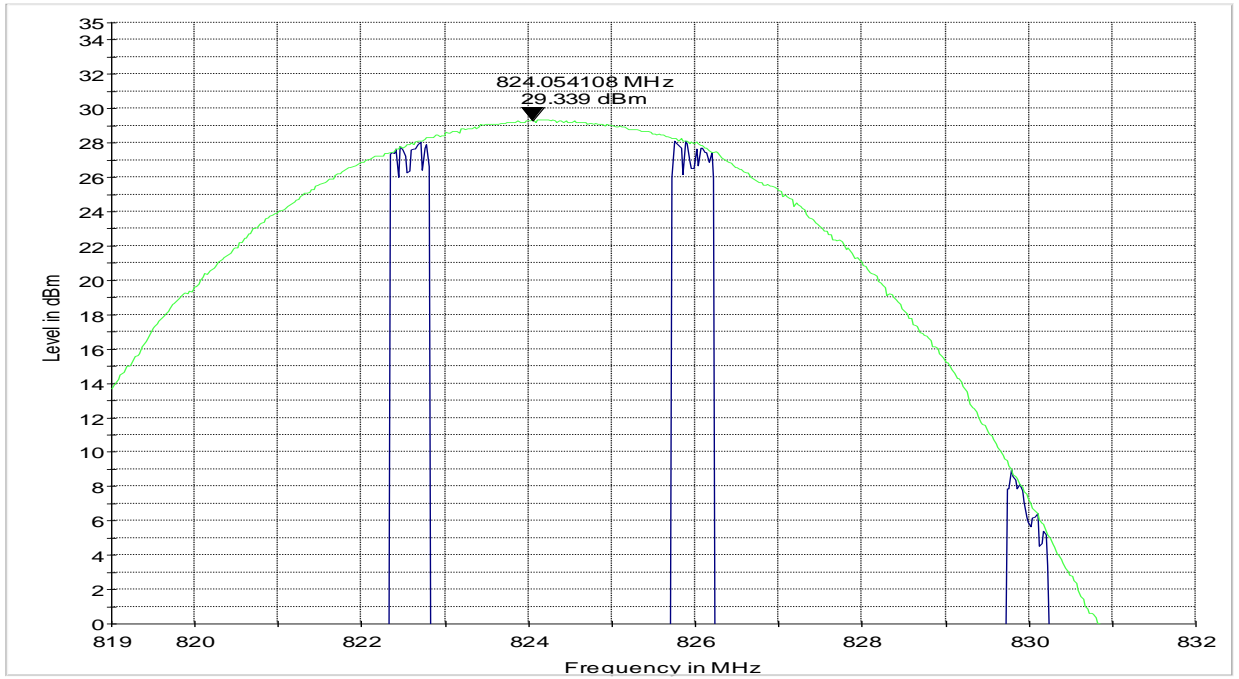


ERP (GSM 850) CHANNEL 251



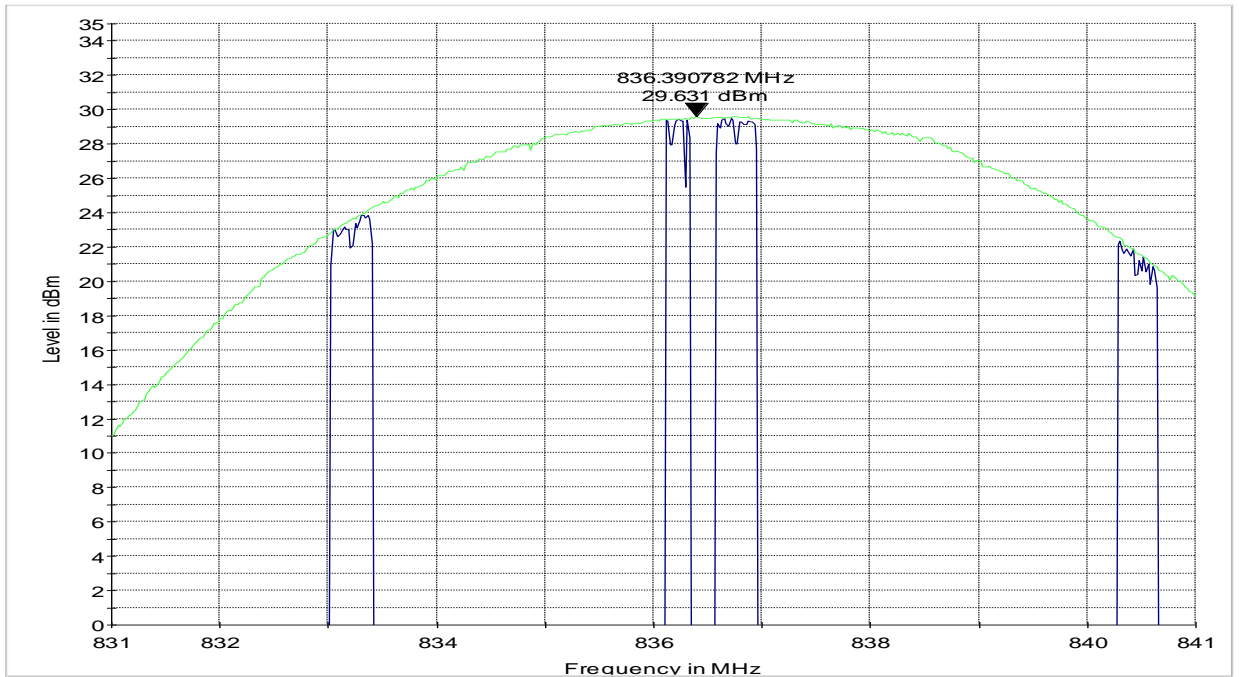
— MaxPeak-ClearWrite-PK+ — MaxPeak-MaxHold-PK+

ERP (EGPRS 850) CHANNEL 128



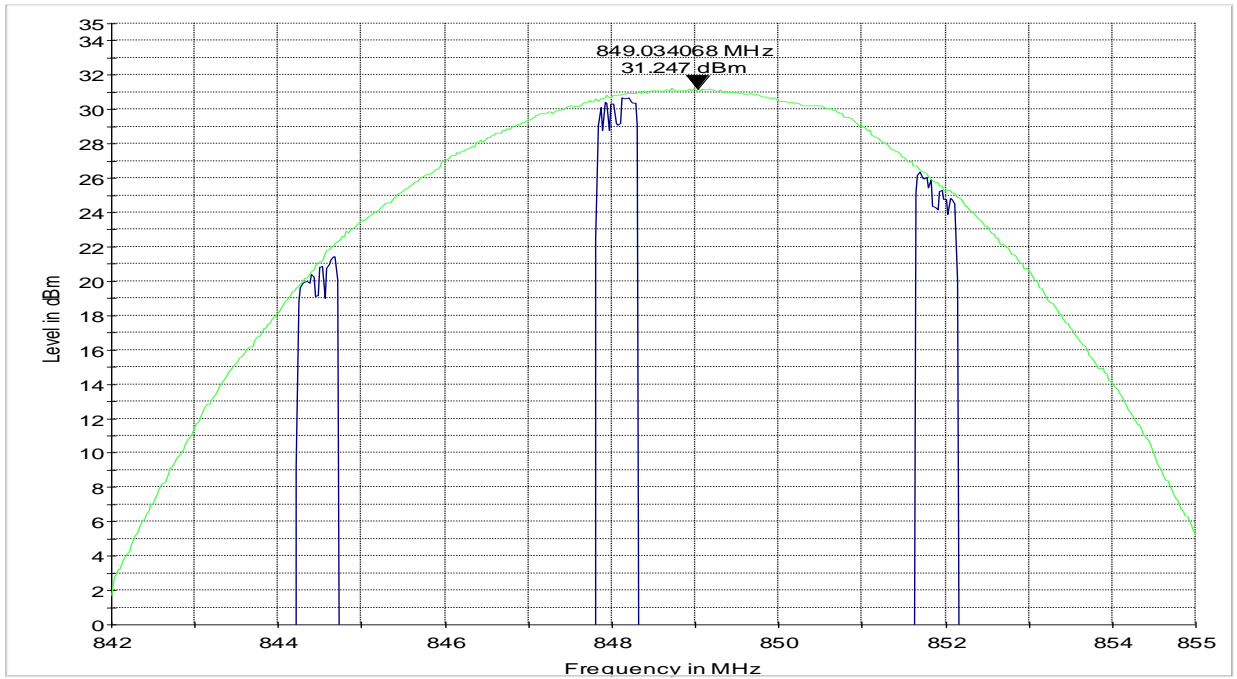
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ERP (EGPRS 850) CHANNEL 190



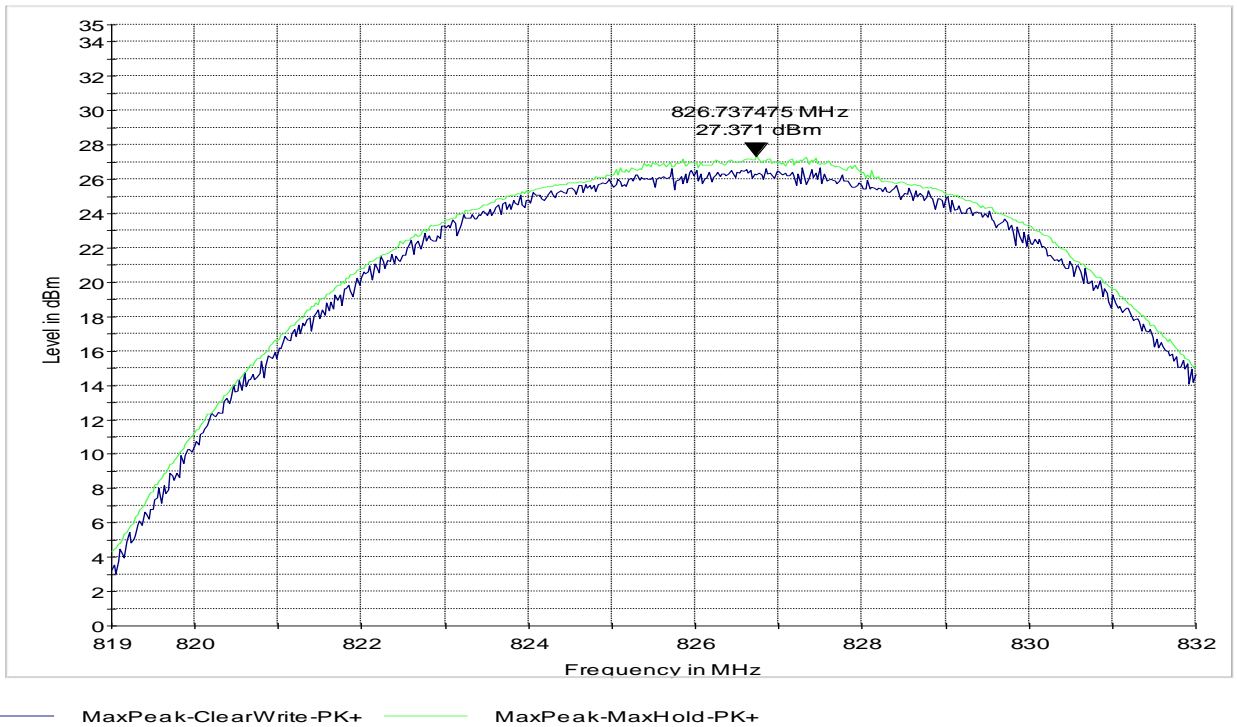
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ERP (EGPRS 850) CHANNEL 251

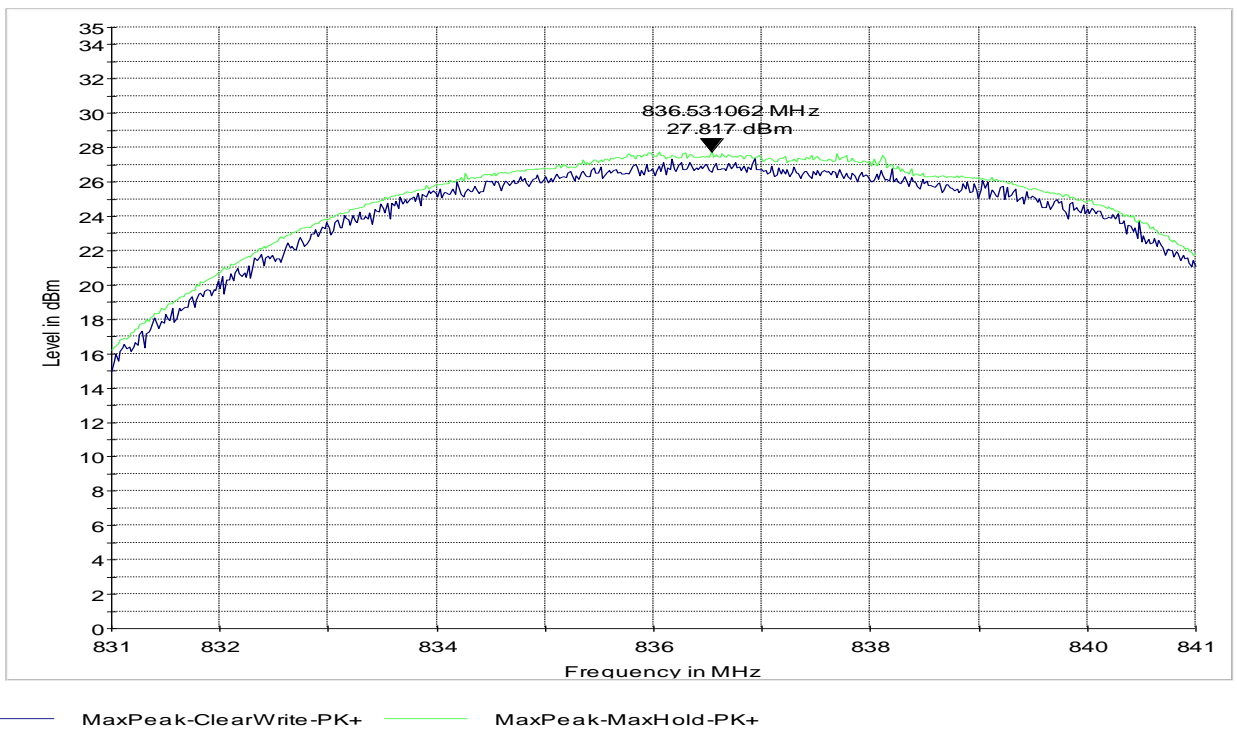


— MaxPeak-ClearWrite-PK+ — MaxPeak-MaxHold-PK+

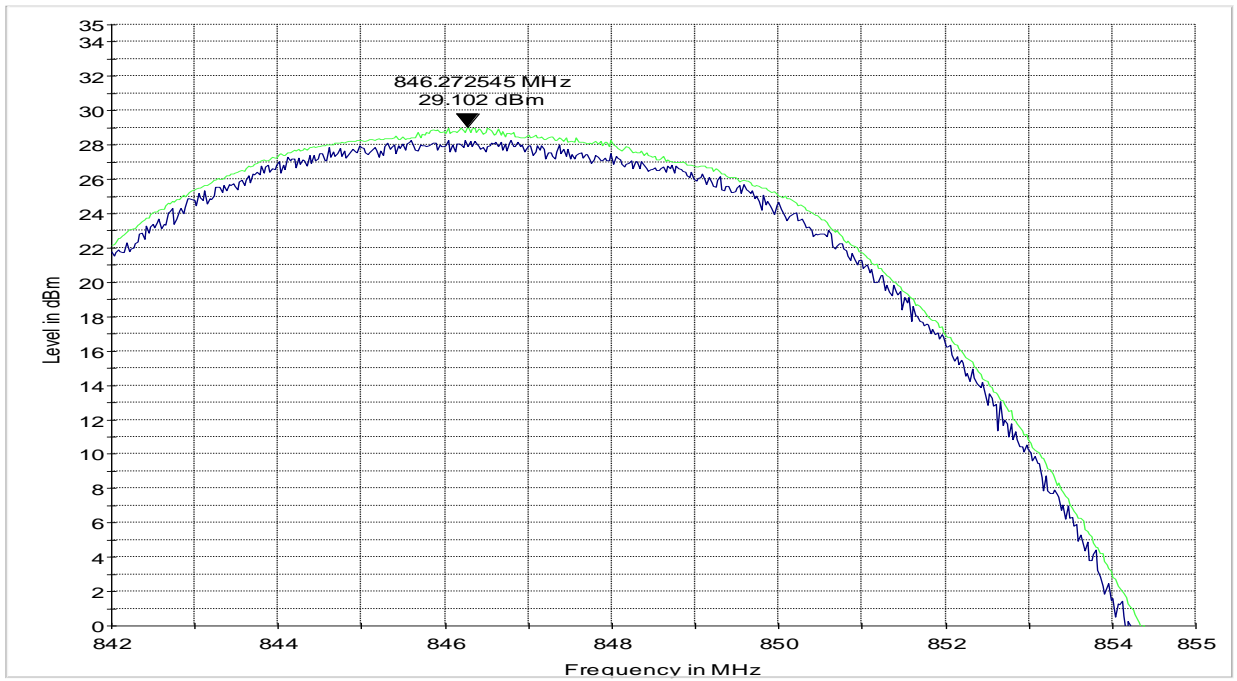
ERP (UMTS FDD5) CHANNEL 4132



ERP (UMTS FDD5) CHANNEL 4183

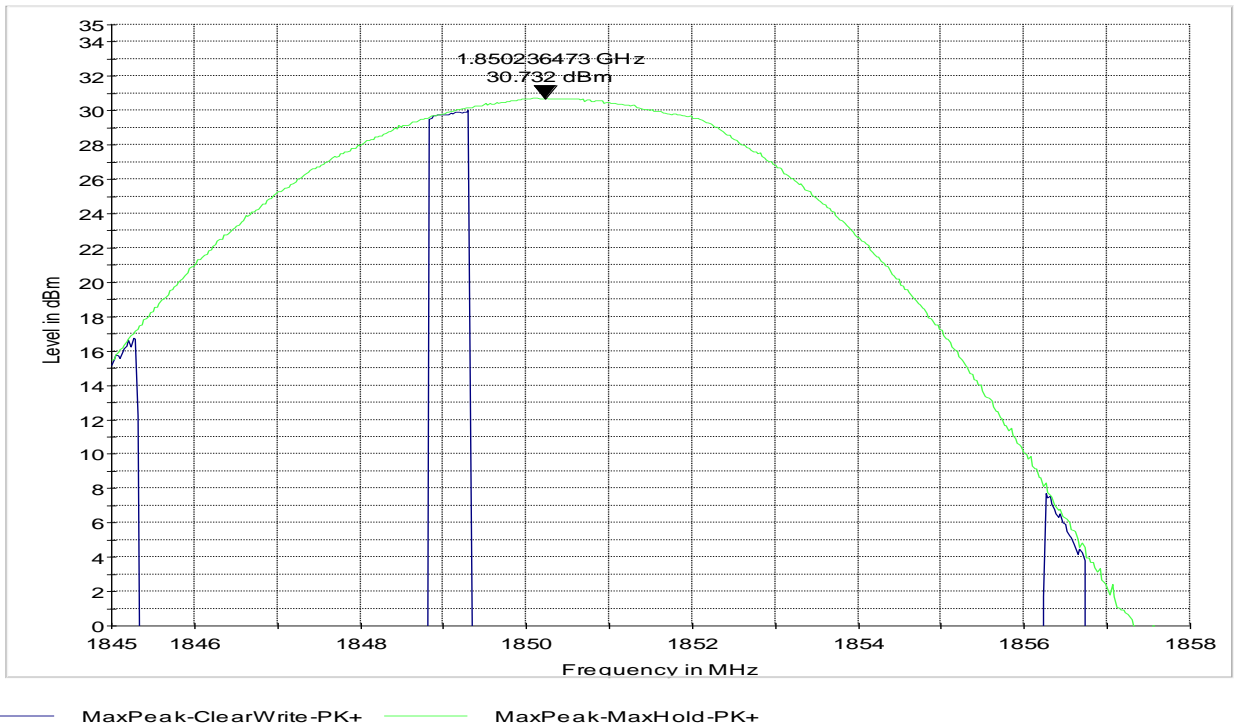


ERP (UMTS FDD5) CHANNEL 4233

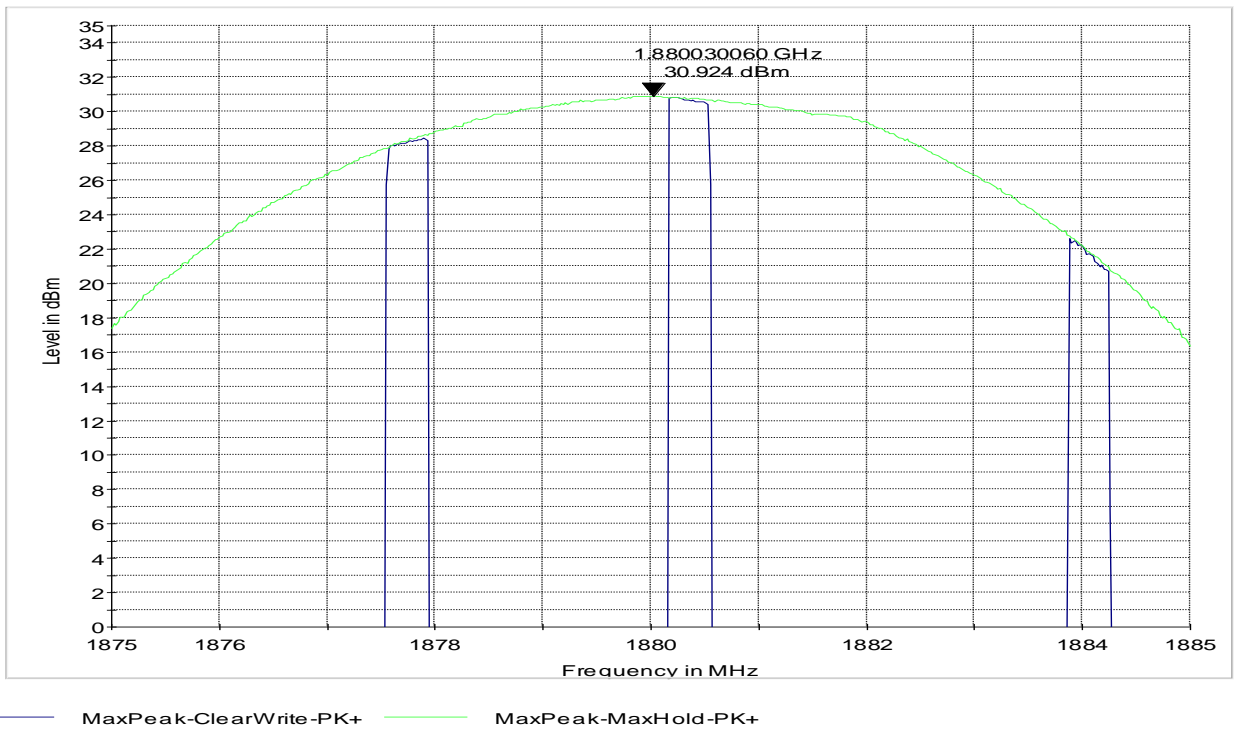


— MaxPeak-ClearWrite-PK+ — MaxPeak-MaxHold-PK+

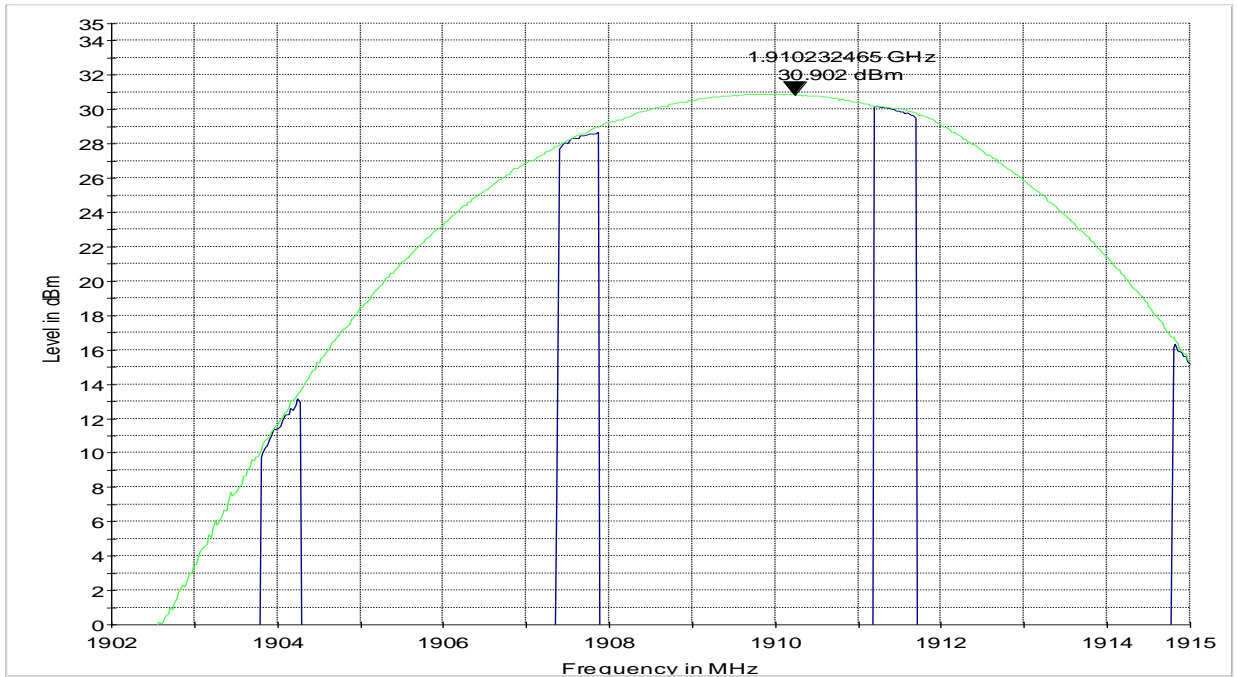
EIRP (PCS-1900) CHANNEL 512



EIRP (PCS-1900) CHANNEL 661

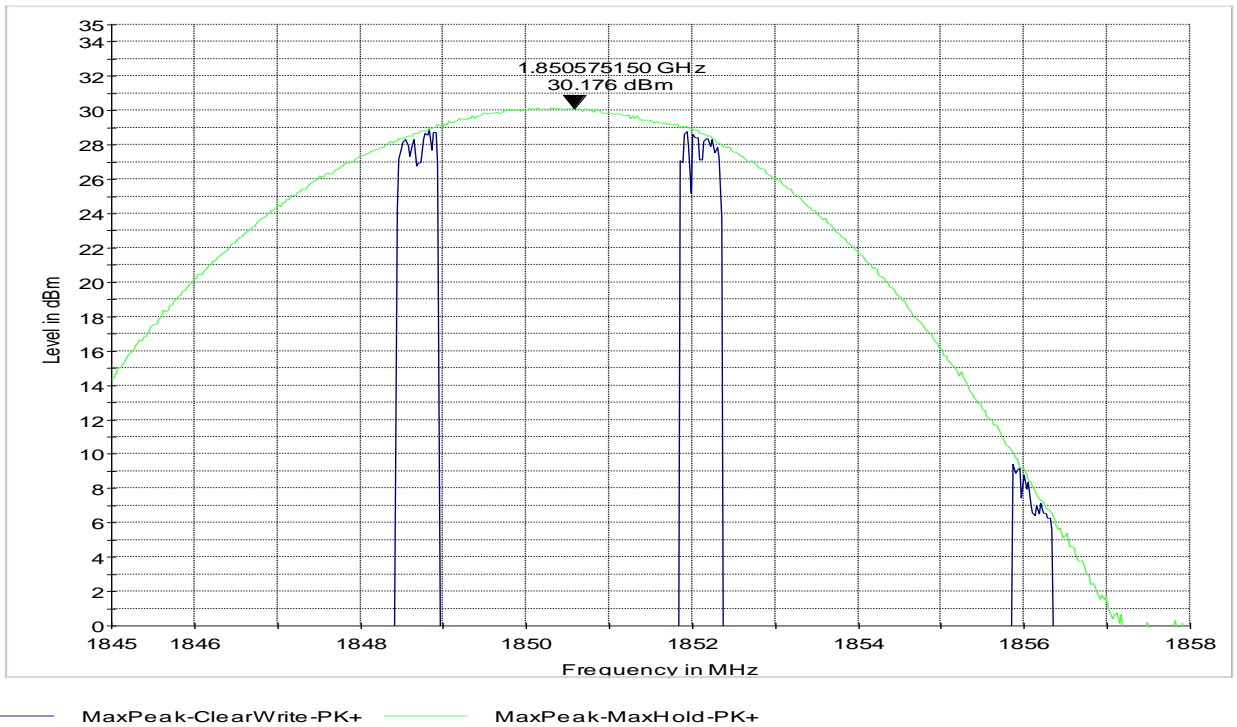


EIRP (PCS-1900) CHANNEL 810

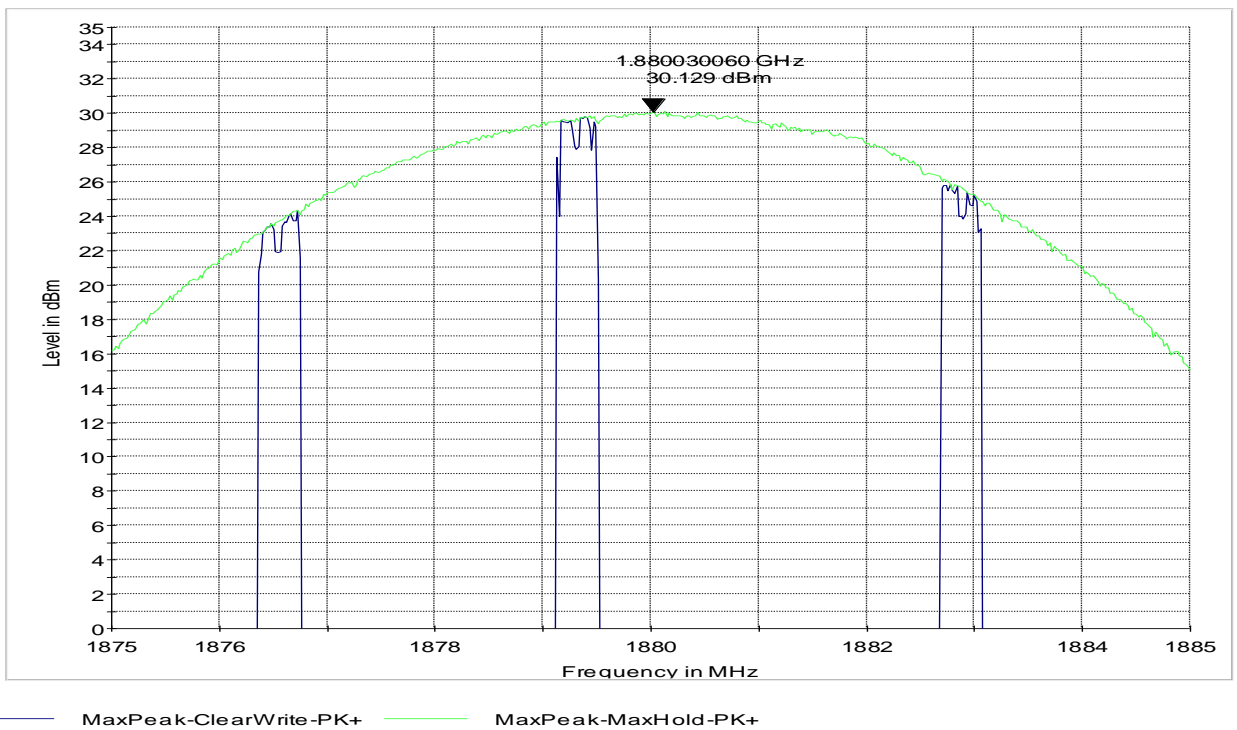


— MaxPeak-ClearWrite-PK+ — MaxPeak-MaxHold-PK+

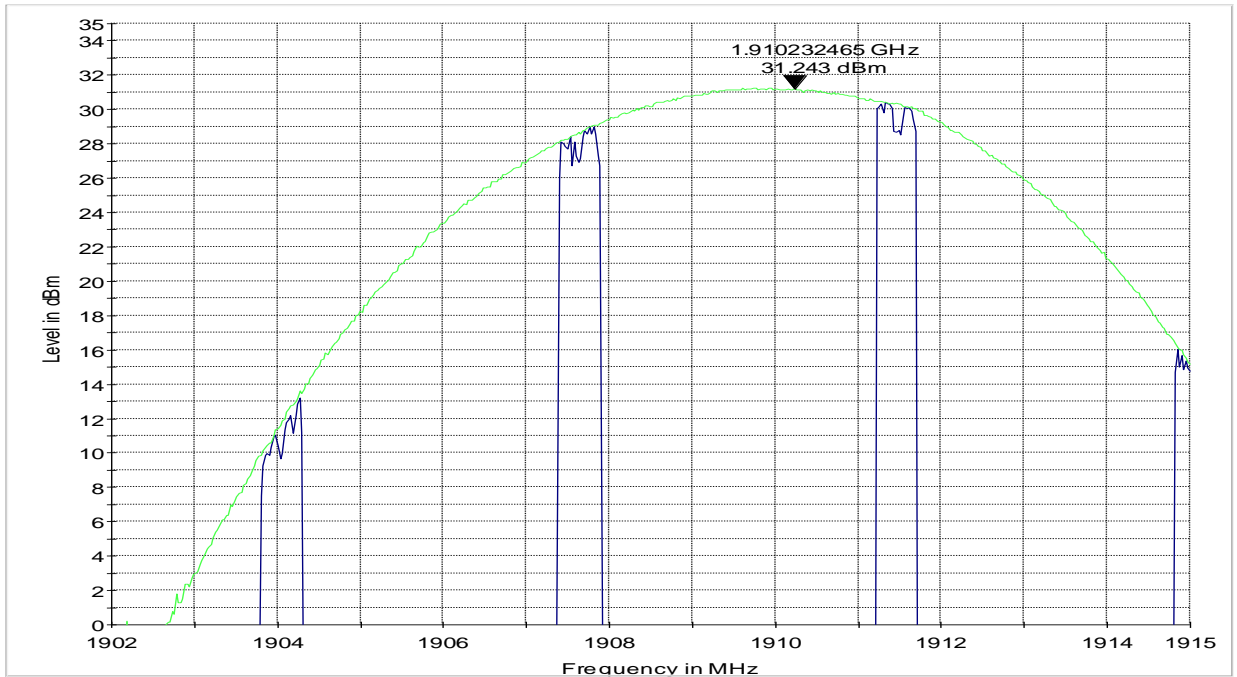
EIRP (EGPRS 1900) CHANNEL 512



EIRP (EGPRS 1900) CHANNEL 661

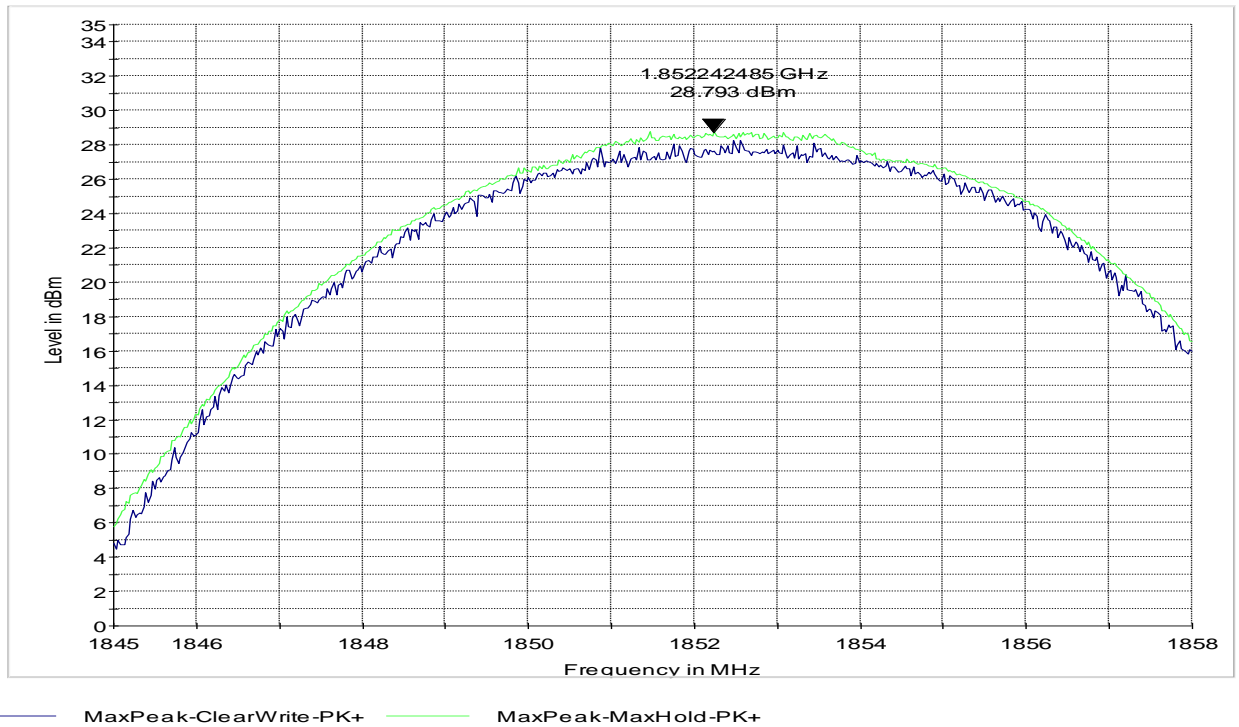


EIRP (EGPRS 1900) CHANNEL 810

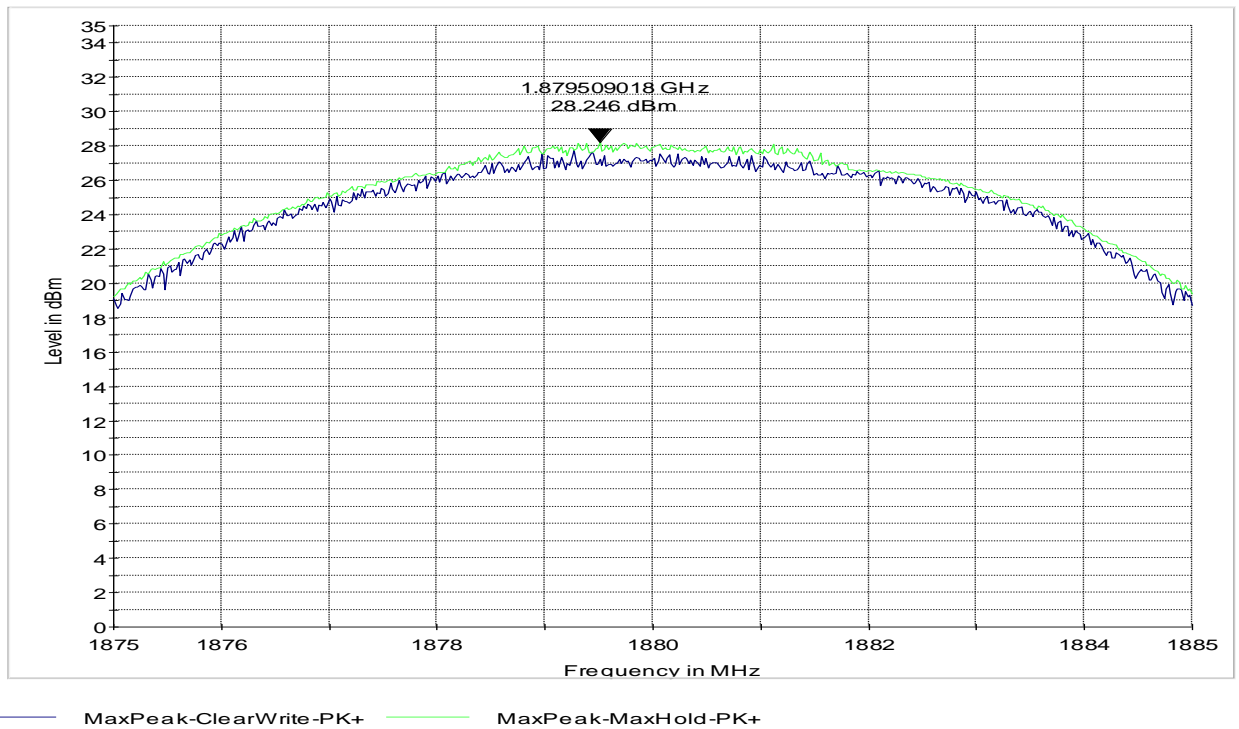


— MaxPeak-ClearWrite-PK+ — MaxPeak-MaxHold-PK+

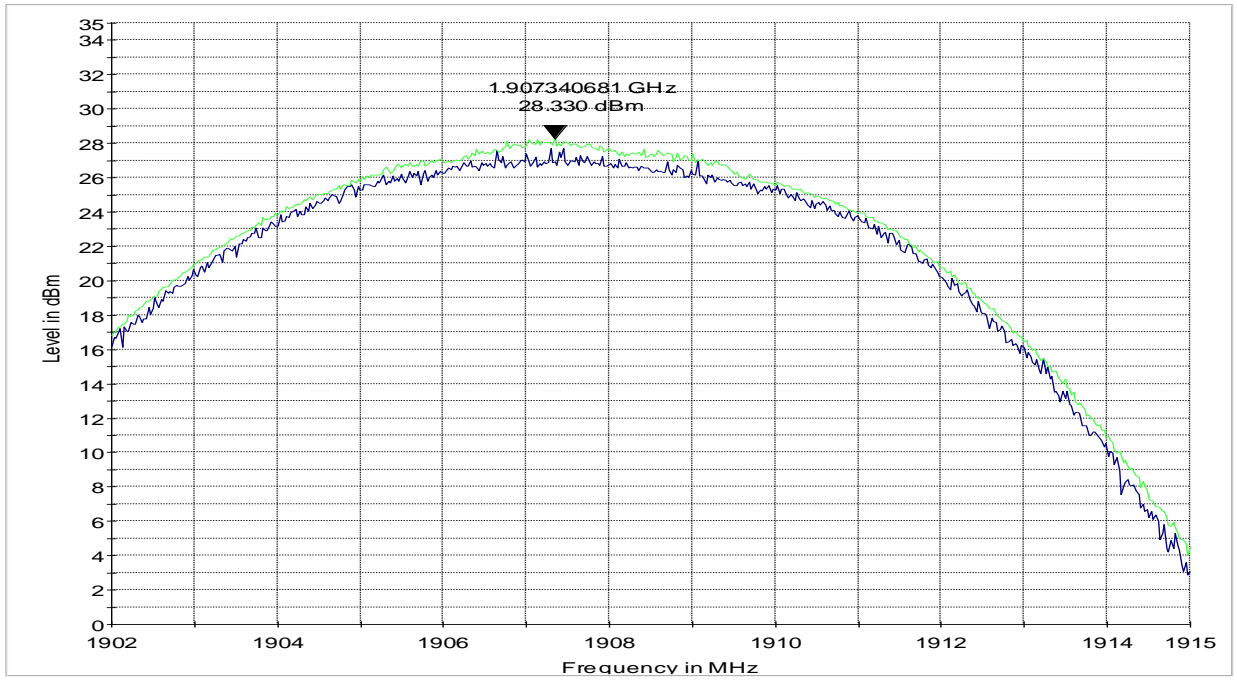
EIRP (UMTS FDD2) CHANNEL 9262



EIRP (UMTS FDD2) CHANNEL 9400



EIRP (UMTS FDD2) CHANNEL 9538



— MaxPeak-ClearWrite-PK+ — MaxPeak-MaxHold-PK+

6.1.8 Module Output Power Verification - 850MHz Band:

GSM Cellular 850 (GMSK Mode)		
Frequency (MHz)	Pre-Certified Module	Conducted Output Power Measurement Verification
	(dBm)	(dBm)
824.2	32.34	32.1
836.6	32.34	32.1
848.8	32.40	32.1

GSM Cellular 850 (8PSK Mode)		
Frequency (MHz)	Pre-Certified Module	Conducted Output Power Measurement Verification
	(dBm)	(dBm)
824.2	27.17	28.1
836.6	27.13	28.2
848.8	27.22	28.2

FDD V 850 (UMTS Mode)		
Frequency (MHz)	Pre-Certified Module Average Power	Conducted Output Power Measurement Verification
	(dBm)	(dBm)
826.2	22.62	23.02
836.6	22.73	23.06
846.6	22.78	23.02

6.1.8.1 Verification Result

Identical; Within measurement uncertainty.

6.1.9 Module Output Power Verification - 1900MHz Band:

GSM PCS 1900 (GMSK Mode)		
Frequency (MHz)	Pre-Certified Module	Conducted Output Power Measurement Verification
	(dBm)	(dBm)
1850.2	28.69	29.1
1880	28.73	29.2
1909.8	28.68	29.2

GSM PCS 1900 (8PSK Mode)		
Frequency (MHz)	Pre-Certified Module	Conducted Output Power Measurement Verification
	(dBm)	(dBm)
1850.2	25.49	27.6
1880	25.51	27.7
1909.8	25.53	27.8

FDD II 1900 (UMTS Mode)		
Frequency (MHz)	Pre-Certified Module Average Power	Conducted Output Power Measurement Verification
	(dBm)	(dBm)
1852.4	22.56	22.51
1880	22.64	22.61
1907.6	22.58	22.60

6.1.9.1 Verification Result

Identical; Within measurement uncertainty.

6.2 Emissions Radiated

6.2.1 References

FCC: CFR Part 2.1053, CFR Part 22.917, CFR Part 24.238
IC: RSS-Gen Section 4.9; RSS 132 Section 4.5; RSS 133 Section 6.5

6.2.2 Measurement requirements:

6.2.2.1 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.

6.2.2.2 RSS-Gen 4.9: Transmitter unwanted spurious emissions

The same parameter, peak power or average power, used for the transmitter output power measurement shall be used for unwanted emission measurements.

The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or from 30 MHz, whichever is the lower, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

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.

6.2.3.1 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.

6.2.3.2 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.

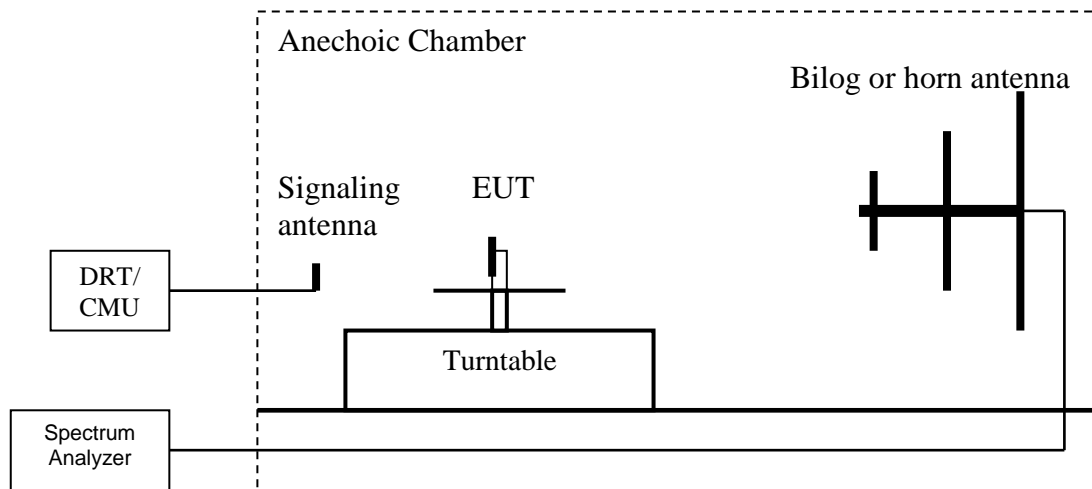
6.2.3.3 RSS-132 Section 4.5.1.1 and RSS-133 Section 6.5.1

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.

6.2.4 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 RadioCommunication 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.)

Spectrum analyzer settings: RBW=VBW=1MHz

6.2.5 Sample Calculations for Radiated Measurements

6.2.5.1 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-

$$\text{EIRP (dBm)} = \text{Signal Generator setting (dBm)} - \text{Cable Loss (dB)} + \text{Antenna Gain (dBi)}$$

Eg:

Frequency (MHz)	Measured SA (dB μ V)	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

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 30MHz 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 GSM-850 & PCS-1900 bands

Radiated emission measurements were made only with Circuit Switched mode GMSK modulation because this mode represents the worse case emission for all the modulations for GSM. All measurements are done in horizontal and vertical antenna polarization; and on three orientations of the EUT. The plots show the worst case where it is not indicated otherwise. Unless mentioned otherwise, the peaks in the plots are from the carrier frequency.

Radiated emissions measurements were made also with UMTS FDD mode.

6.2.6 Radiated out of band emissions results on EUT- Transmit Mode:

6.2.6.1 Test Results Transmitter Spurious Emission GSM850:

Harmonic	Tx ch-128 Freq. (MHz)	Level (dBm)	Tx ch-190 Freq. (MHz)	Level (dBm)	Tx ch-251 Freq. (MHz)	Level (dBm)
1	824.2	26.5	836.6	-11.5	848.8	22.6
2	1648.4	NF	1673.2	NF	1697.6	NF
3	2472.6	NF	2509.8	NF	2546.4	NF
4	3296.8	NF	3346.4	NF	3395.2	NF
5	4121	NF	4183	NF	4244	NF
6	4945.2	NF	5019.6	NF	5092.8	NF
7	5769.4	NF	5856.2	NF	5941.6	NF
8	6593.6	NF	6692.8	NF	6790.4	NF
9	7417.8	NF	7529.4	NF	7639.2	NF
10	8242	NF	8366	NF	8488	NF
NF = Noise Floor Measurement Uncertainty: ±3dB						

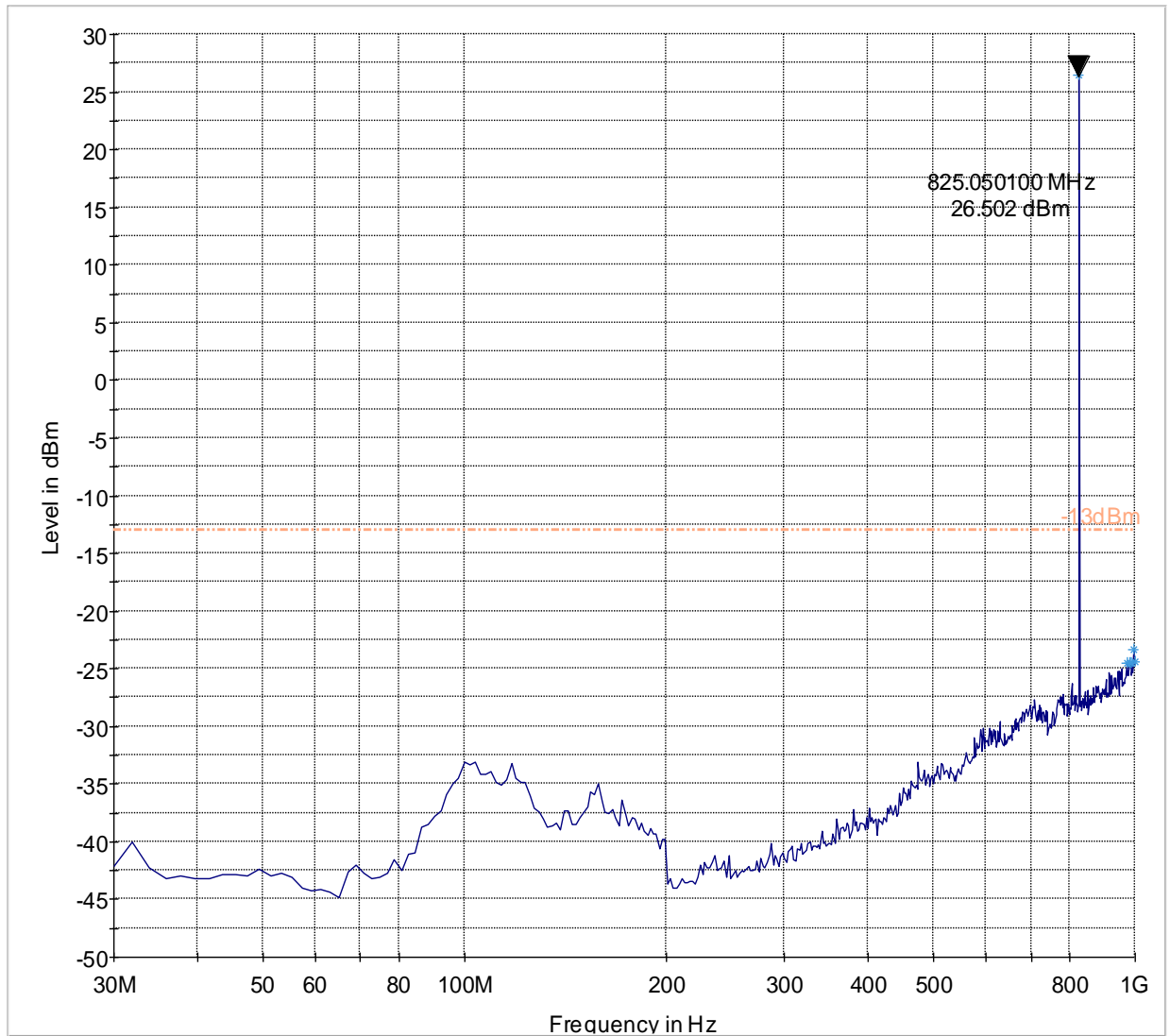
6.2.6.2 Measurement Result

Pass.

Legend for the plots:

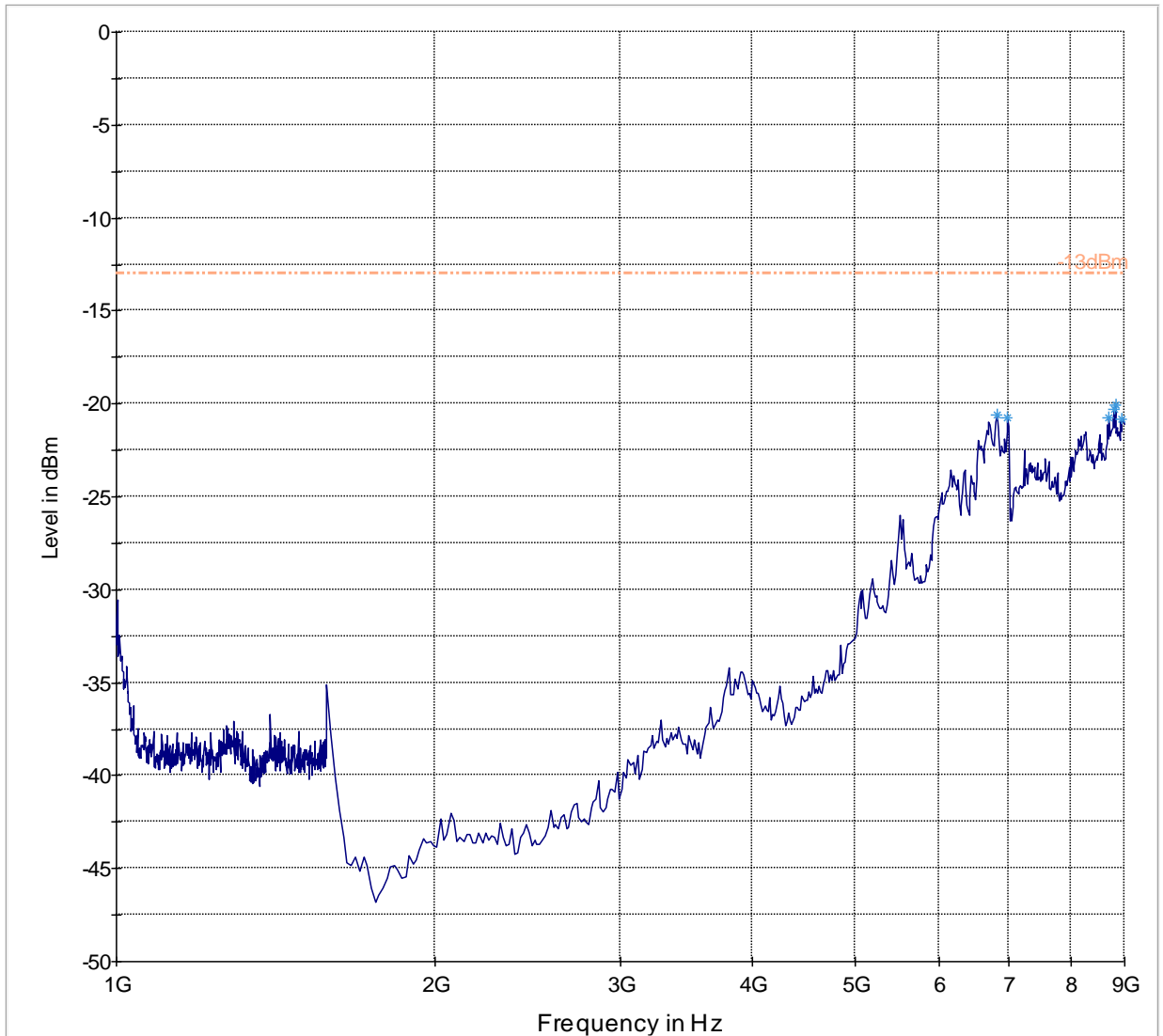
- 13dBm.LimitLine
- Preview Result
- Data Reduction Result
- Final Measurement Result

Radiated Spurious Emissions (GSM-850) Tx: Low Channel
Test results 30M-1GHz (Signal over limit is the carrier frequency)



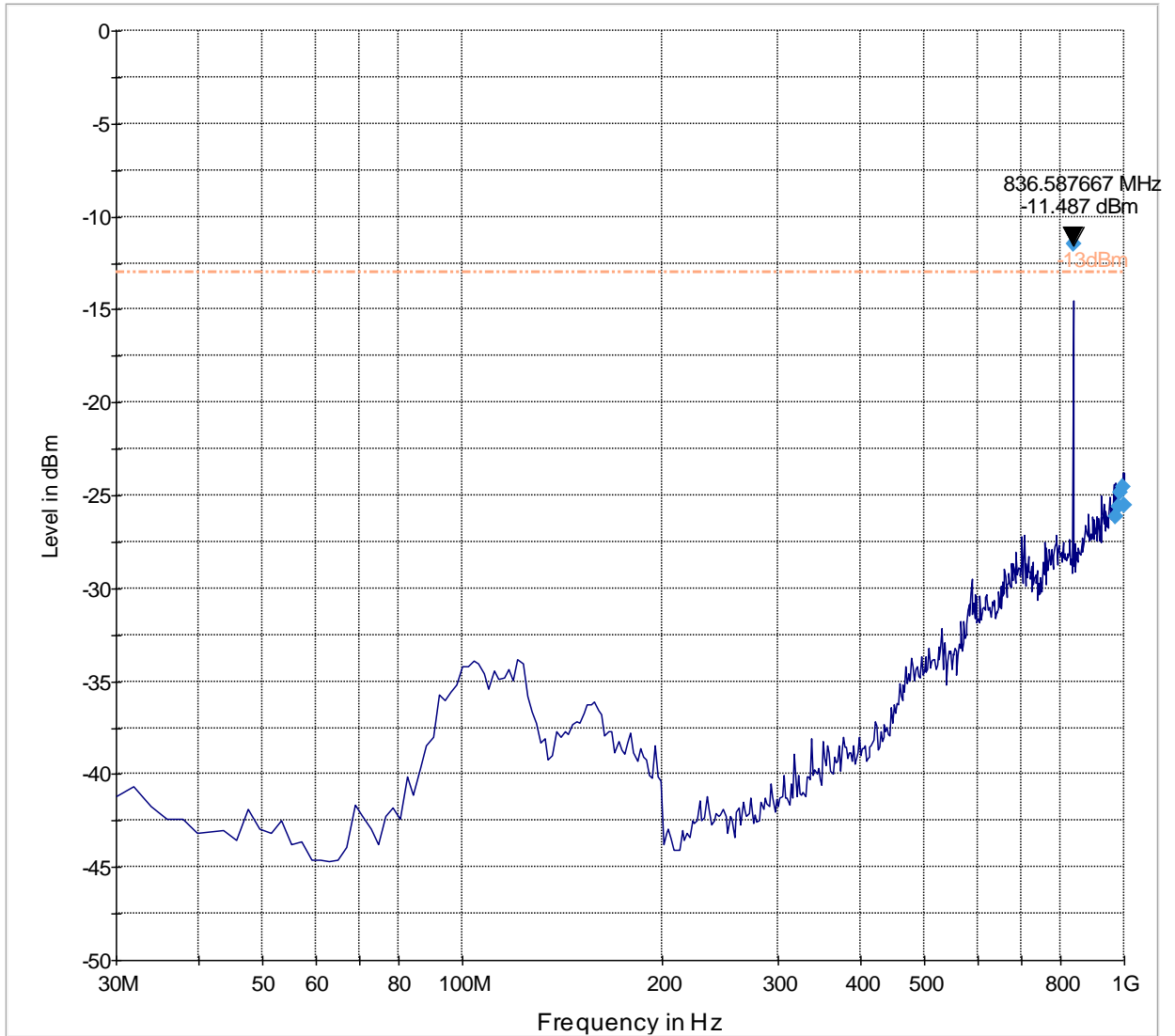
----- -13dBm ——— Preview Result 1-PK+ * Data Reduction Result 1 [1]-PK+

Test results 1GHz-9GHz



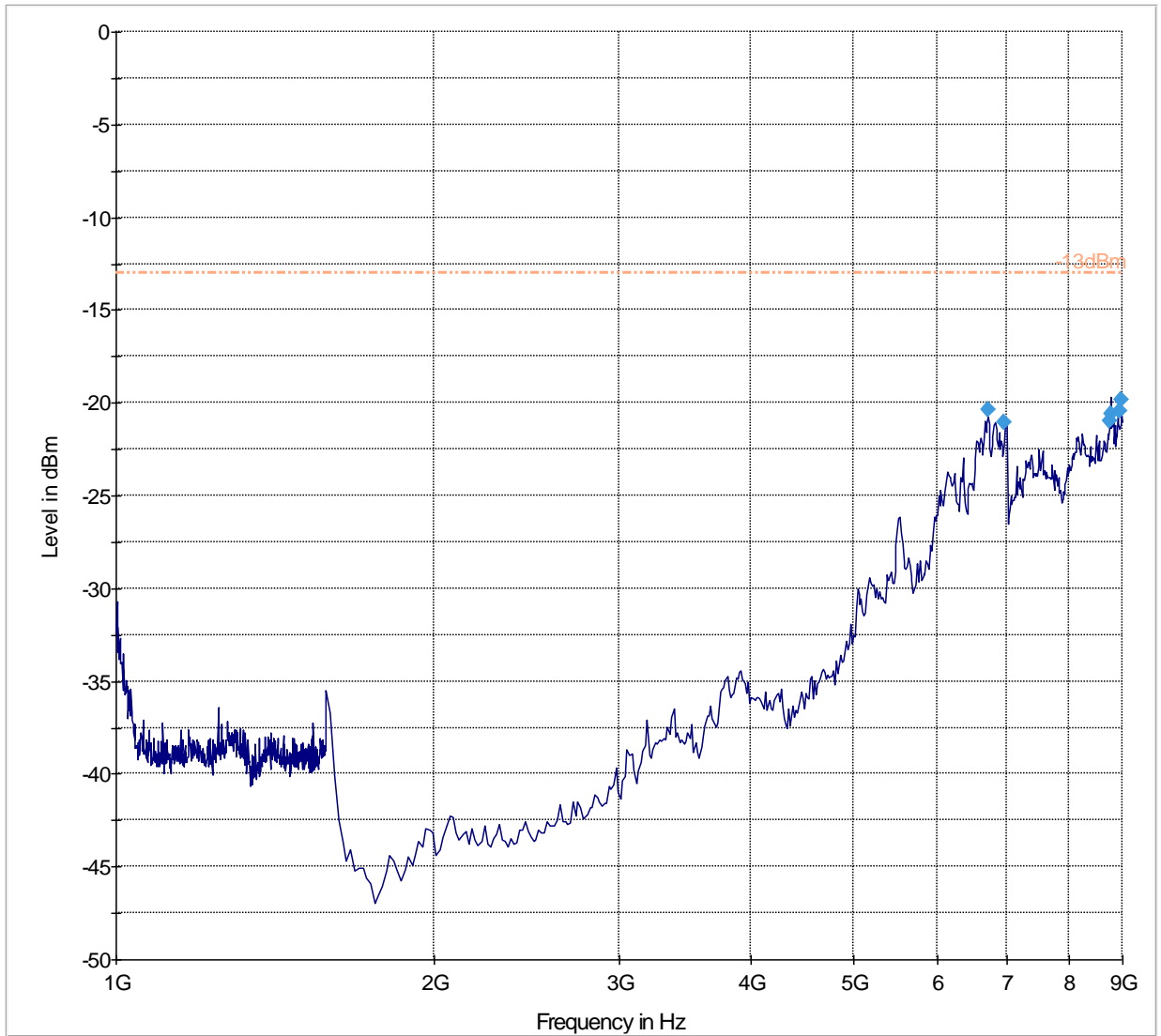
----- -13dBm ——— Preview Result 1-PK+ * Data Reduction Result 1 [2]-PK+

Radiated Spurious Emissions (GSM-850) Tx: Mid Channel
Test results 30M-1GHz (Signal over limit is the carrier frequency)



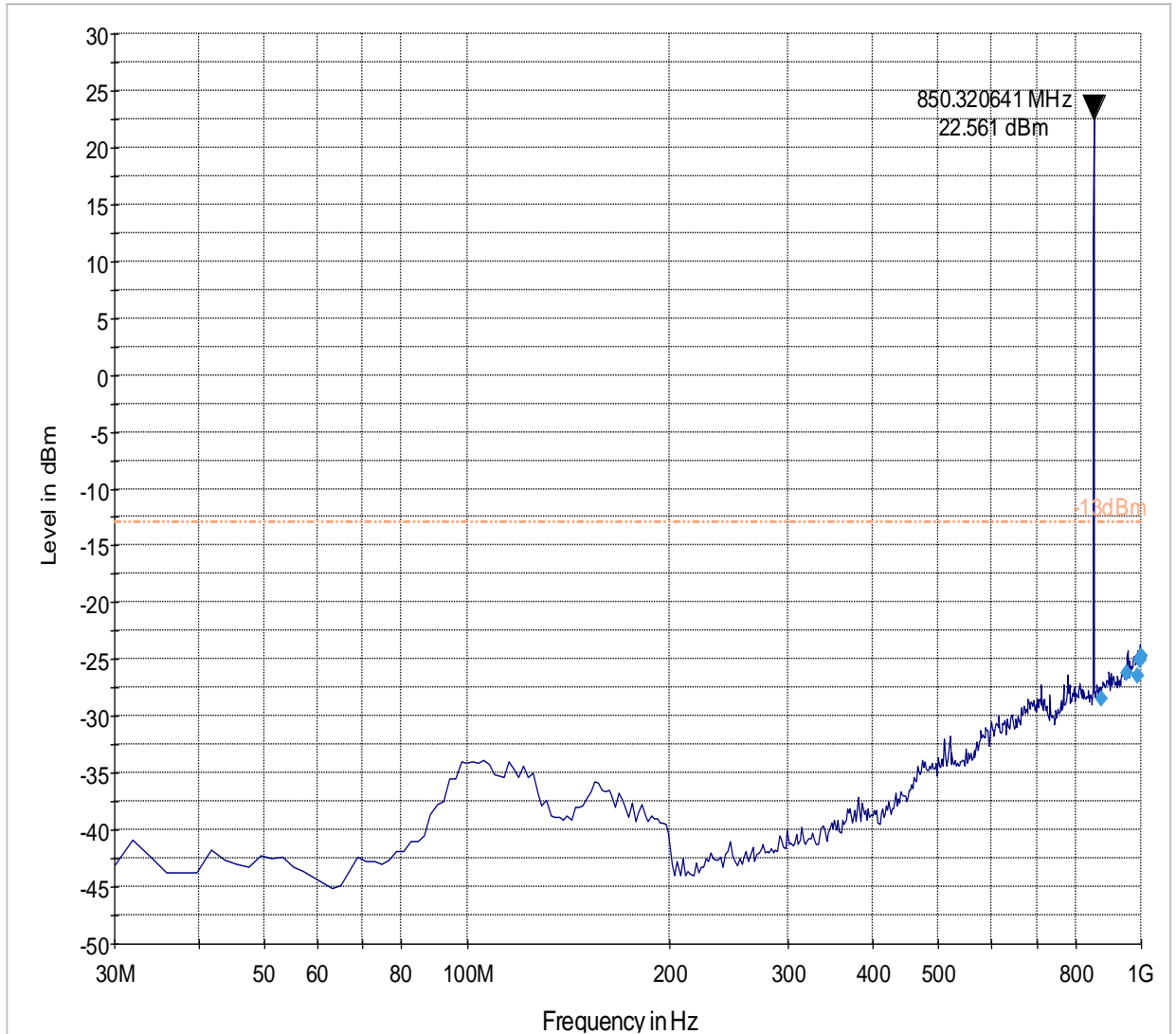
----- -13dBm ——— Preview Result 1-PK+ ◆ Final Result 1-PK+

Test results 1GHz-9GHz



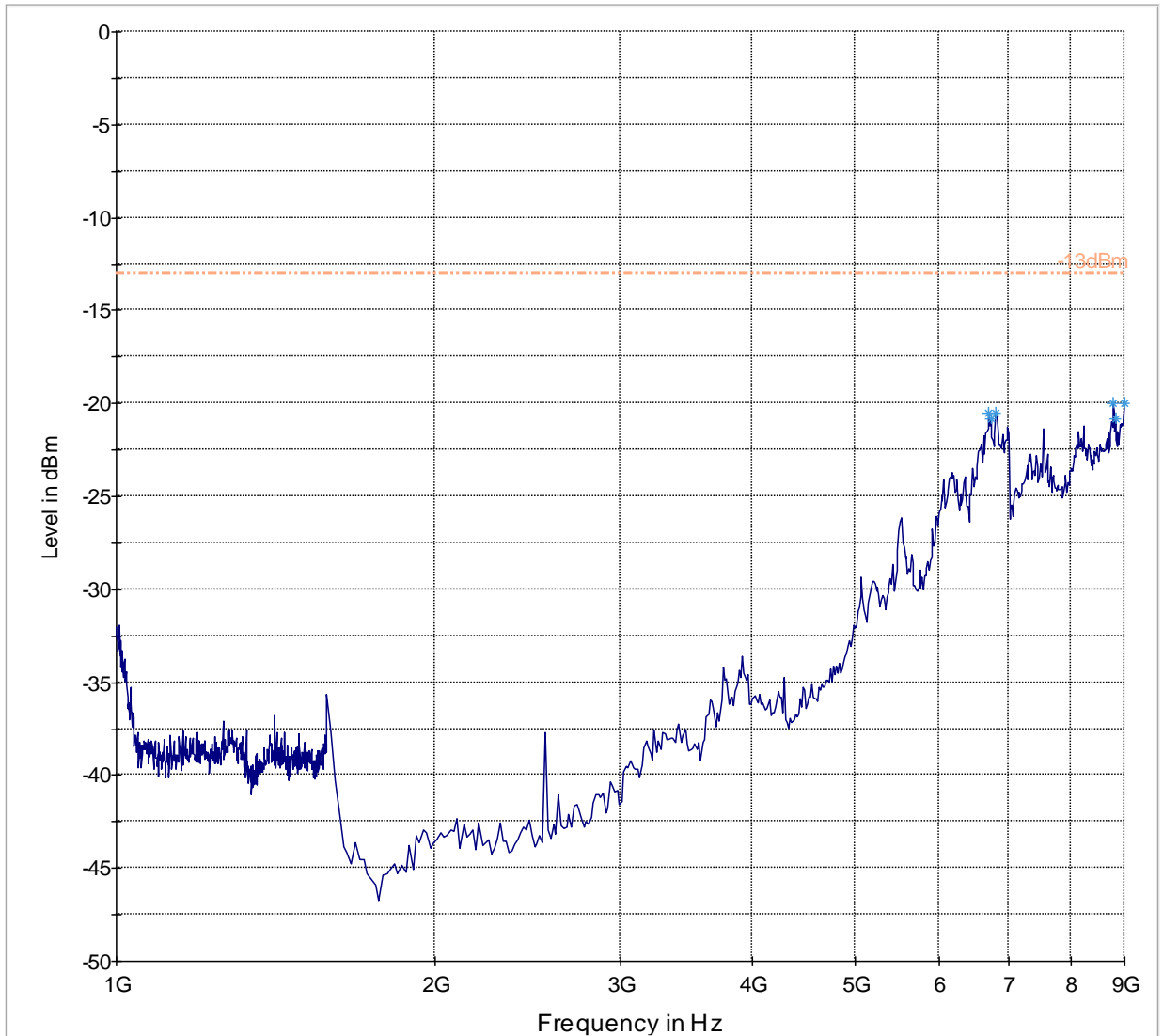
- - - - -13dBm — Preview Result 1-PK+ ◆ Final Result 1-PK+

Radiated Spurious Emissions (GSM-850) Tx: High Channel
Test results 30M-1GHz (Signal over limit is the carrier frequency)



----- -13dBm ——— Preview Result 1-PK+ ◆ Final Result 1-PK+

Test results 1GHz-9GHz



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

6.2.6.3 Test Results Transmitter Spurious Emission UMTS FDDV

Harmonic	Tx ch-4132 Freq. (MHz)	Level (dBm)	Tx ch-4183 Freq. (MHz)	Level (dBm)	Tx ch-4233 Freq. (MHz)	Level (dBm)
1	826.4	15.2	836.6	15.6	846.6	17.2
2	1652.8	NF	1673.2	NF	1693.2	NF
3	2479.2	NF	2509.8	NF	2539.8	NF
4	3305.6	NF	3346.4	NF	3386.4	NF
5	4132	NF	4183	NF	4233	NF
6	4958.4	NF	5019.6	NF	5079.6	NF
7	5784.8	NF	5856.2	NF	5926.2	NF
8	6611.2	NF	6692.8	NF	6772.8	NF
9	7437.6	NF	7529.4	NF	7619.4	NF
10	8264	NF	8366	NF	8466	NF
NF= Noise Floor Measurement Uncertainty: ±3dB						

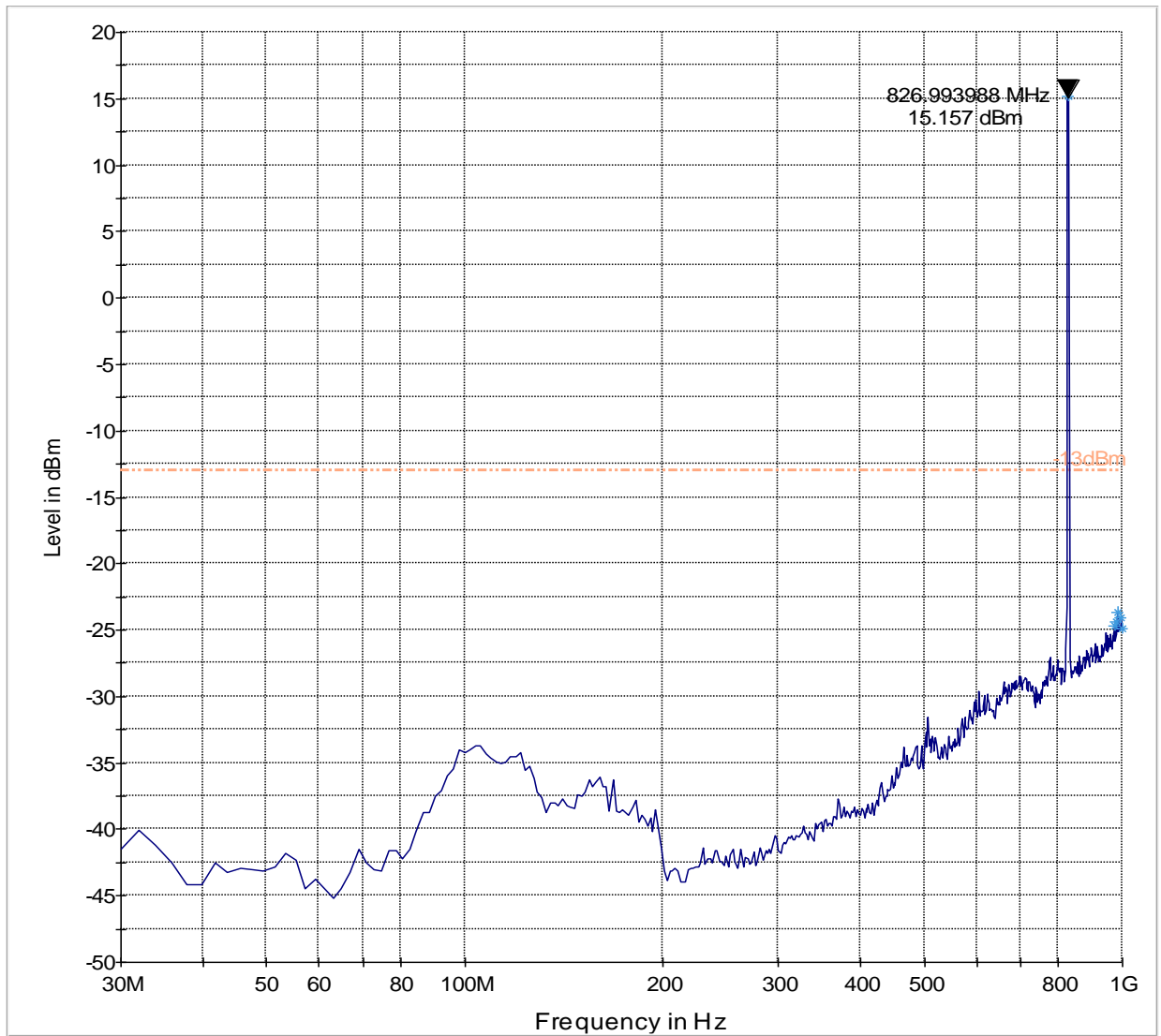
6.2.6.4 Measurement Result

Pass.

Legend for the plots:

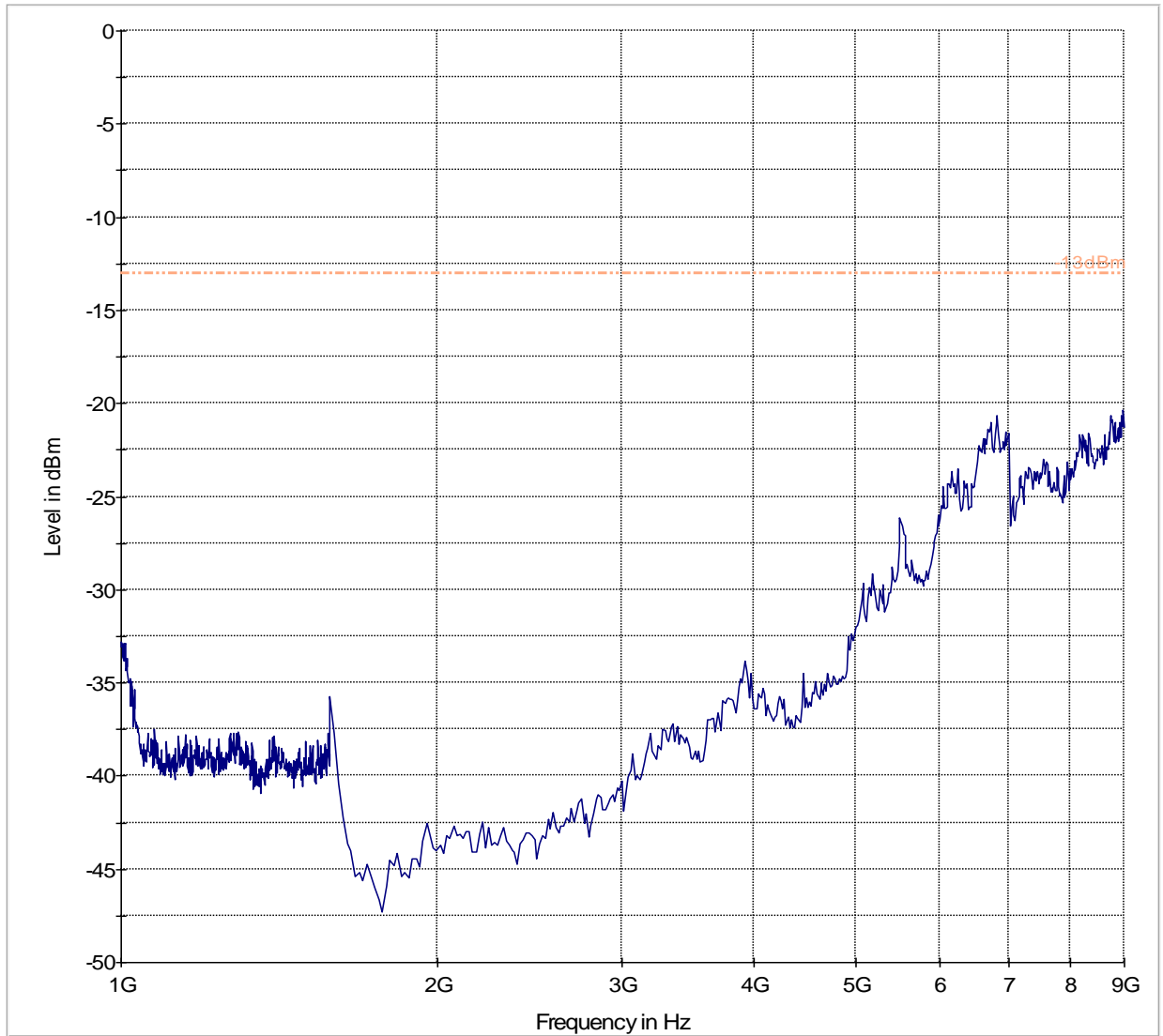
- 13dBm.LimitLine
- Preview Result
- Data Reduction Result
- Final Measurement Result

Radiated Spurious Emissions (UMTS Band 5) Tx: Low Channel
Test results 30M-1GHz (Signal over limit is the carrier frequency)



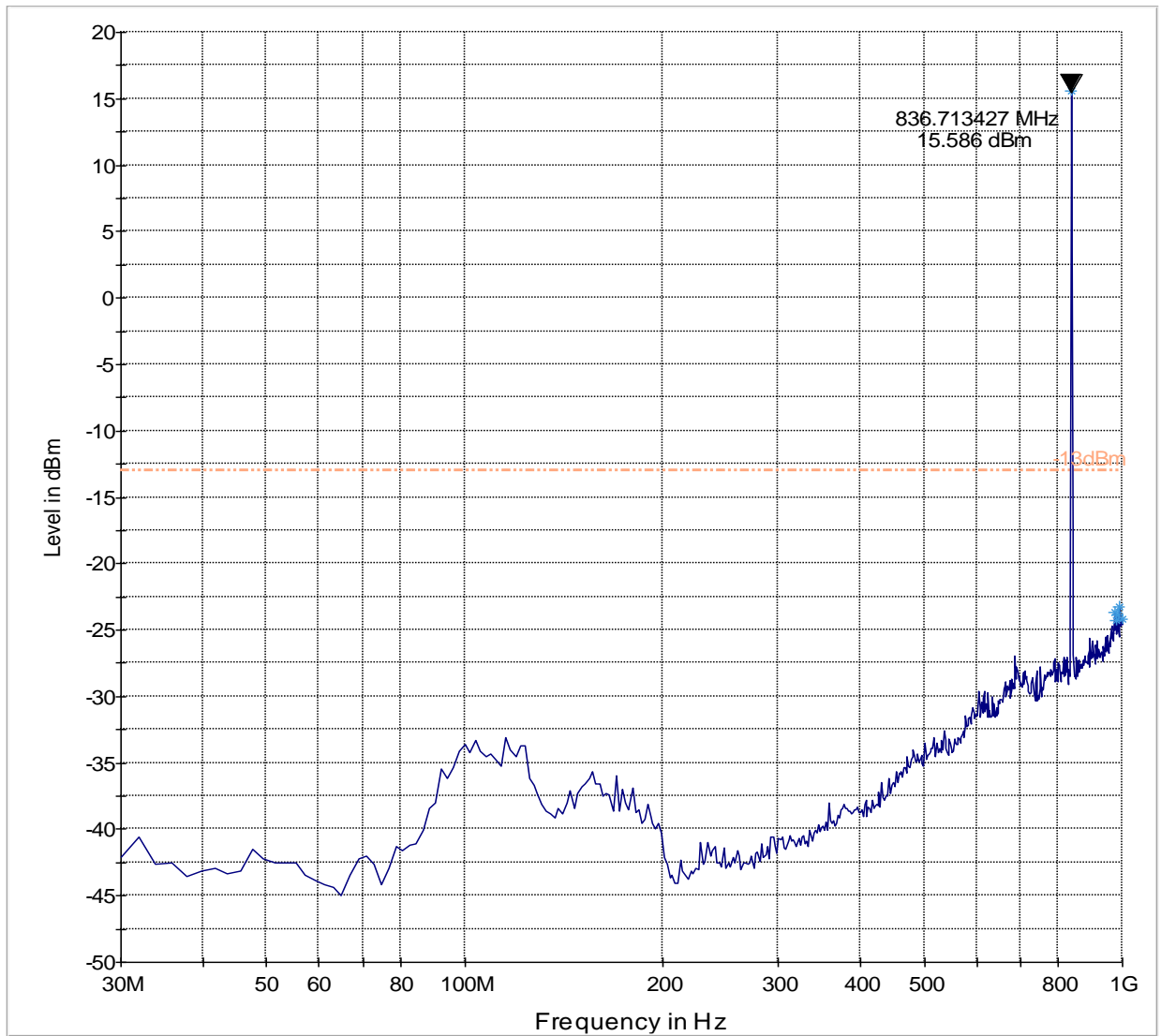
- - - - -13dBm — Preview Result 1-PK+ * Data Reduction Result 1 [1]-PK+

Test results 1GHz-9GHz



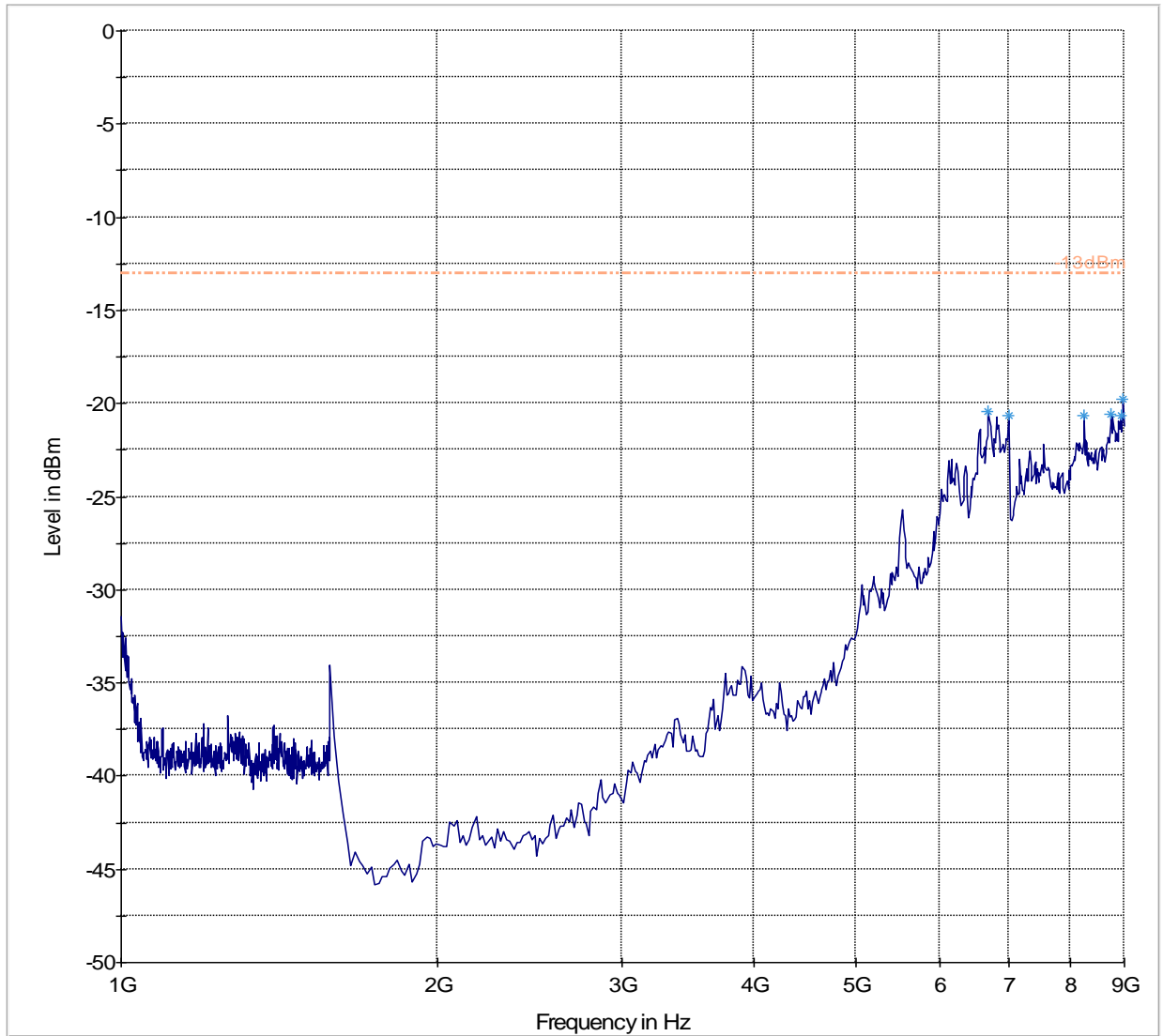
----- -13dBm ——— Preview Result 1-PK+

Radiated Spurious Emissions (UMTS Band 5) Tx: Mid Channel
Test results 30M-1GHz (Signal over limit is the carrier frequency)



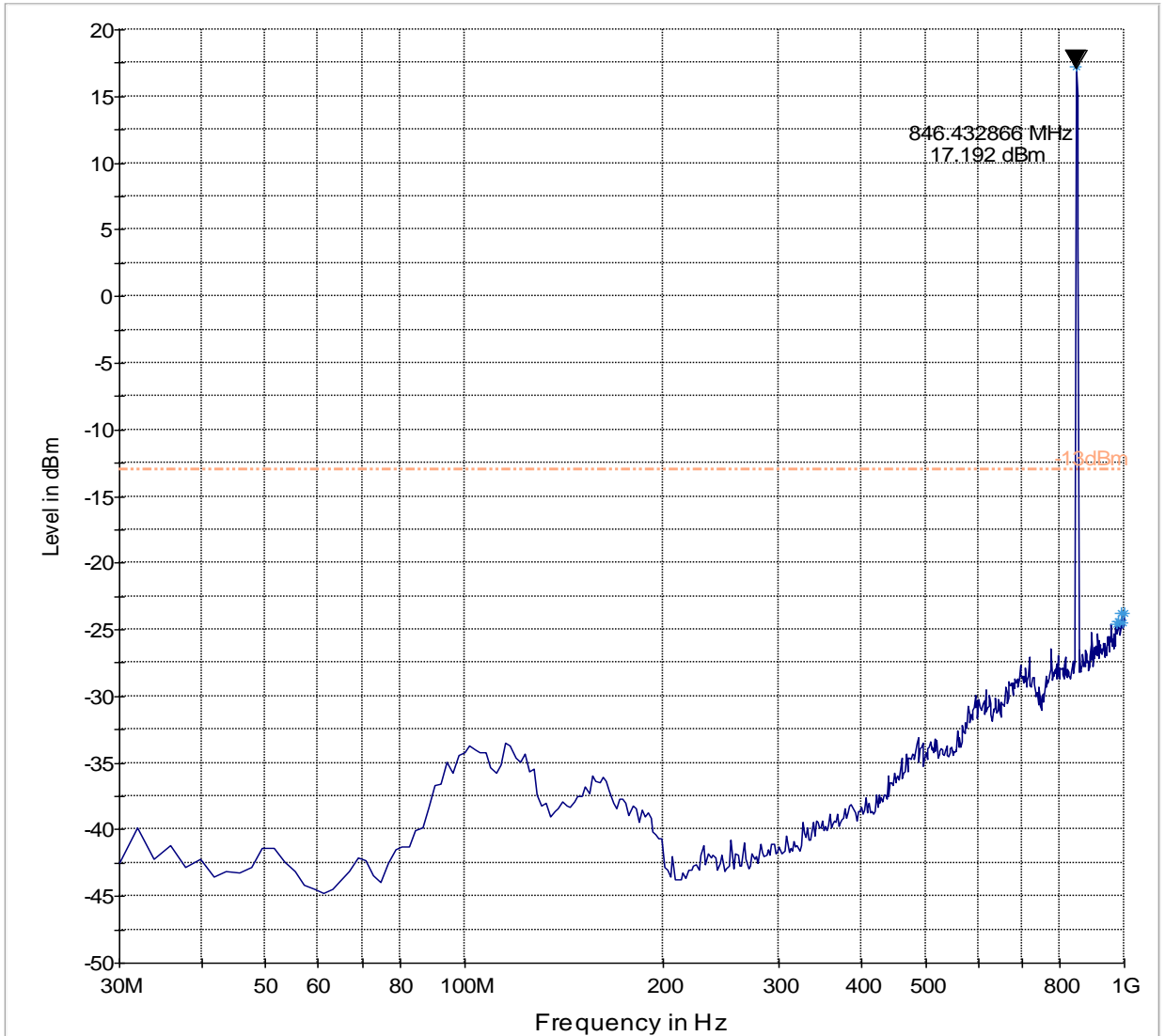
- - - - -13dBm — Preview Result 1-PK+ * Data Reduction Result 1 [1]-PK+

Test results 1GHz-9GHz



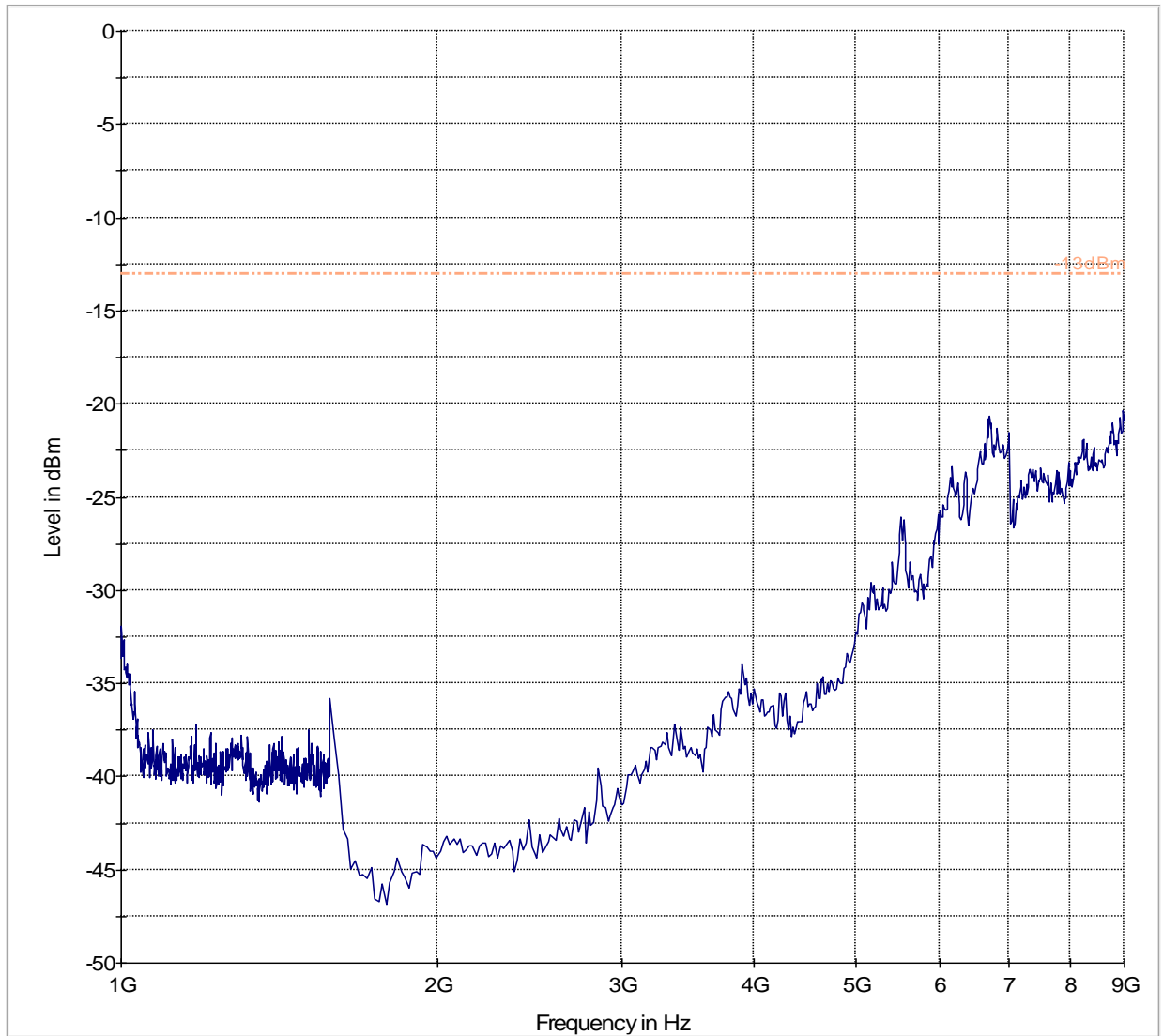
----- -13dBm ——— Preview Result 1-PK+ * Data Reduction Result 1 [2]-PK+

Radiated Spurious Emissions (UMTS Band 5) Tx: High Channel
Test results 30M-1GHz (Signal over limit is the carrier frequency)



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

Test results 1GHz-9GHz



----- -13dBm ——— Preview Result 1-PK+

6.2.6.5 Test Results Transmitter Spurious Emission PCS-1900:

Harmonic	Tx ch-512 Freq.(MHz)	Level (dBm)	Tx ch-661 Freq. (MHz)	Level (dBm)	Tx ch-810 Freq. (MHz)	Level (dBm)
1	1850.2	27.34	1880.0	-18.6	1909.8	24.5
2	3700.4	NF	3760	NF	3819.6	NF
3	5550.6	NF	5640	NF	5729.4	NF
4	7400.8	NF	7520	NF	7639.2	NF
5	9251	NF	9400	NF	9549	NF
6	11101.2	NF	11280	NF	11458.8	NF
7	12951.4	NF	13160	NF	13368.6	NF
8	14801.6	NF	15040	NF	15278.4	NF
9	16651.8	NF	16920	NF	17188.2	NF
10	18502	NF	18800	NF	19098	NF
NF = Noise Floor Measurement Uncertainty: $\pm 3\text{dB}$						

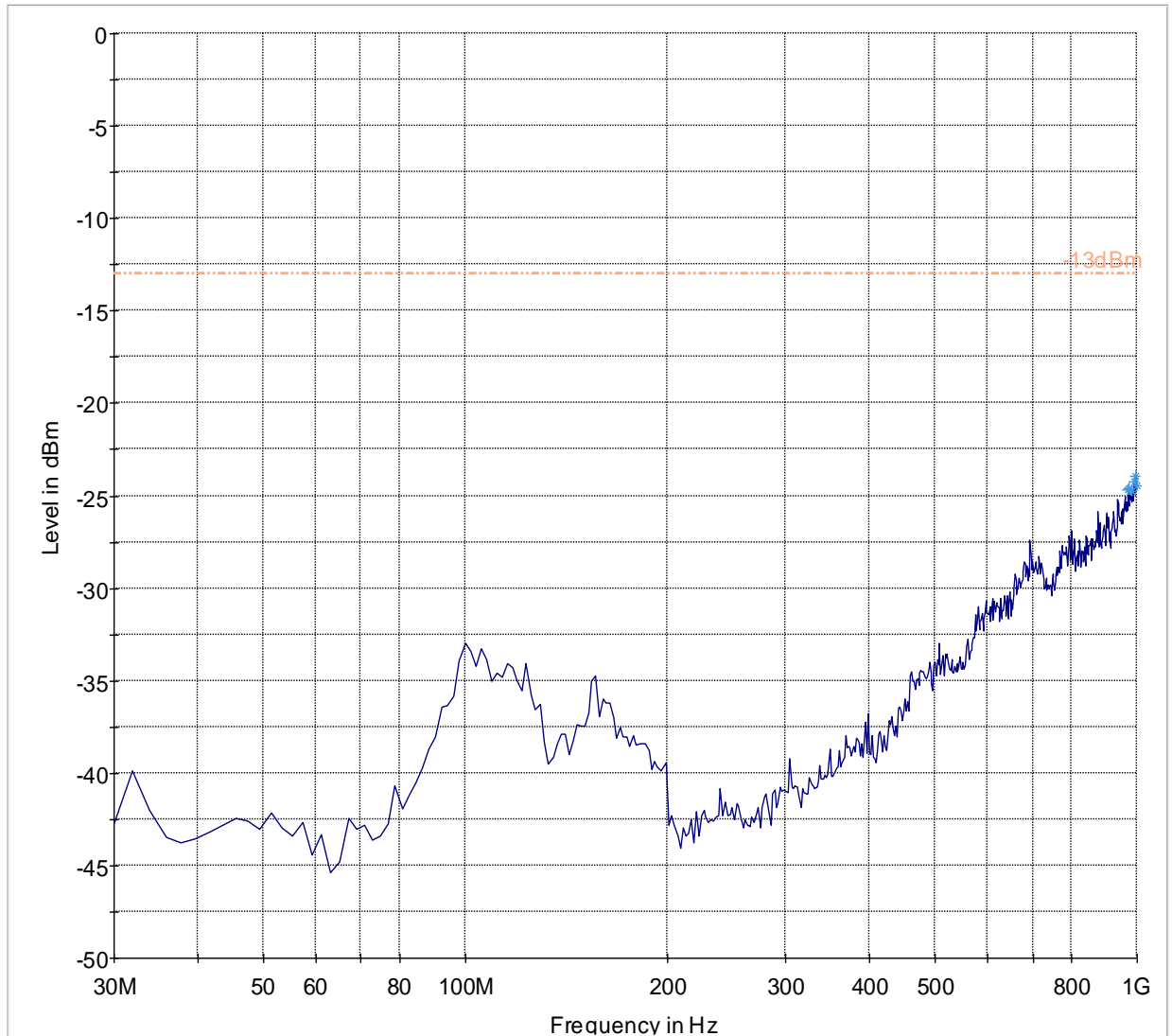
6.2.6.6 Measurement Result

Pass.

Legend for the plots:

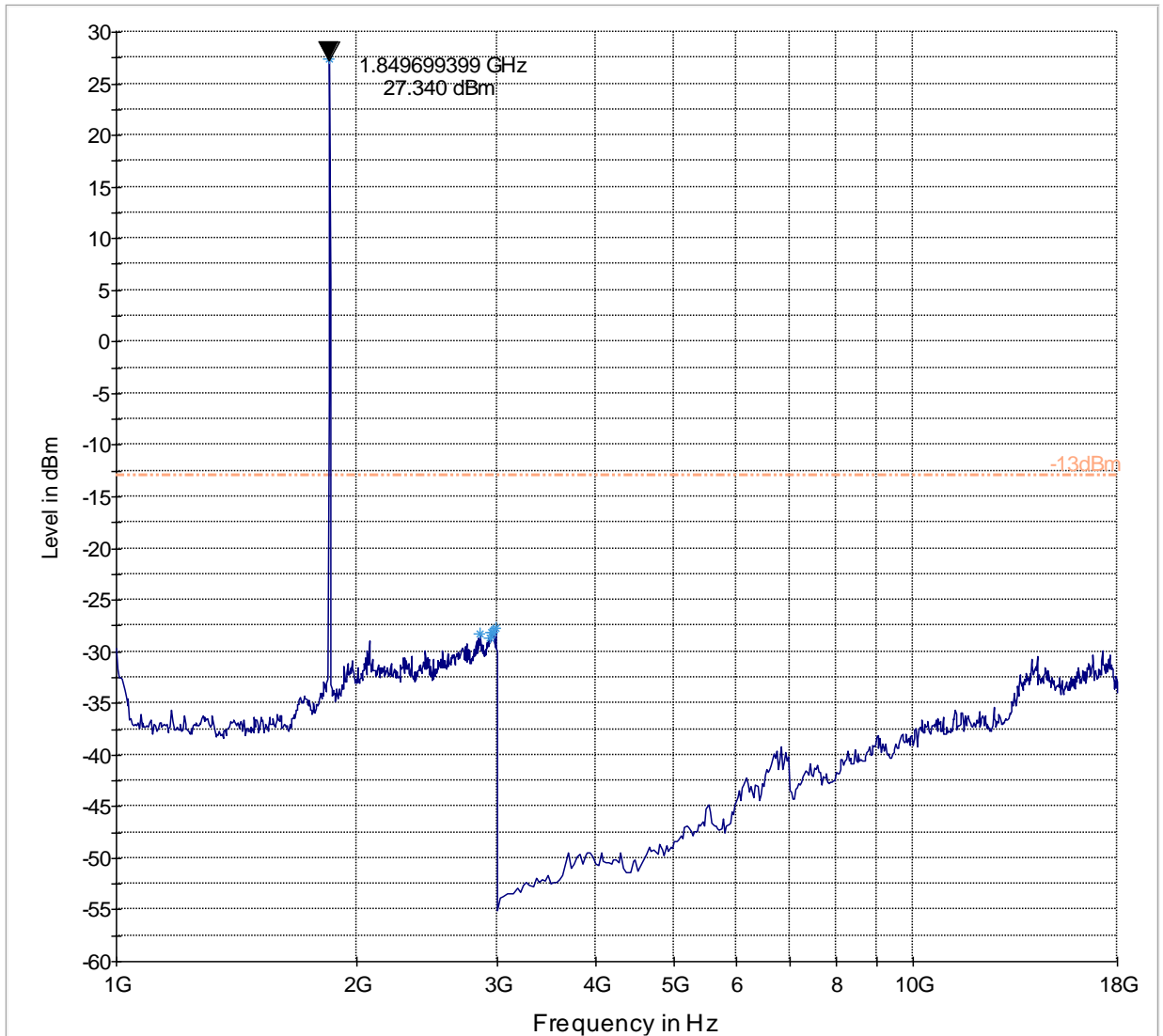
- 13dBm.LimitLine
- Preview Result
- Data Reduction Result
- Final Measurement Result

Radiated Spurious Emissions (GSM-1900) Tx: Low Channel
Test results 30M-1GHz



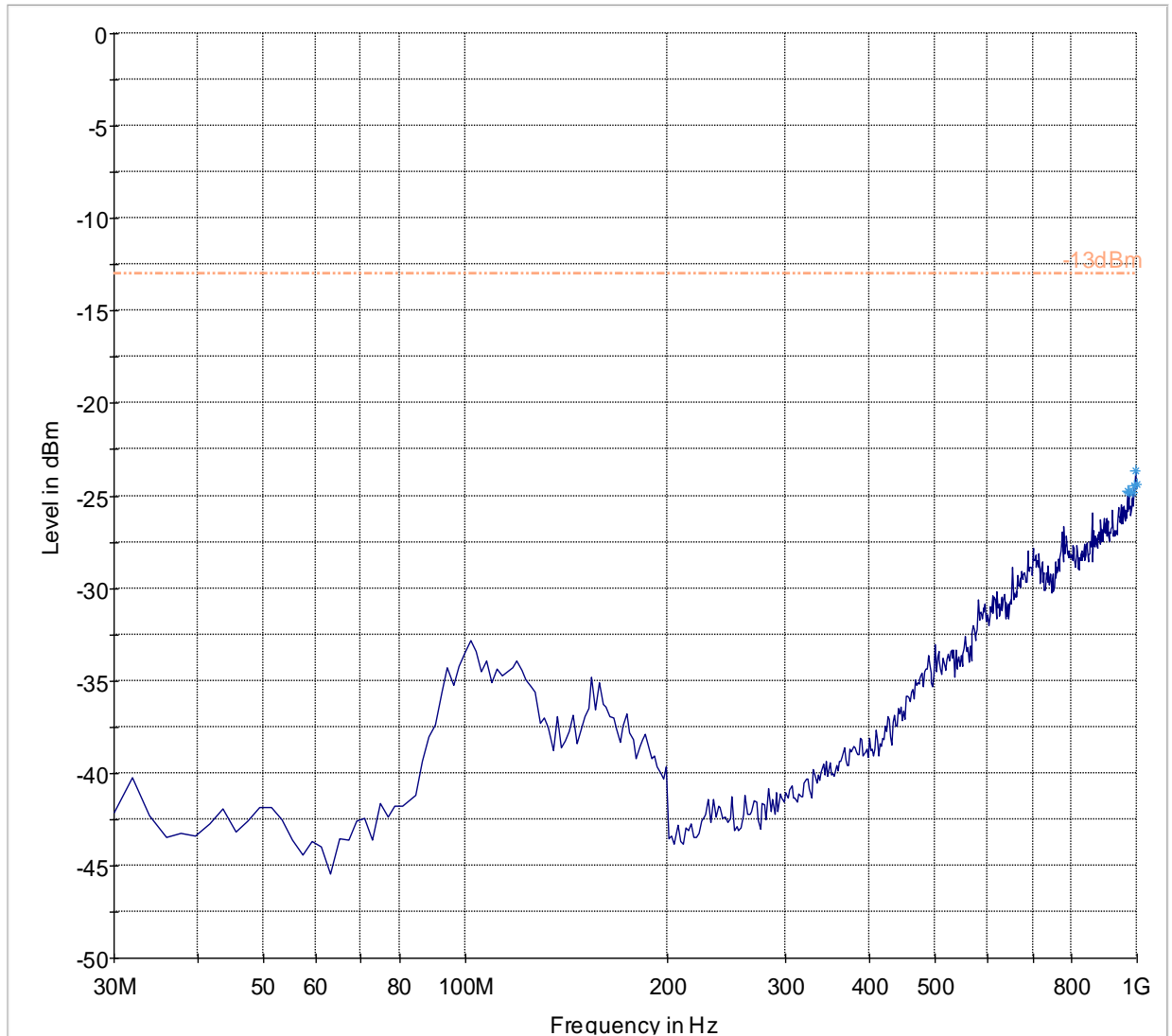
----- -13dBm ——— Preview Result 1-PK+ * Data Reduction Result 1 [1]-PK+

Test results 1GHz-18GHz (Signal over limit is the carrier frequency)



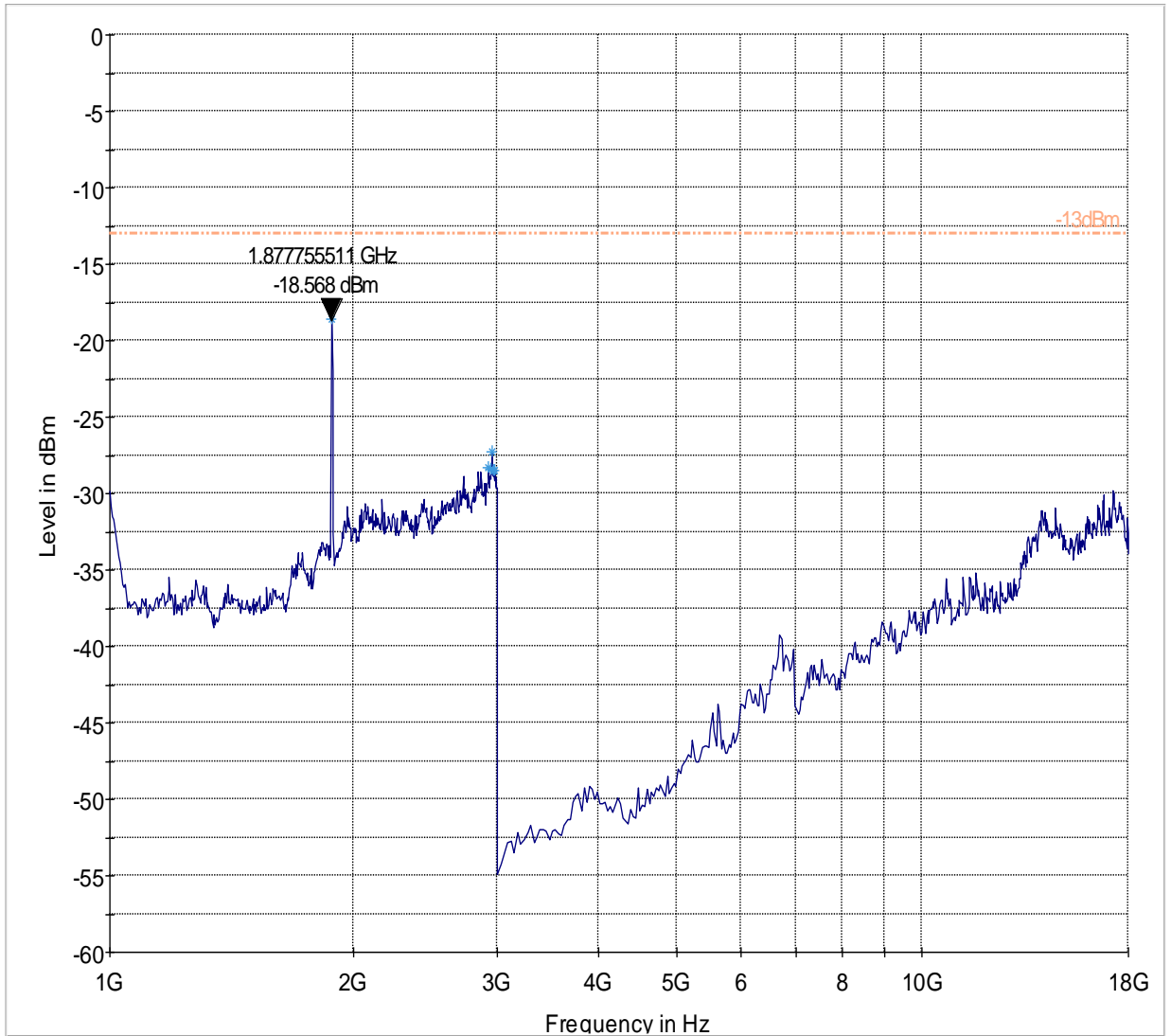
-13dBm Preview Result 1-PK+ * Data Reduction Result 1 [2]-PK+

Radiated Spurious Emissions (GSM-1900) Tx: Mid Channel
Test results 30M-1GHz



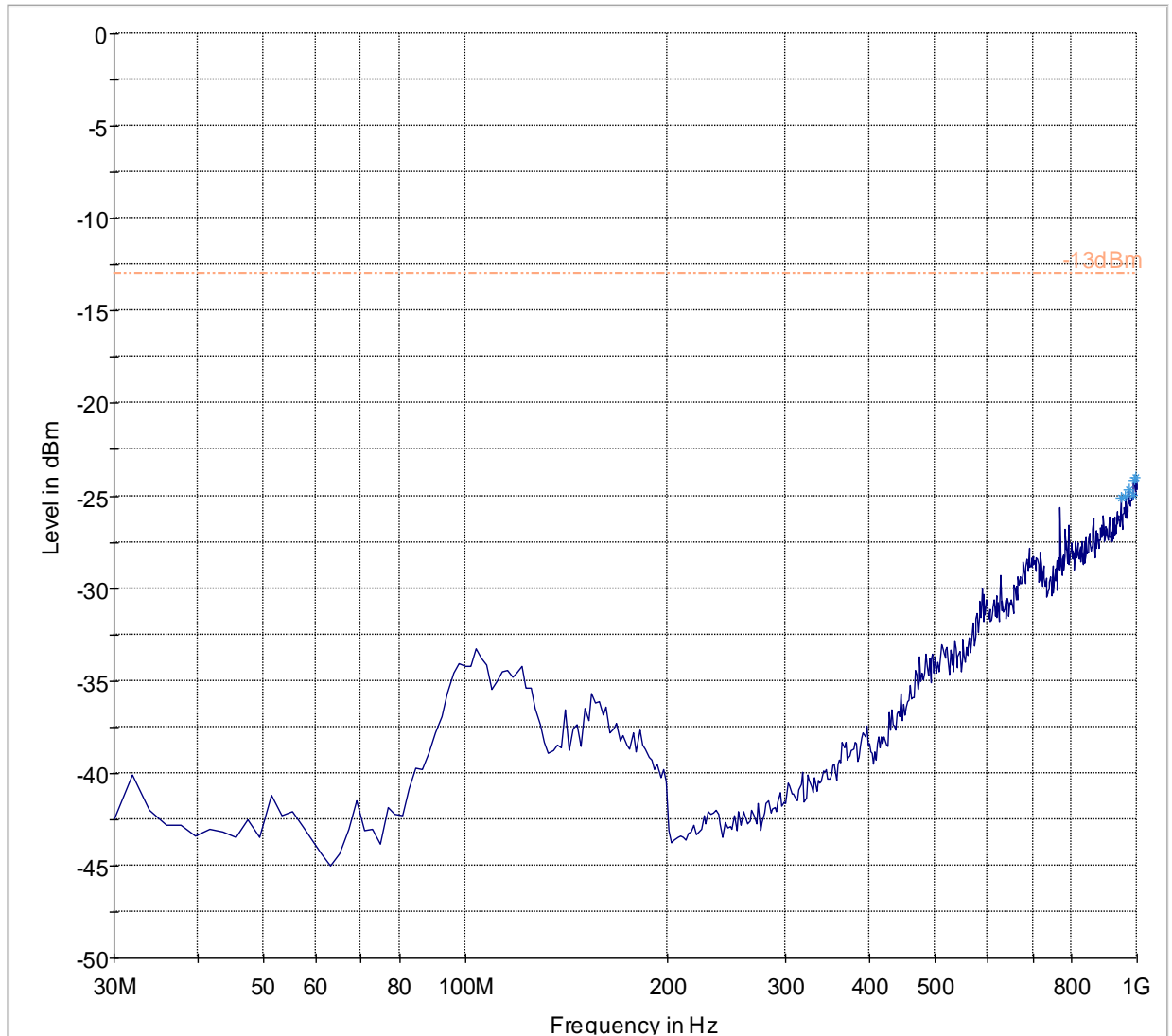
----- -13dBm ——— Preview Result 1-PK+ * Data Reduction Result 1 [1]-PK+

Test results 1GHz-18GHz



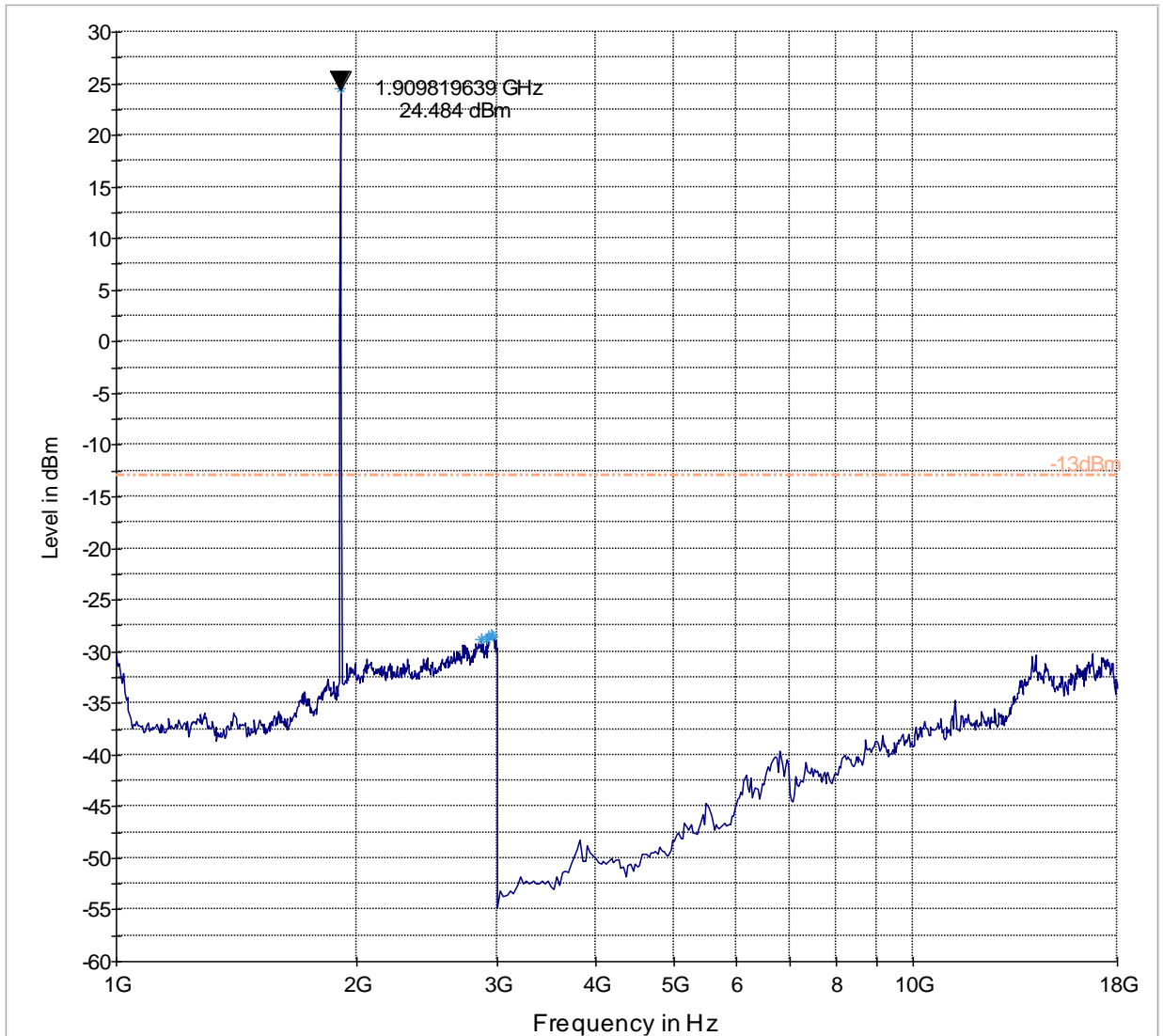
-13dBm Preview Result 1-PK+ * Data Reduction Result 1 [2]-PK+

Radiated Spurious Emissions (GSM-1900) Tx: High Channel
Test results 30M-1GHz



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

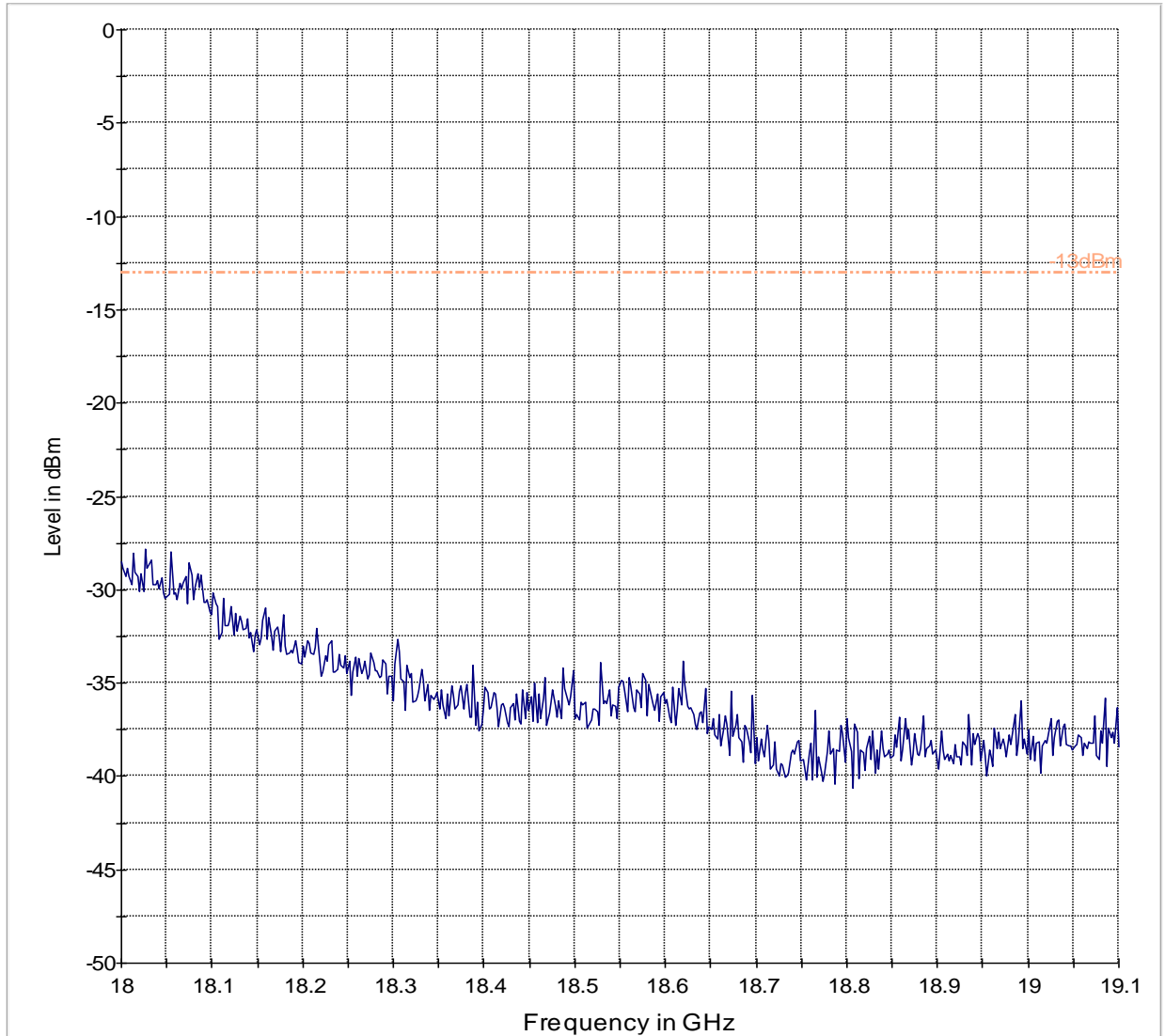
Test results 1GHz-18GHz (Signal over limit is the carrier frequency)



-13dBm Preview Result 1-PK+ *

Test results 18GHz-19.1GHz Tx: Mid Channel

Note: Worst case representation of all channels



----- -13dBm ——— Preview Result 1-PK+

6.2.6.7 Test Results Transmitter Spurious Emission UMTS FDD2:

Harmonic	Tx ch-9262 Freq. (MHz)	Level (dBm)	Tx ch-9400 Freq. (MHz)	Level (dBm)	Tx ch-9538 Freq. (MHz)	Level (dBm)
1	1852.4	20.4	1880.0	16.0	1907.6	19.6
2	3704.8	NF	3760	NF	3815.2	NF
3	5557.2	NF	5640	NF	5722.8	NF
4	7409.6	NF	7520	NF	7630.4	NF
5	9262	NF	9400	NF	9538	NF
6	11114.4	NF	11280	NF	11445.6	NF
7	12966.8	NF	13160	NF	13353.2	NF
8	14819.2	NF	15040	NF	15260.8	NF
9	16671.6	NF	16920	NF	17168.4	NF
10	18524	NF	18800	NF	19076	NF
NF= Noise Floor Measurement Uncertainty: ±3dB						

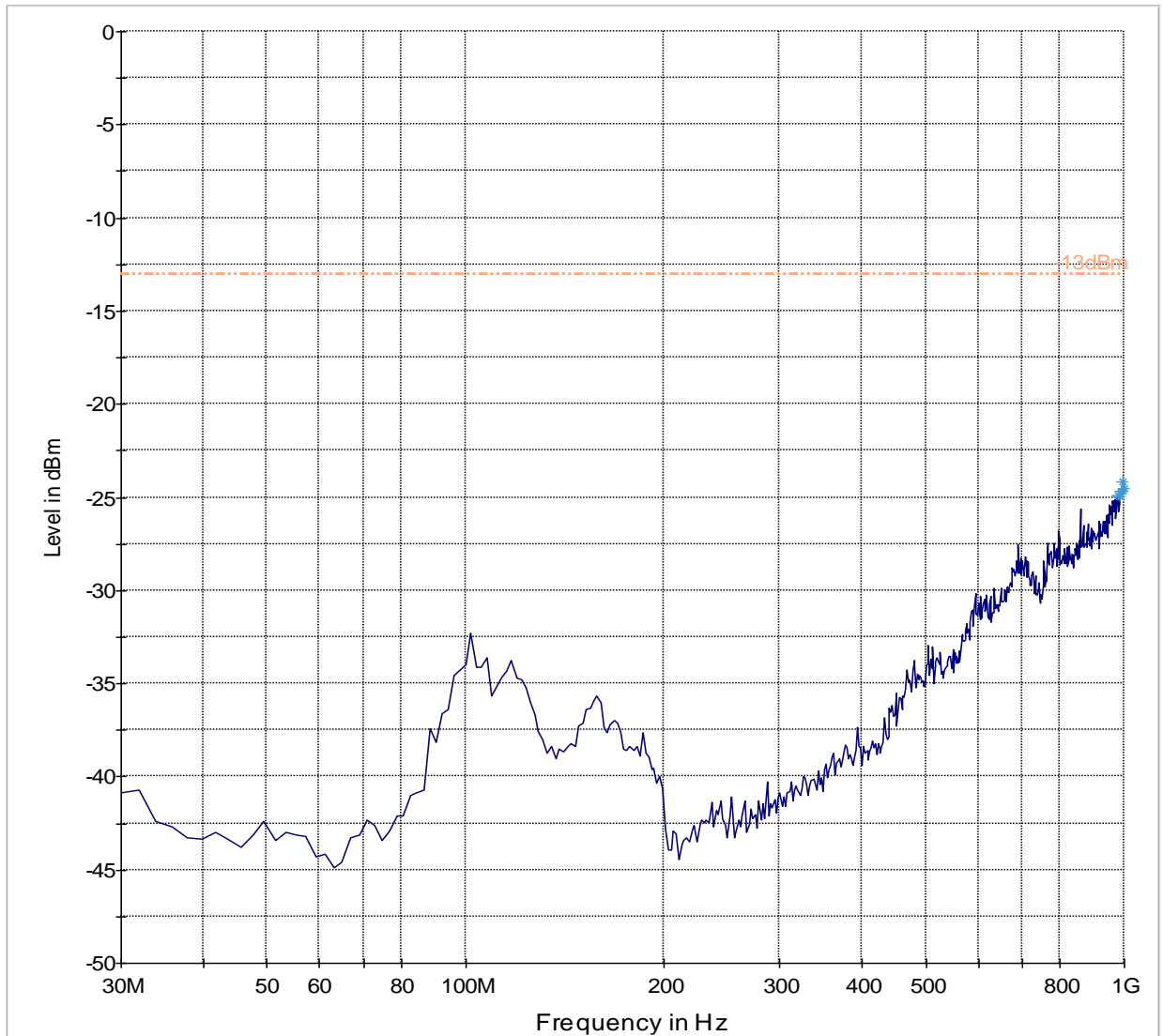
6.2.6.8 Measurement Result

Pass.

Legend for the plots:

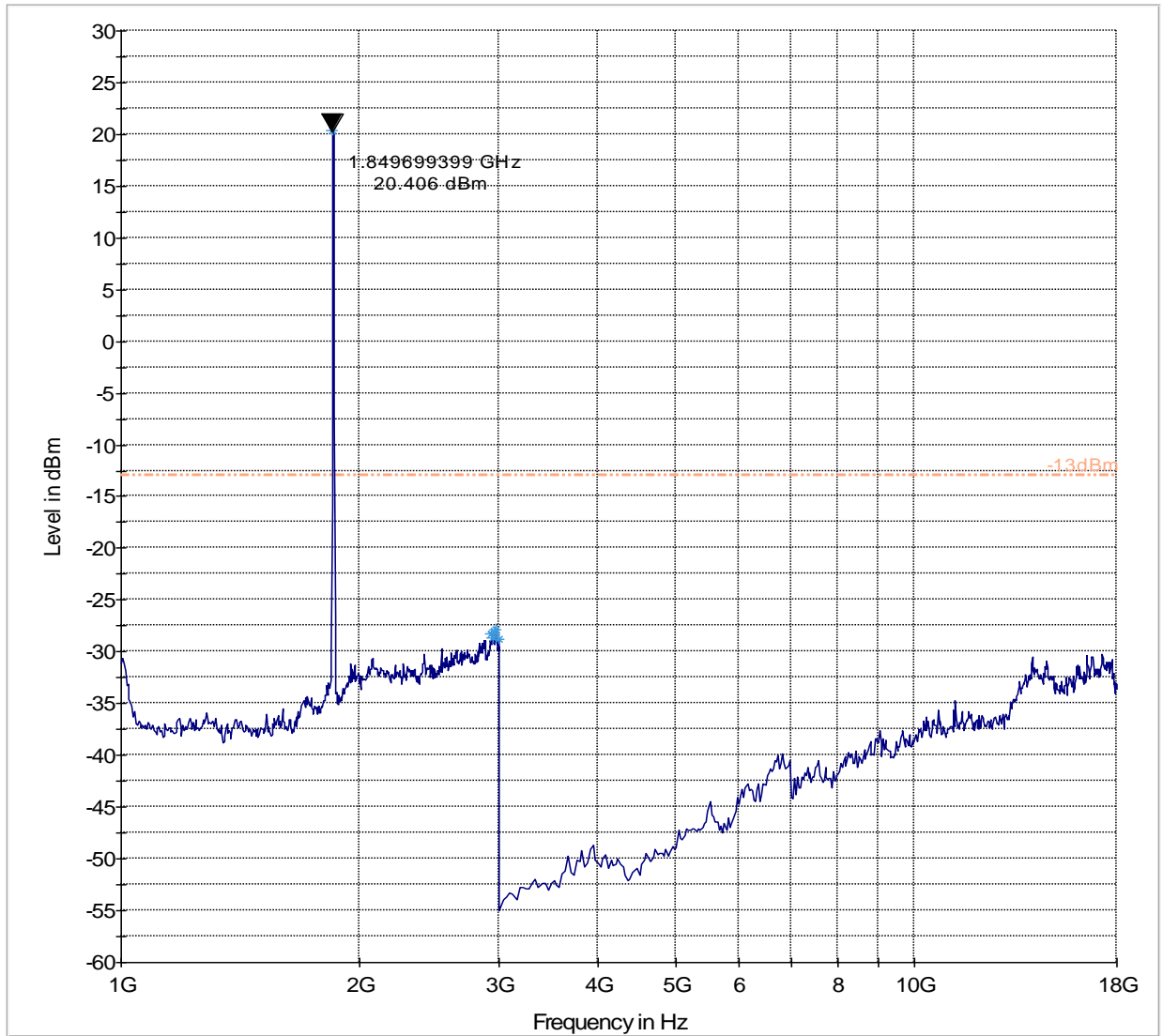
- 13dBm.LimitLine
- Preview Result
- Data Reduction Result
- Final Measurement Result

Radiated Spurious Emissions (UMTS Band 2) Tx: Low Channel
Test results 30M-1GHz



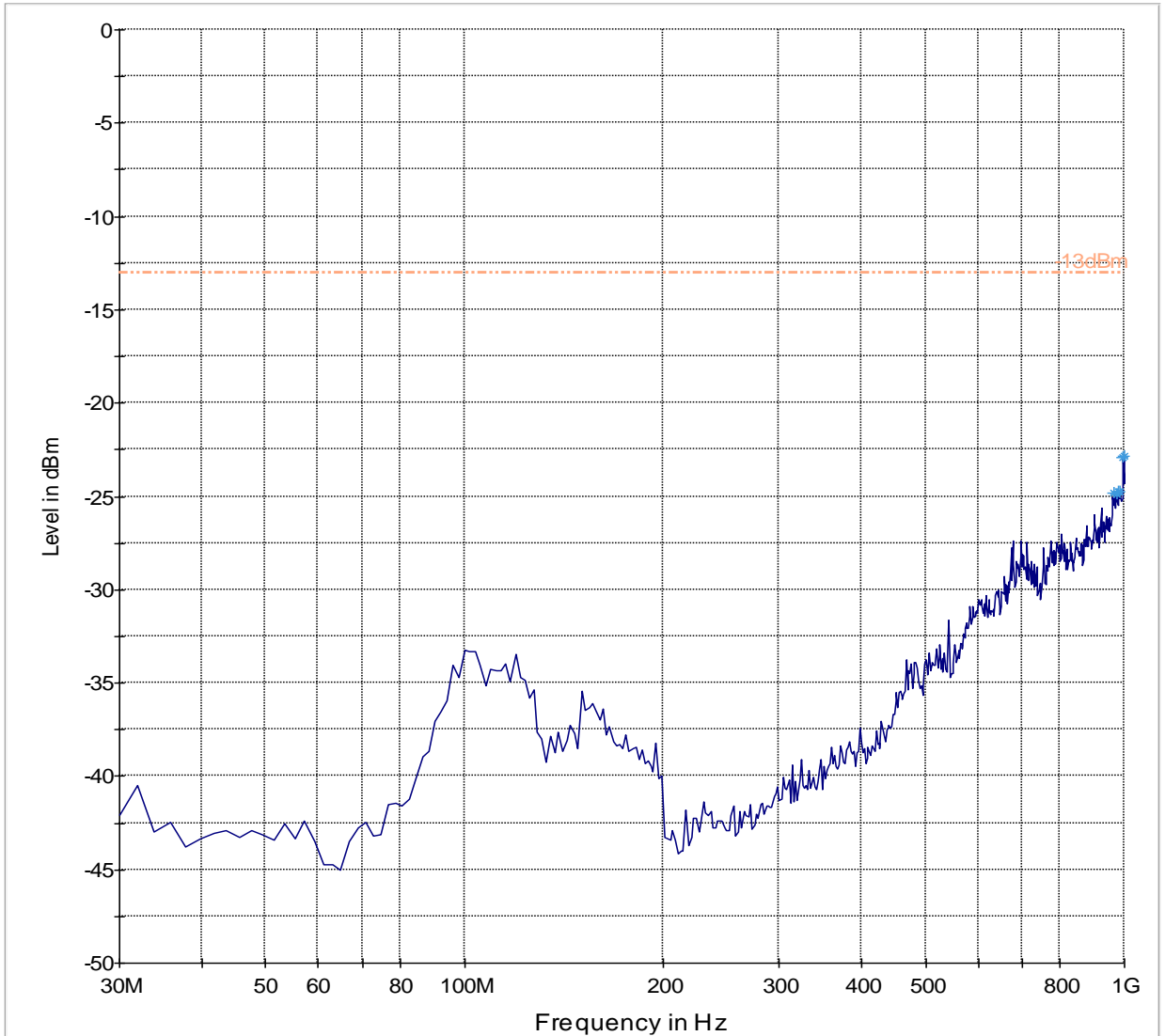
----- -13dBm ——— Preview Result 1-PK+ * Data Reduction Result 1 [1]-PK+

Test results 1GHz-18GHz (Signal over limit is the carrier frequency)



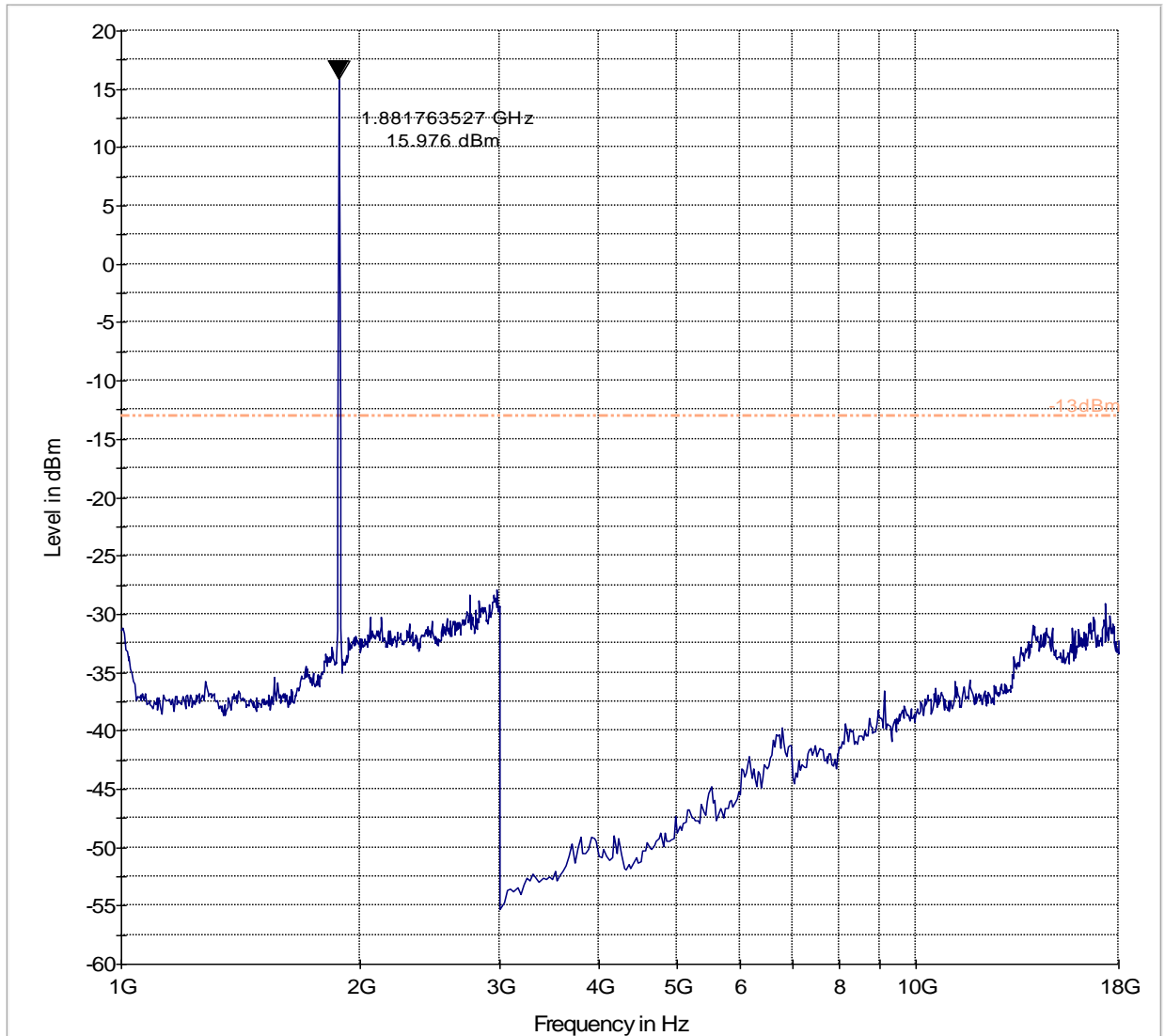
-13dBm Preview Result 1-PK+ * Data Reduction Result 1 [2]-PK+

Radiated Spurious Emissions (UMTS Band 2) Tx: Mid Channel
Test results 30M-1GHz



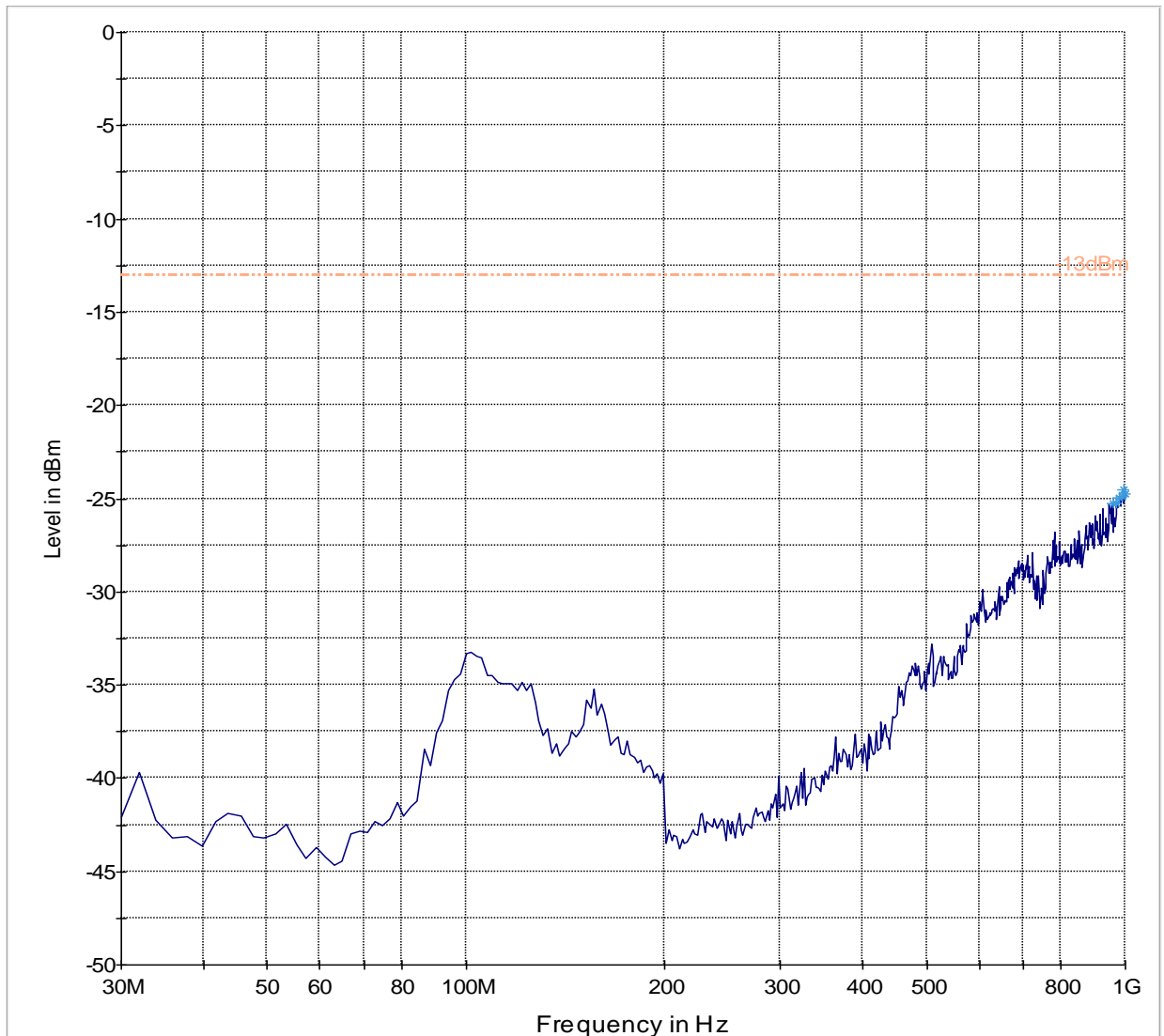
----- -13dBm ——— Preview Result 1-PK+ * Data Reduction Result 1 [1]-PK+

Test results 1GHz-18GHz (Signal over limit is the carrier frequency)



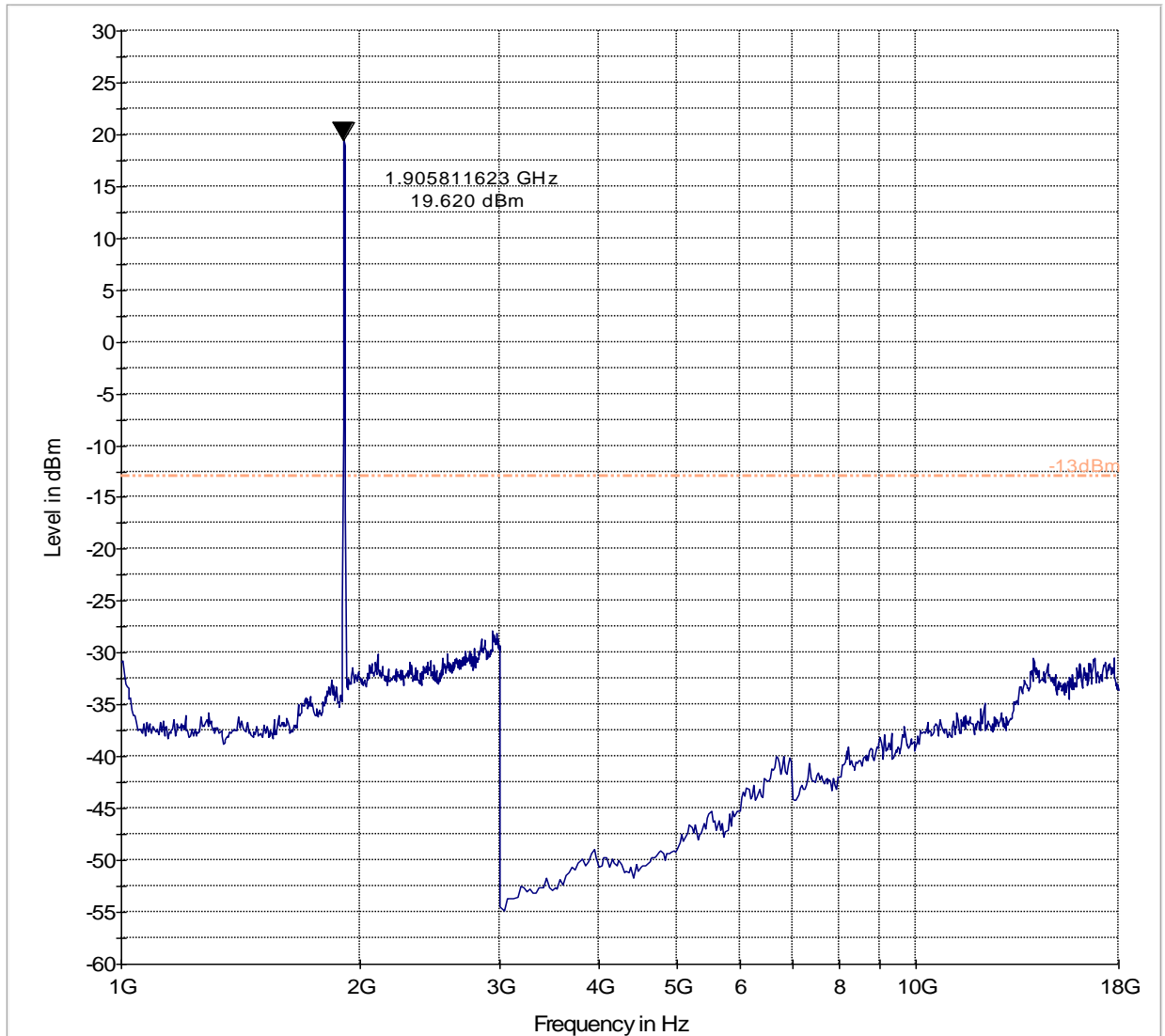
----- -13dBm ——— Preview Result 1-PK+

Radiated Spurious Emissions (UMTS Band 2) Tx: High Channel
Test results 30M-1GHz



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

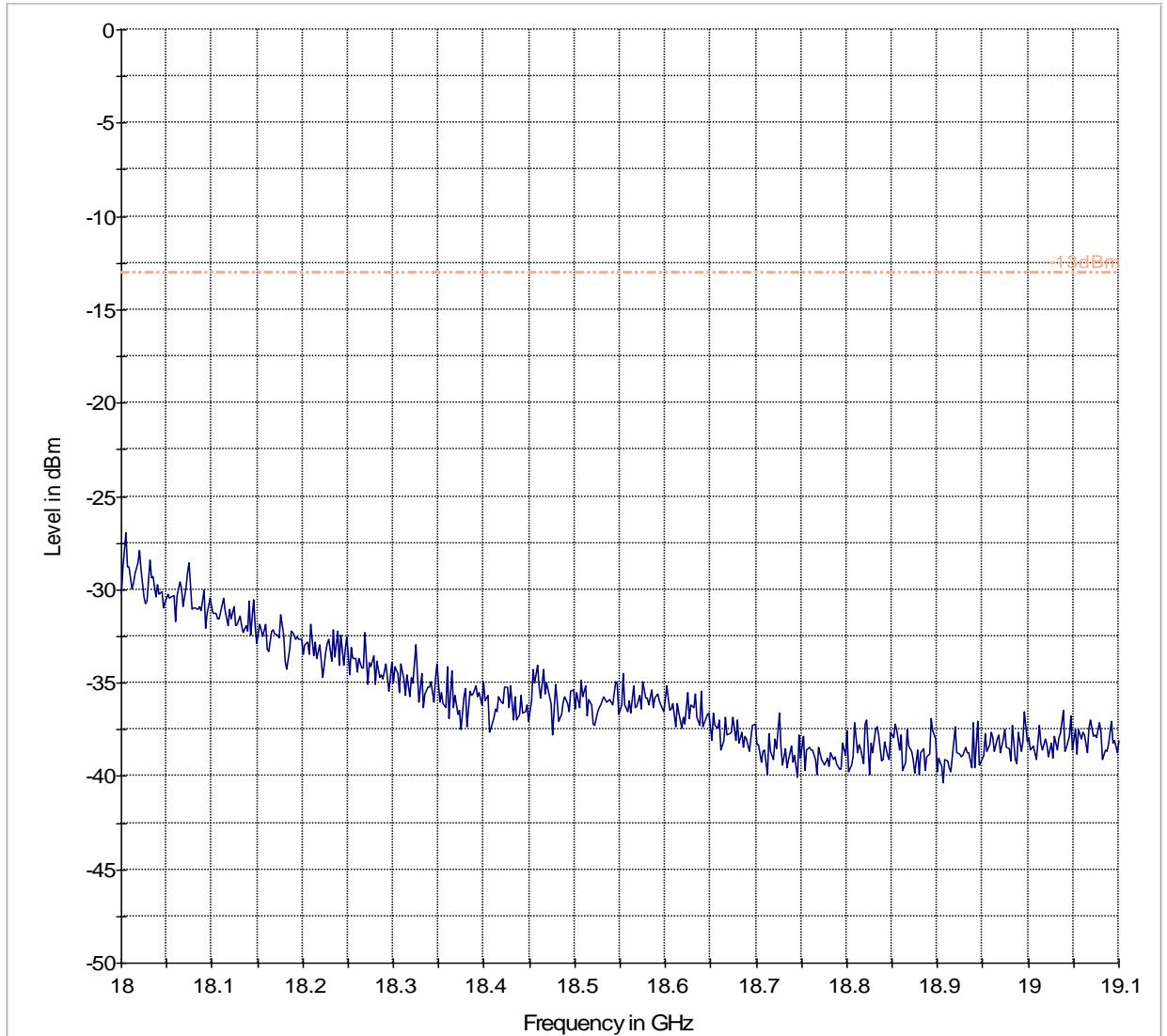
Test results 1GHz-18GHz (Signal over limit is the carrier frequency)



----- -13dBm ——— Preview Result 1-PK+

Test results 18GHz-19.1GHz Tx: Mid Channel

Note: Worst case representation of all channels



----- -13dBm ——— Preview Result 1-PK+

6.3 AC Power Line Conducted Emissions

6.3.1 References:

FCC: CFR Part 15.207

IC: RSS-Gen Section 7.2.2

The purpose of this test is to measure unwanted radio frequency currents induced in any AC conductor external to the equipment which could conduct interference to other equipment via the AC electrical network.

6.3.2 Limits:

6.3.2.1 §15.207 Conducted limits- Intentional Radiators:

(a) Except as shown in paragraphs (b) and (c) of this section of the CFR, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table (1), as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

6.3.2.2 RSS-Gen 7.2.2

Except when the requirements applicable to a given device state otherwise, for any licence-exempt radiocommunication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown below. The tighter limit applies at the frequency range boundaries.

Table 1:

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

6.3.3 Measurement settings:

RBW= 9kHz

6.3.4 Results

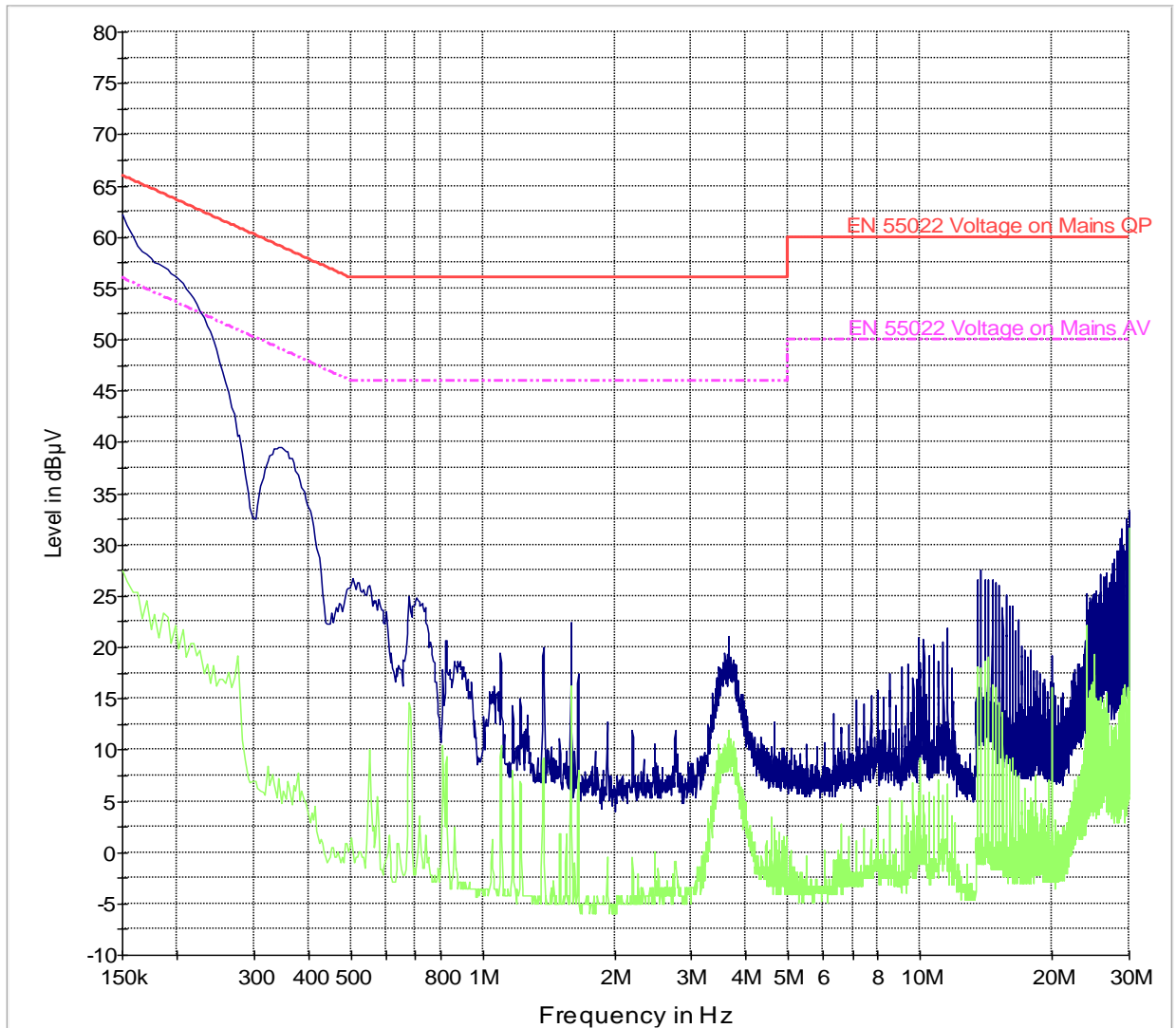
Plots shown here represent the combined worse case emissions for Lines, Phase and Neutral.

6.3.4.1 Measurement Result

Pass.

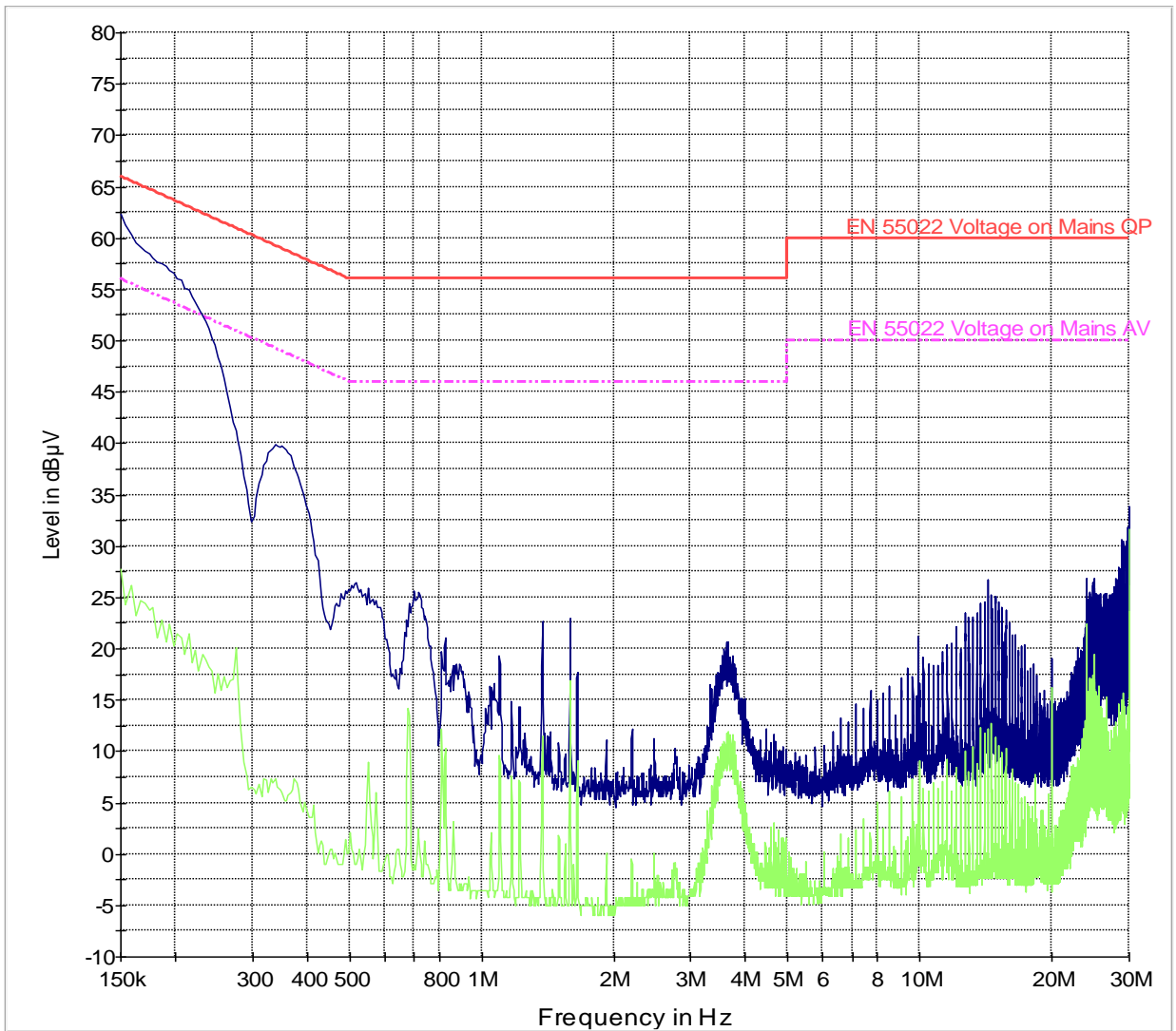
6.3.5 Test Results:

850 TX Mode:



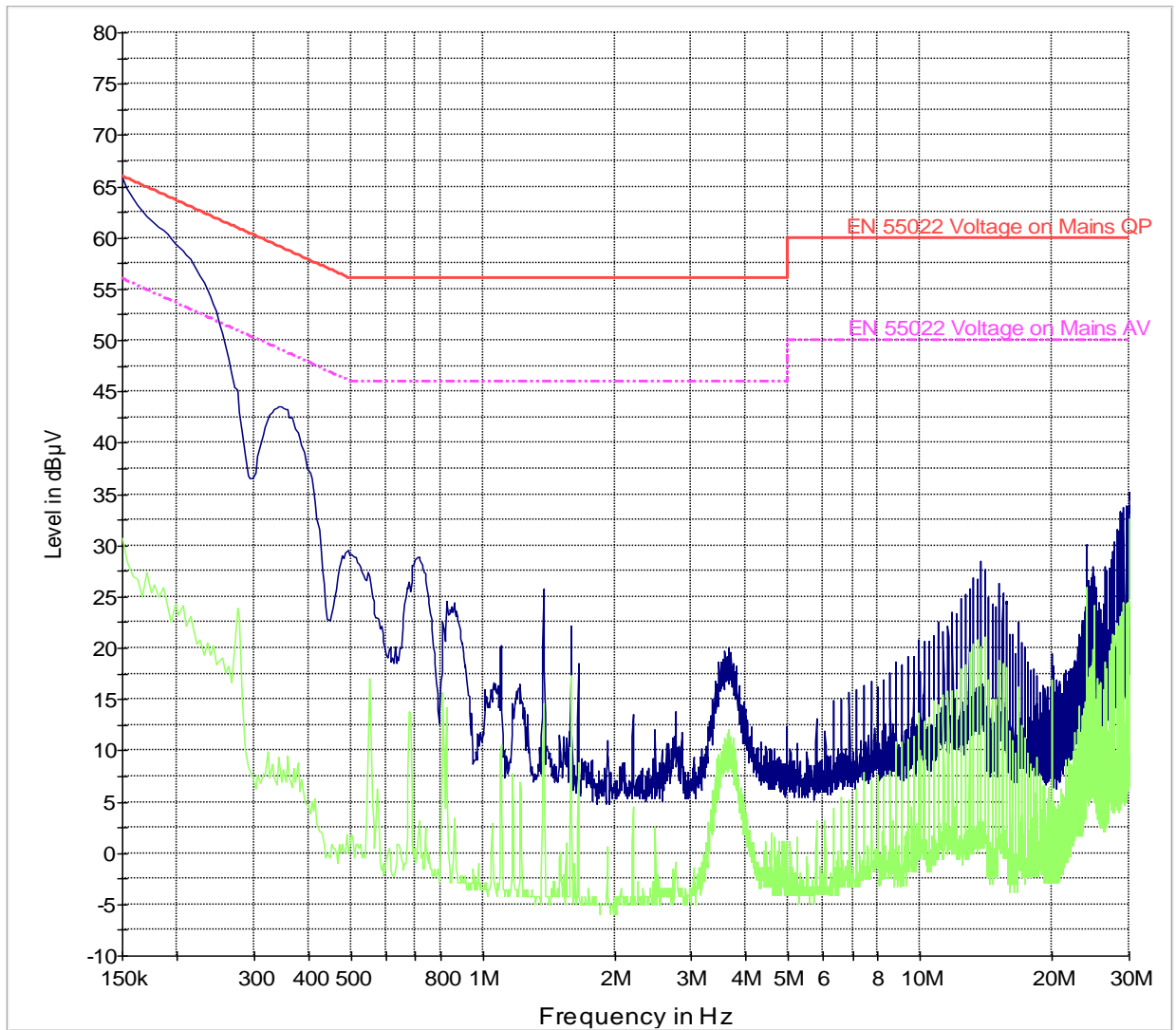
— EN 55022 Voltage on Mains QP - - - EN 55022 Voltage on Mains AV
— Preview Result 1-PK+ — Preview Result 2-AVG

1900 TX Mode:



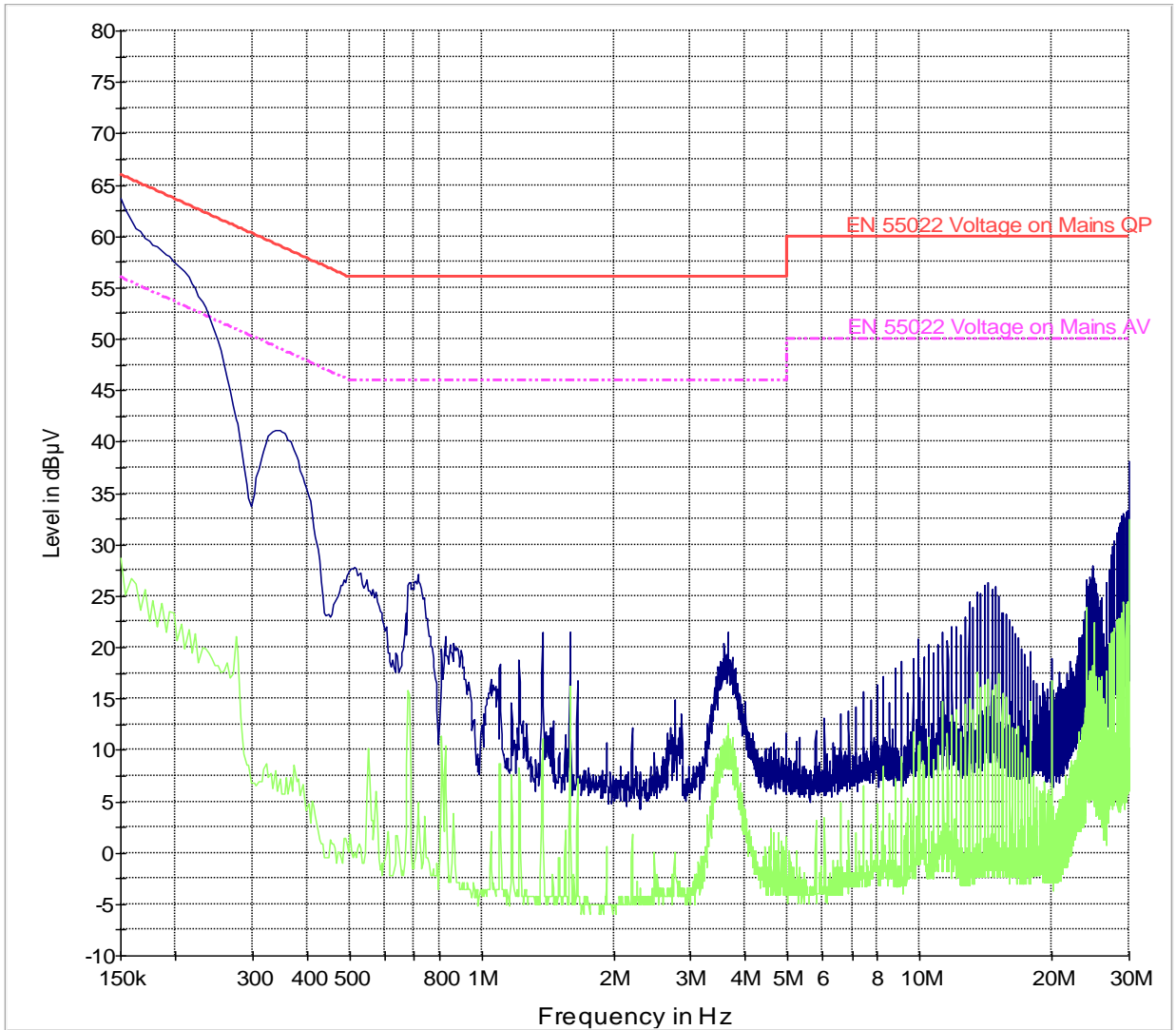
— EN 55022 Voltage on Mains QP - - - EN 55022 Voltage on Mains AV
— Preview Result 1-PK+ — Preview Result 2-AVG

FDD II TX Mode:



- EN 55022 Voltage on Mains QP
- - - EN 55022 Voltage on Mains AV
- Preview Result 1-PK+
- Preview Result 2-AVG

FDD V TX Mode:

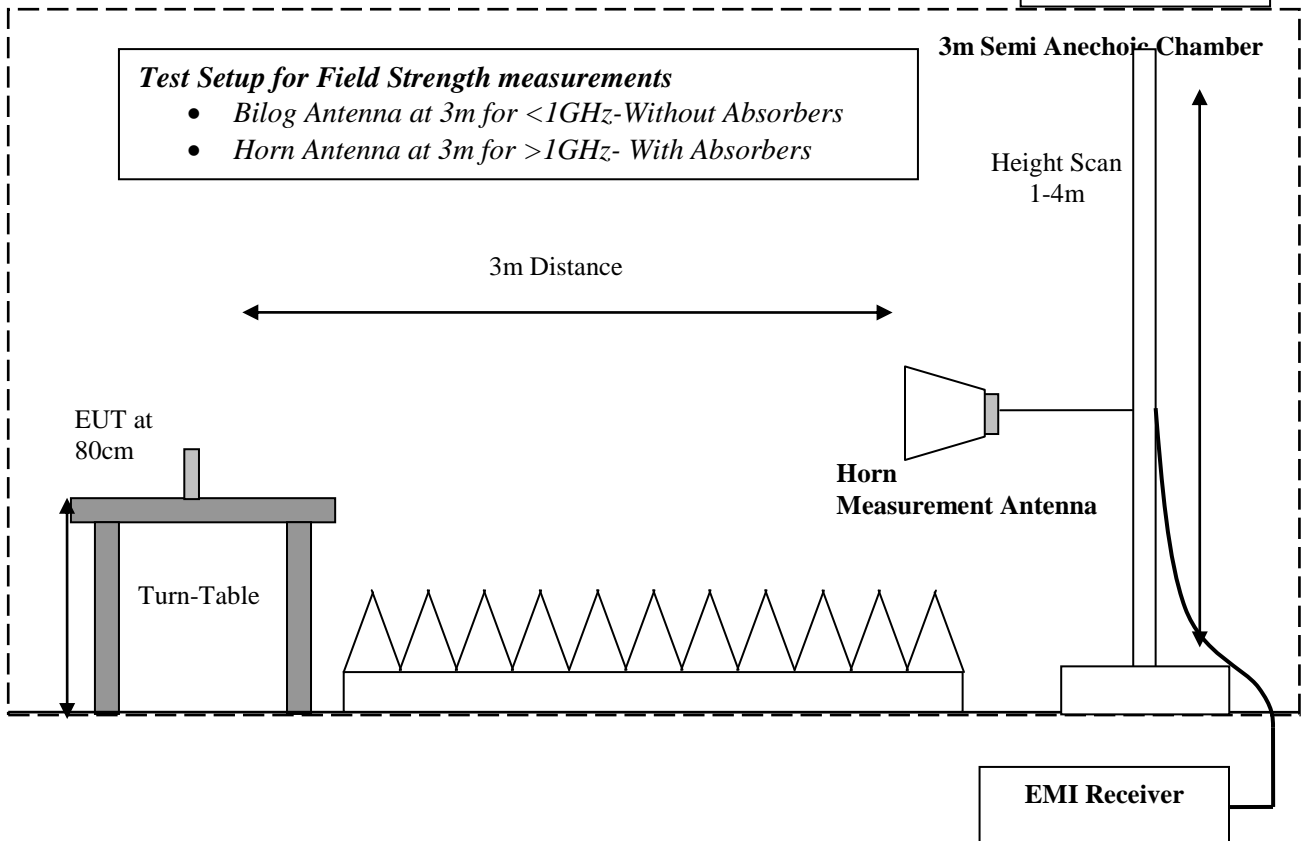
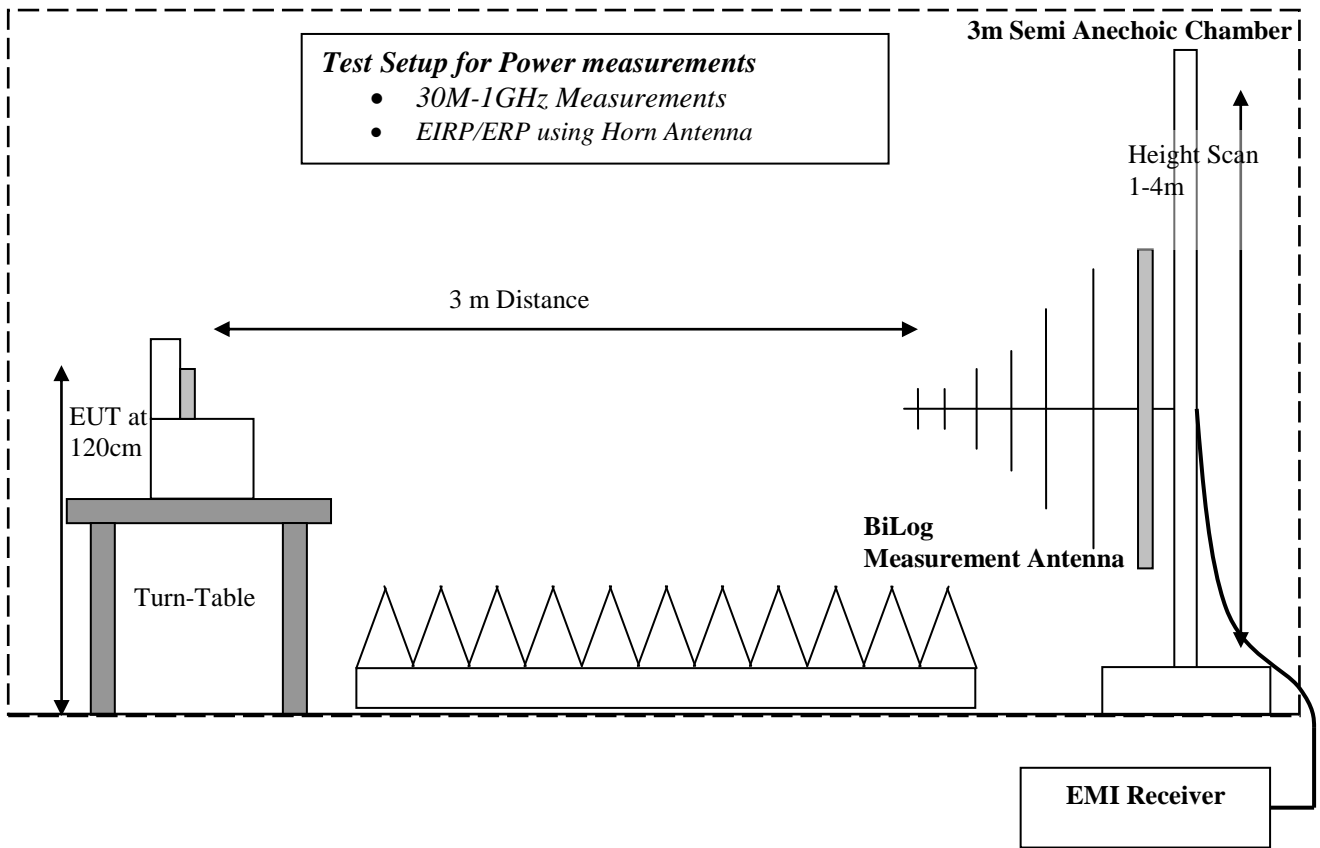


- EN 55022 Voltage on Mains QP
- - - EN 55022 Voltage on Mains AV
- Preview Result 1-PK+
- Preview Result 2-AVG

7 Test Equipment and Ancillaries used for tests

Instrument/Ancillary	Model	Manufacturer	Serial No.	Cal Date	Cal Interval
Radio Communication Tester	CMU 200	Rohde & Schwarz	101821	May 2011	2 Years
EMI Receiver/Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2011	2 Years
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	May 2011	2 Years
Loop Antenna	6512	EMCO	00049838	Aug 2011	3 years
Biconilog Antenna	3141	EMCO	0005-1186	Apr 2012	3 years
Horn Antenna (1-18GHz)	3115	ETS	00035111	Apr 2012	3 years
Horn Antenna (18-40GHz)	3116	ETS	00070497	Sep 2011	3 years
Communication Antenna	IBP5-900/1940	Kathrein	n/a	n/a	n/a
High Pass Filter	5HC2700	Trilithic Inc.	9926013	Part of system calibration	
High Pass Filter	4HC1600	Trilithic Inc.	9922307	Part of system calibration	
6GHz High Pass Filter	HPM50106	Microtronics	001	Part of system calibration	
Pre-Amplifier	JS4-00102600	Miteq	00616	Part of system calibration	
LISN	50-25-2-08	FCC	08014	June 2011	2 Years
Power Smart Sensor	R&S	NRP-Z81	100161	May 2011	2 Years
Multimeter	MM200	Klein	N/A	Apr 2011	2 Years
Temp Hum Logger	TM320	Dickson	03280063	Mar 2012	1 Year
Temp Hum Logger	TM325	Dickson	5285354	Mar 2012	1 Year

8 Block Diagrams



9 Revision History

Date	Report Name	Changes to report	Report prepared by
2012-04-18	EMC_TYCO_043_12001_WWAN	First Version	Tunji Yusuf