



10

TEST REPORT

No. FCC-PART24-2005003

Test name	FCC Test
Product	GSM Mobile Station
Model	T538
Client	TCL Mobile Communication Co.,Ltd
Type of test	Entrusted

Telecommunication Metrology Center
of Ministry of Information Industry



Notice

1. The test report is invalid if not marked with “exclusive stamp for the test report” or the stamp of the test center.
2. Any copy of the test report is invalid if not re-marked with the “exclusive stamp for the test report” or the stamp of the test center.
3. The test report is invalid if not marked with the stamps or the signatures of the persons responsible for performing, revising and approving the test report.
4. The test report is invalid if there is any evidence of erasure and/or falsification.
5. If there is any dissidence for the test report, please file objection to the test center within 15 days from the date of receiving the test report.
6. Normally, entrust test is only responsible for the samples that have undergone the test.
7. Context of the test report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of the test center.

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Product	GSM Mobile Station	Model	T538
		Trade mark	
Client	TCL Mobile Communication Co.,Ltd	Type of test	Entrusted
Manufacturer	TCL Mobile Communication Co.,Ltd	Arrival Date of sample	Jan,20 2005
Place of sampling	(Blank)	Carrier of the samples	Luo Jian
Quantity of the samples	1	Date of product	(Blank)
Base of the samples	(Blank)	Items of test	8
Series number	354883000007493		
Standard(s)	FCC Part 24		
Conclusion	Final Judgment: Pass  (Stamp) Date of issue: Mar 11, 2005		
Comment	The test result only relates to the tested sample.		

Approved by 陆冰松 (Lu Bingsong)
 Revised by 王洪波 (Wang Hongbo)
 Performed by 宋崇文 (Song Chongwen)

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1 COMPETENCE AND WARRANTIES

Telecommunication Metrology Center of Ministry of Information Industry is a test laboratory accredited by DAR (DATEch) – Deutschen Akkreditierungs Rat (Deutsche Akkreditierungsstelle Technik), for the tests indicated in the Certificate No. **DAT-P-114/01-10**.

Telecommunication Metrology Center of Ministry of Information Industry is a test laboratory accredited by CNAL – Accreditation Certificate of China National Accreditation Board for Laboratories, for the tests indicated in the Certificate No. **L0442**.

Telecommunication Metrology Center of Ministry of Information Industry has been accepted by the CETECOM Competent Body for the EMC test reports since April 2000.

Telecommunication Metrology Center of Ministry of Information Industry is a testing laboratory competent to carry out the tests described in this report.

Telecommunication Metrology Center of Ministry of Information Industry guarantees the reliability of the data presented in this report, which is the result of measurements and tests performed to the item under test on the date and under the conditions stated on the report and is based on the knowledge and technical facilities available at **Telecommunication Metrology Center of Ministry of Information Industry** at the time of execution of the test.

Telecommunication Metrology Center of Ministry of Information Industry is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the item under test and the results of the test.

2 GENERAL CONDITIONS

- 2.1 This report only refers to the item that has undergone the test.
- 2.2 This report standalone dose not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities.
- 2.3 This document is only valid if complete; no partial reproduction can be made without written approval of Telecommunication Metrology Center of Ministry of Information Industry.
- 2.4 This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of Telecommunication Metrology Center of Ministry of Information Industry and the Accreditation Bodies, if it applies.

3 ABOUT EUT

3.1 Addressing Information Related to EUT

Table 1: Applicant's details (The Client)

Name or Company	TCL Mobile Communication Co.,Ltd
Address/Post	No.23, Zone,Zhongkai High Technology Development Zone,Huizhou, Guangdong
City	Huizhou
Postal Code	516006
Country	China
Telephone	07522636729
Fax	0752-2636525

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Table 2: Manufacturer's details

Name or Company	TCL Mobile Communication Co.,Ltd
Address/Post	No.23, Zone,Zhongkai High Technology Development Zone,Huizhou, Guangdong
City	Huizhou
Postal Code	516006
Country	China
Telephone	07522636729
Fax	0752-2636525

3.2 Equipment under test (EUT)

Model	T538
Description	GSM Triple frequency mobile station
IMEI	354883000007493
Hardware status	1.5t3
Software status	1.3t3
Frequency	1850.2MHz – 1909.8MHz for PCS 1900
Type of modulation	GMSK
Number of channels	299 for PCS 1900
Antenna	Tri-band
Power supply	Battery or Charger (AC Adaptor)
Output power	29.60dBm(0.912W) maximum EIRP measured for PCS 1900
Extreme vol. Limits	3.5VDC to 4.2VDC (nominal: 3.7 VDC)
Extreme temp. Tolerance	-30°C to +50°C

3.3 Photographs of Equipment under test

Photographs of MS Hand Telephone Set and Charger are respectively shown in annex B.

4 LABORATORY ENVIRONMENT

Semi-anechoic chamber (23 meters×17meters×10meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 30 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω
Normalised site attenuation (NSA)	< ±3.2 dB, 10 m distance, from 30 to 1000 MHz
Uniformity of field strength	Between 0 and 6 dB, from 26 to 1000 MHz

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Control room did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 30 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω

Conducted chamber did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 30 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω

Fully-anechoic chamber (6.8 meters×3.08 meters×3.53 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 30 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω
Uniformity of field strength	Between 0 and 6 dB, from 26 to 1000 MHz

5 SUMMARY OF TEST RESULTS

Abbreviations used in this clause:	
— — Pass	P
— — Not applicable	NA
— — Fail	F
— — Not measured	NM

Clause	List	Clause in FCC rules	Verdict
1	POWER OUTPUT	24.232(b)	P
2	FREQUENCY STABILITY	2.1055/24.235	P
3	OCCUPIED BANDWIDTH	2.1049(h)(i)	P
4	EMISSION BANDWIDTH	24.238(b)	P
5	EMISSION LIMIT	24.238	P
6	BAND EDGE COMPLIANCE	24.238(b)	P
7	CONDUCTED SPURIOUS EMISSIONS	2.1057/24.238	P
8	CONDUCTED EMISSIONS	15.107/207	P

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6 MAIN TEST INSTRUMENTS

NO.	NAME	TYPE	SERIES NUMBER	PRODUCER
1	Test Receiver	ESS	847151/015	R&S
2	Test Receiver	ESI40	831564/002	R&S
3	BiLog Antenna	3142B	9908-1403	EMCO
4	BiLog Antenna	3142B	9908-1405	EMCO
5	Signal Generator	SMT06	831285/005	R&S
6	Signal Generator	SMP04	100070	R&S
7	LISN	ESH2-Z5	829991/012	R&S
8	Spectrum Analyzer	E4440A	MY41000262	Agilent
9	Universal Radio Communication Tester	CMU200	100680	R&S
10	Dual-Ridge Waveguide Horn Antenna	3115	9906-5827	EMCO
11	Dual-Ridge Waveguide Horn Antenna	3116	2663	EMCO
12	Dual-Ridge Waveguide Horn Antenna	3116	2661	EMCO
13	Climatic Chamber	PL-2G	343074	ESPEC

7 TEST PERIOD

The performed test started on Jan,20 2005 and finished on Mar, 09, 2005.

8 TEST LOCATION

Safety & EMC laboratory of Telecommunication Metrology Center of Ministry of Information Industry.

ANNEX A MEASUREMENT RESULTS

A.1 OUTPUT POWER (§ 24.232(b))

A.1.1 Summary

During the process of testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication tester (CMU-200) to ensure max power transmission and proper modulation. This paragraph contains Burst Average conducted output power and EIRP measurements for the EUT.

In all cases, output power is within the specified limits.

A.1.2 Conducted

A.1.2.1 Method of Measurements

The EUT was set up for the max output power with pseudo random data modulation.

The power was measured with Agilent Spectrum Analyzer E4440A (peak)

These measurements were done at 3 frequencies, 1850.2 MHz, 1880.0 MHz and 1909.8 MHz (bottom, middle and top of operational frequency range).

A.1.2.2 Limit

Power step	Nominal Peak output power (dBm)	Tolerance (dB)
0	30dBm(1W)*	± 2

*GSM Specification – ETSI EN 300 910 V8.5.1 (2000-11) Section 4.1

A1.2.3 Measurement result

Frequency(MHz)	Power Step	Peak output power(dBm)
1850.2	0	29.01
1880.0	0	28.55
1909.8	0	28.88

A.1.3 Radiated

A.1.3.1 Description

This is the test for the maximum radiated power from the EUT. Rule Part 24.232(b) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

A.1.3.2 Method of Measurement

1. In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference centre of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power (P_{in}) is applied to the input of the dipole, and the power received (P_r) at the chamber's probe antenna is recorded.
2. A "reference path loss" is established as $P_{in} + 2.15 - P_r$.
3. The EUT is substituted for the dipole at the reference centre of the chamber and a scan is performed to obtain the radiation pattern.

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4. From the radiation pattern, the co-ordinates where the maximum antenna gain occurs are identified.
5. The EUT is then put into pulse mode at its maximum power level (Power Step 0).
6. "Gated mode" power measurements are performed with the receiving antenna placed at the coordinates determined in Step 3 to determine the output power as defined in FCC Rule 24.232 (b) and (c). The "reference path loss" from Step1 is added to this result.
7. This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.15 dBi) and known input power (Pin).
8. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dBi}$.

A.1.3.3 Limits

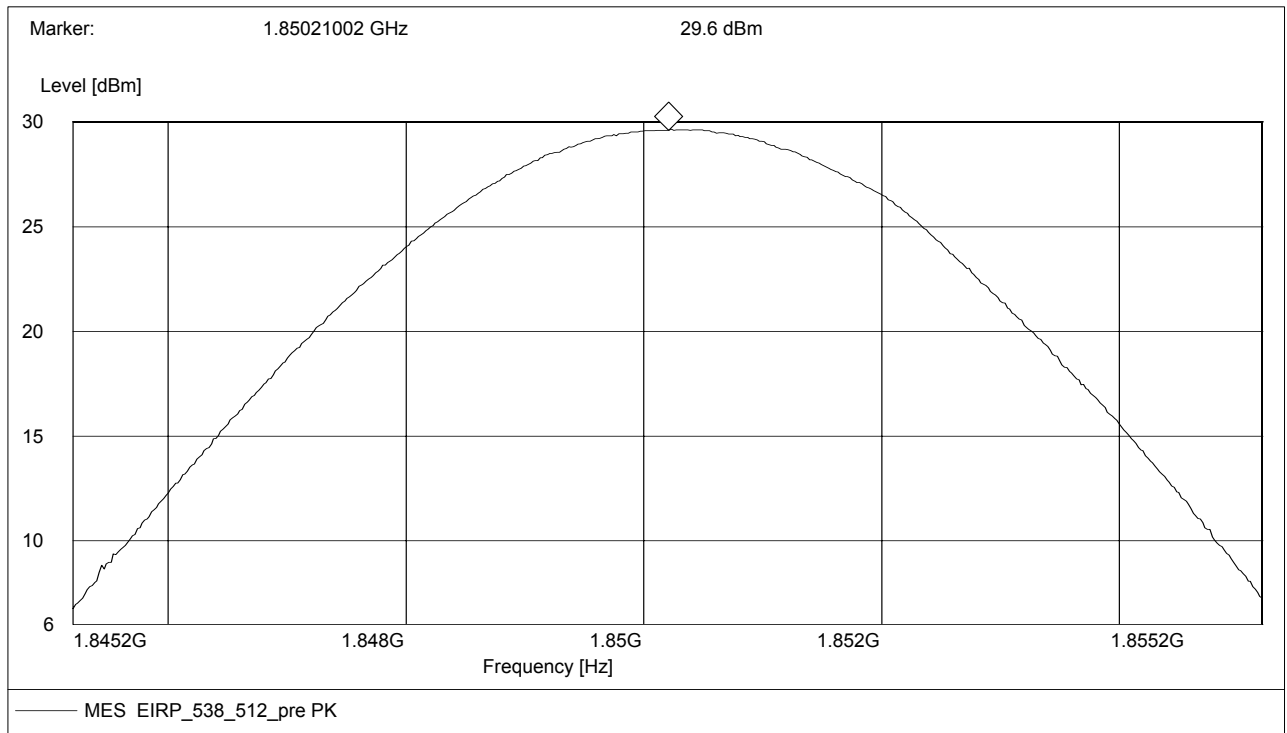
Power Step	Burst Peak EIRP (dBm)
0	$\leq 33\text{dBm}$ (2W)

A.1.3.4 Measurement result

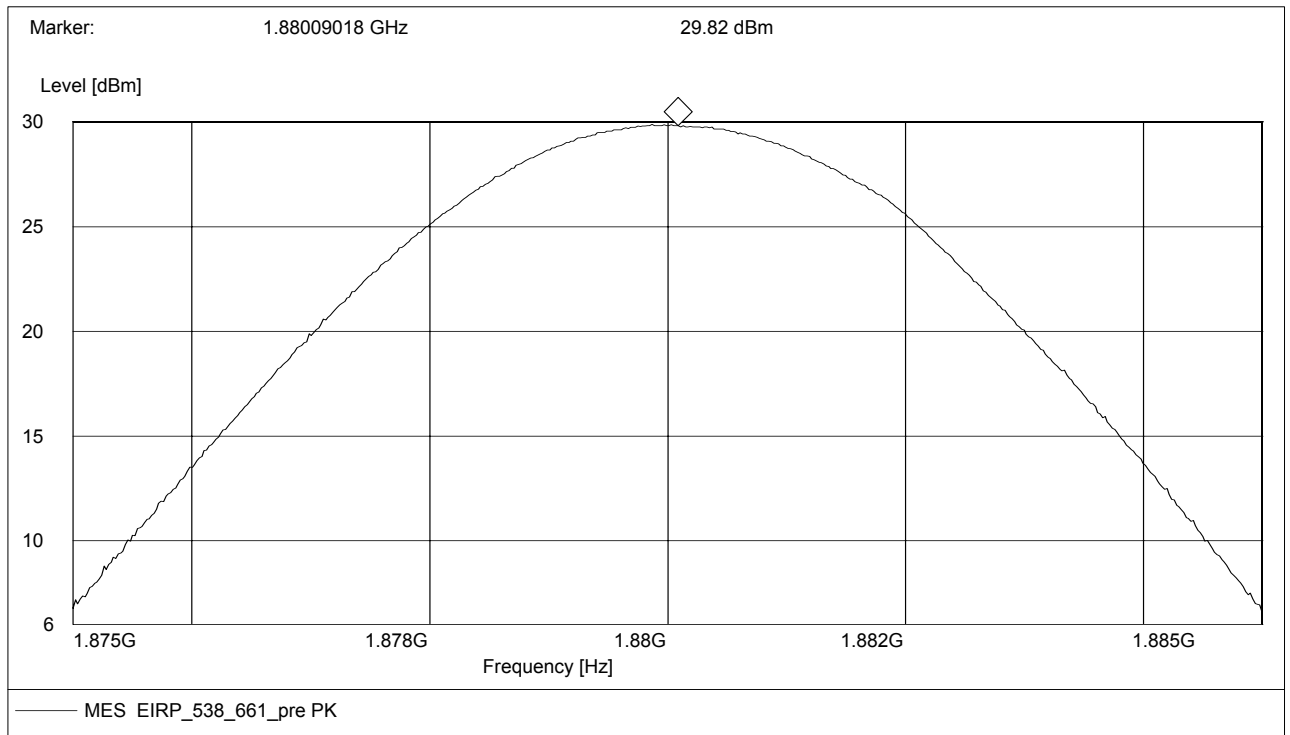
Frequency(MHz)	Power Step	Peak EIRP(dBm)
1850.2	0	29.60
1880.0	0	29.82
1909.8	0	24.42

ANALYZER SETTINGS: RBW = VBW = 3MHz

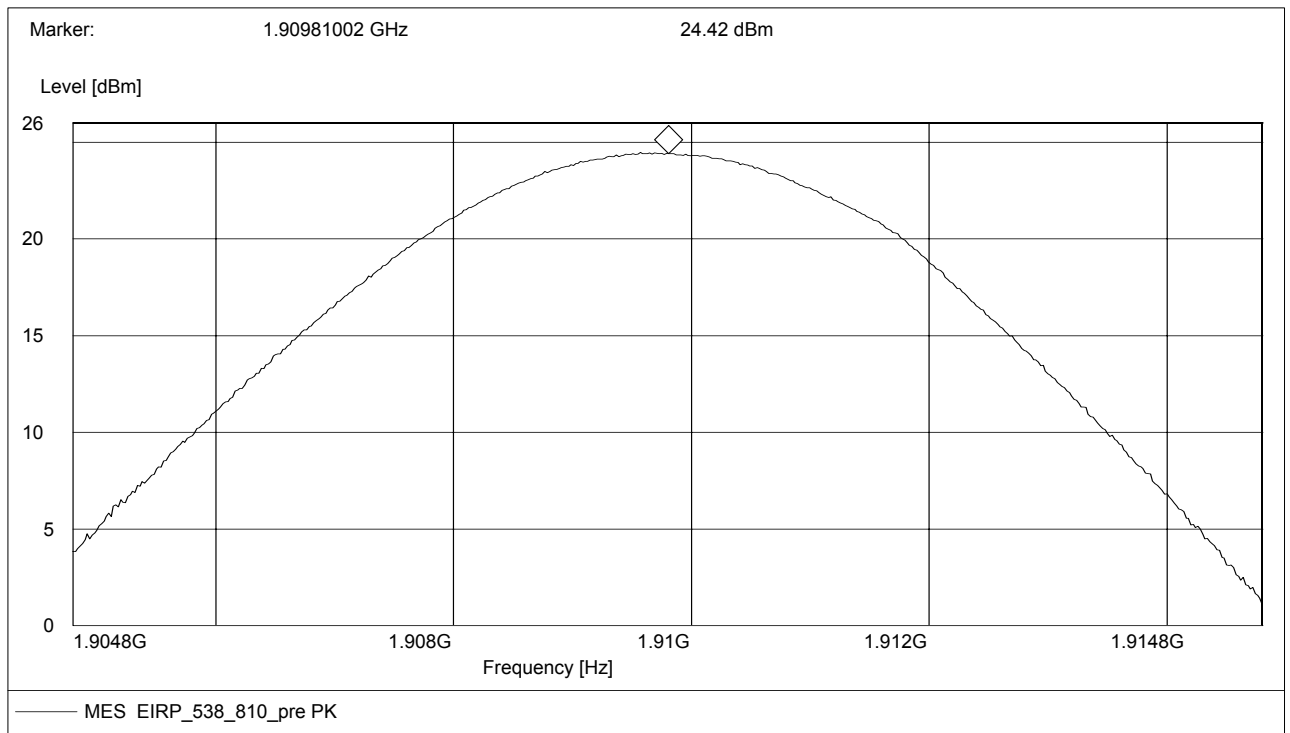
A.1.3.4.1 EIRP CHANNEL 512



A.1.3.4.2 EIRP CHANNEL 661



A.1.3.4.3 EIRP CHANNEL 810



A.2 FREQUENCY STABILITY (§2.1055/24.235)

A.2.1 Method of Measurement

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30°C.
3. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on channel 661 (centre channel), measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
5. Remeasure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1V increments remeasuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50°C.
7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on channel 661 (centre channel), measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 C increments from +50°C to -30°C. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

A.2.2 Measurement Limit

A.2.2.1 For Hand carried battery powered equipment

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.4VDC and 4.2VDC, with a nominal voltage of 3.7VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of -10 % and +12.5 %. For the purposes of measuring frequency stability these voltage limits are to be used.

A.2.2.1 For equipment powered by primary supply voltage

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

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A.2.3 Measurement results

A.2.3.1 Frequency Error vs Voltage

Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
3.5	48	0.026
3.7	54	0.029
4.2	51	0.027

A.2.3.2 Frequency Error vs Temperature

temperature(°C)	Frequency error(Hz)	Frequency error(ppm)
-30	56	0.030
-20	52	0.028
-10	48	0.026
0	47	0.025
10	55	0.029
20	50	0.027
30	60	0.032
40	49	0.026
50	51	0.027

A.3 OCCUPIED BANDWIDTH (§2.1049(h)(i))

A.3.1 Occupied Bandwidth Results

Similar to conducted emissions; occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. The table below lists the measured -20dBc BW (99%). Spectrum analyzer plots are included on the following pages.

Frequency(MHz)	Occupied Bandwidth (99% Pwr BW)(kHz)
1850.2	246.341
1880.0	246.871
1909.8	252.071

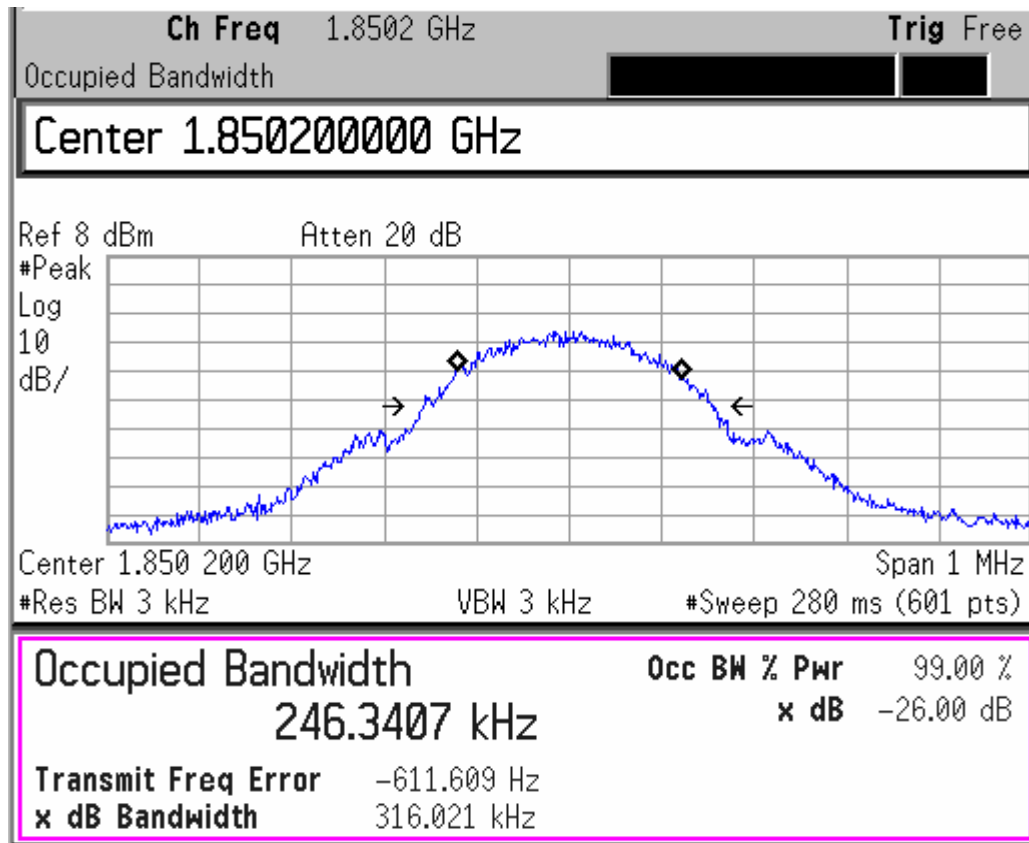
ANALYZER SETTINGS: RBW=VBW=3kHz

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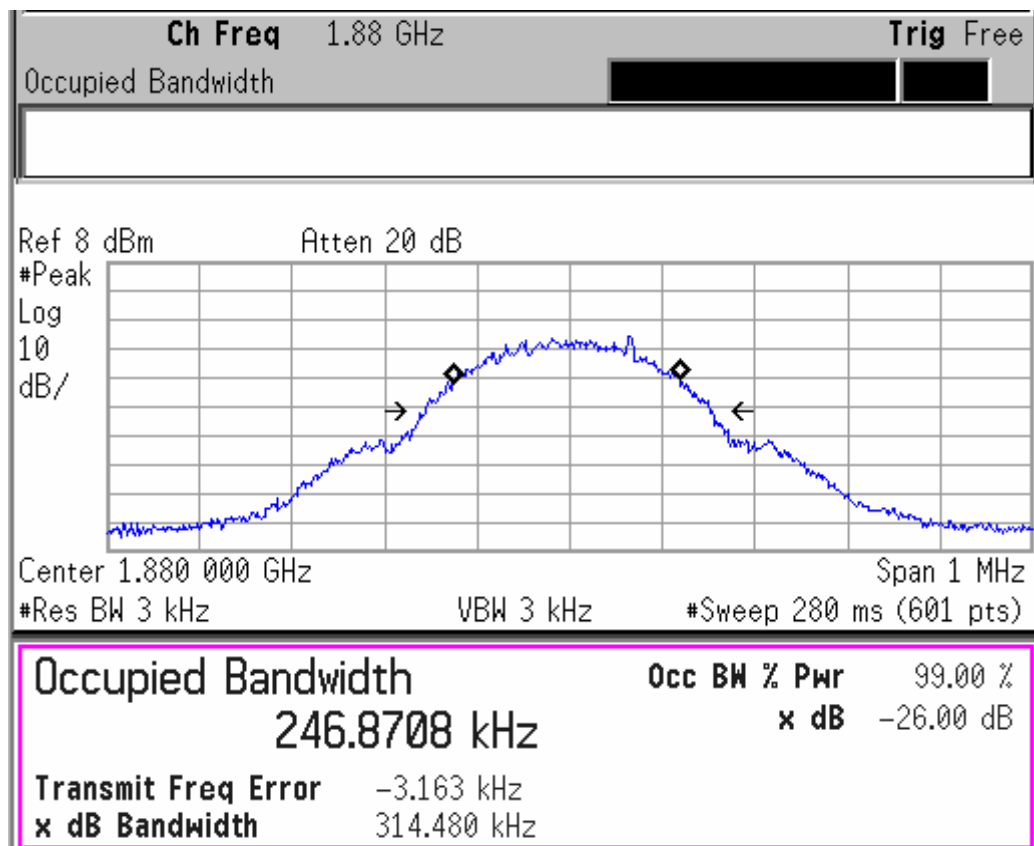
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A.3.1.1 Channel 512-Occupied Bandwidth (99%Pwr BW)



A.3.1.2 Channel 661-Occupied Bandwidth (99%Pwr BW)

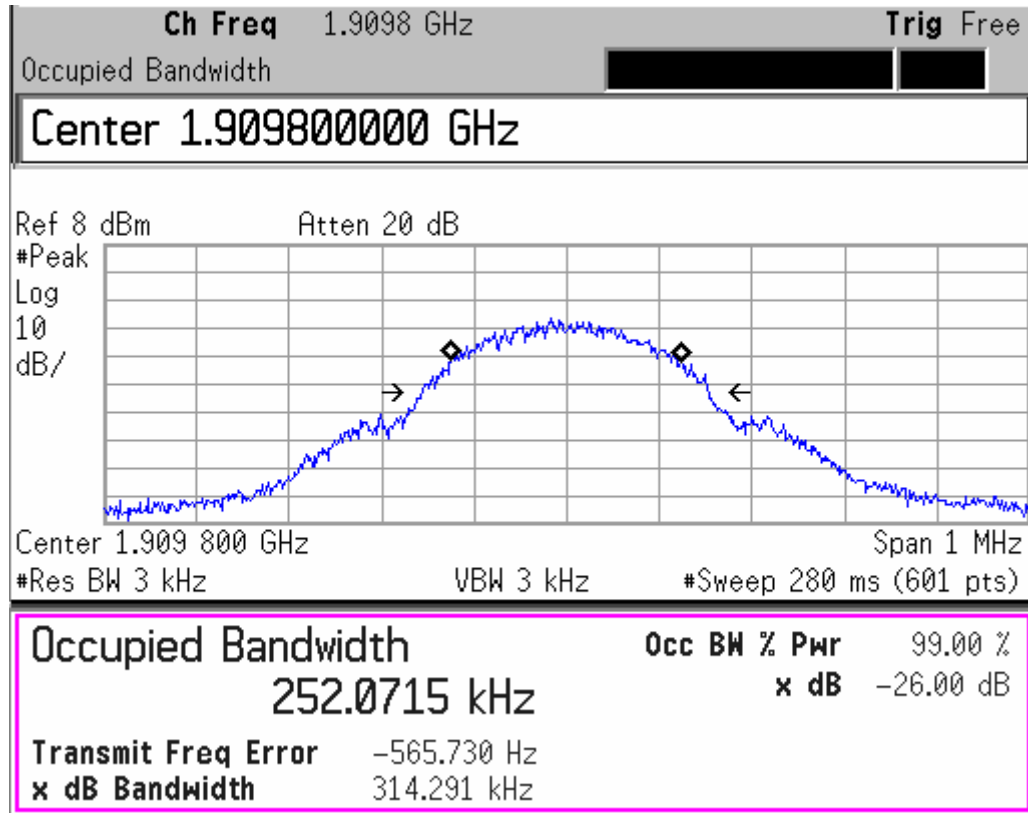


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A.3.1.3 Channel 810-Occupied Bandwidth (99%Pwr BW)



A.4 EMISSION BANDWIDTH (§24.238(b))

A.4.1 Emission Bandwidth Results

Similar to conducted emissions; Emission bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the following pages.

Frequency(MHz)	Occupied Bandwidth (-26dBc BW)(kHz)
1850.2	316.021
1880.0	314.480
1909.8	314.291

ANALYZER SETTINGS: RBW=VBW=3kHz;

Please refer to A.3 occupied bandwidth to see the graphic result of this test item.

A.5 EMISSION LIMIT (§24.238)

A.5.1 Measurement Method

The site is constructed in accordance with ANSI C63.4 – 1992 requirements and is recognized by the FCC. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the USPCS band.

A.5.2 Measurement Limit

Sec. 24.238 Emission Limits.

(a) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least $43 + 10 \log(P)$ dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10 \log(P)$ dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

A.5.3 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the USPCS band (1850.2 MHz, 1880 MHz and 1909.8 MHz). 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 USPCS band into any of the other blocks. 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.

NOTE: The spurious emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 18GHz and 20GHz very short cable connections to the antenna was used to minimize the noise level.

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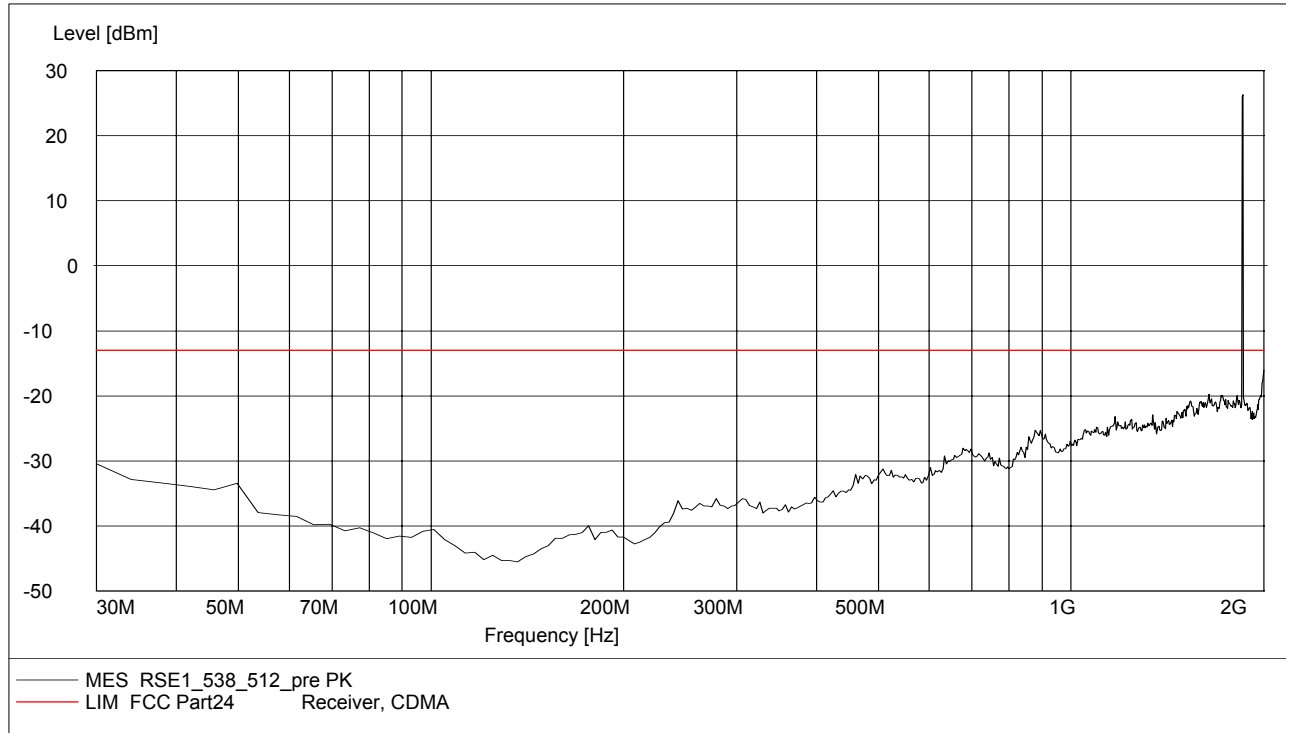
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A.5.3.1 RADIATED SPURIOUS EMISSIONS-Channel 512: 30MHz – 2GHz

RBW=VBW=1MHz

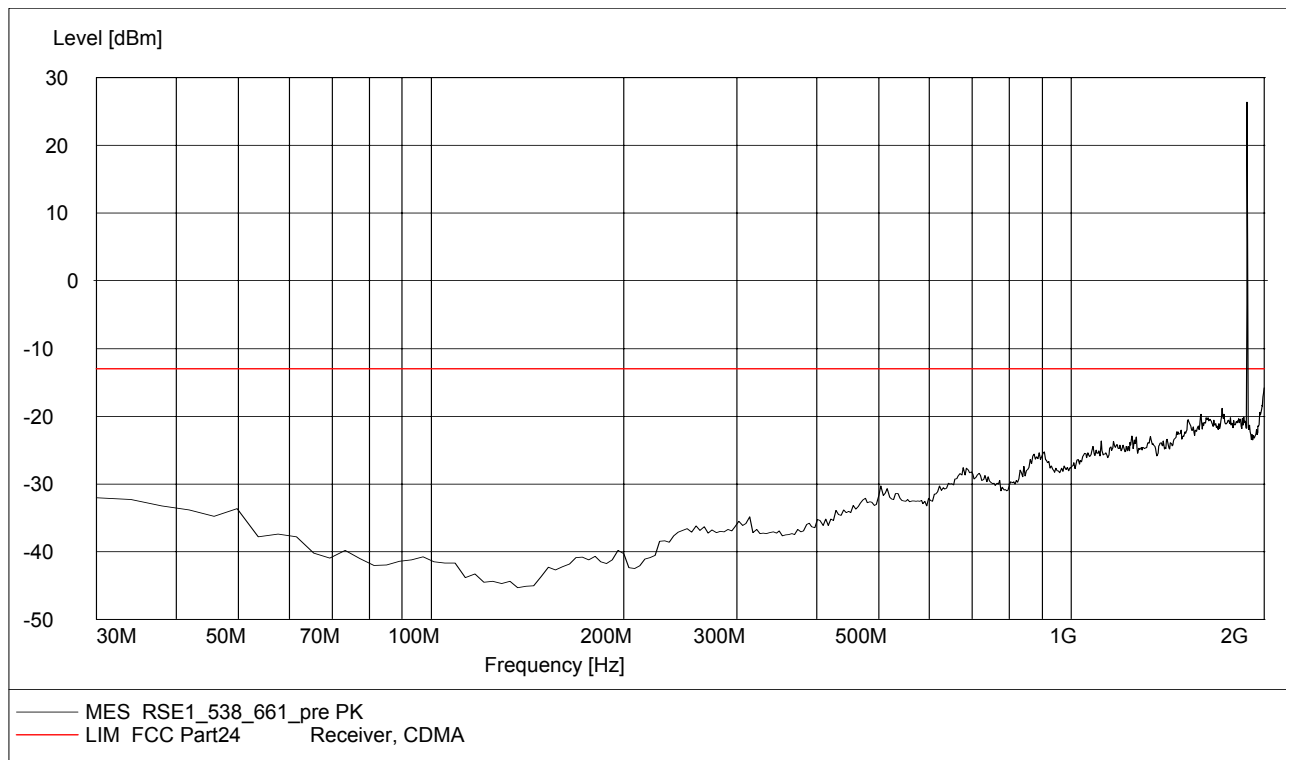
NOTE: peak above the limit line is the Carrier frequency @ ch-512



A.5.3.2 RADIATED SPURIOUS EMISSIONS-Channel 661: 30MHz – 2GHz

RBW=VBW=1MHz

NOTE: peak above the limit line is the Carrier frequency @ ch-661



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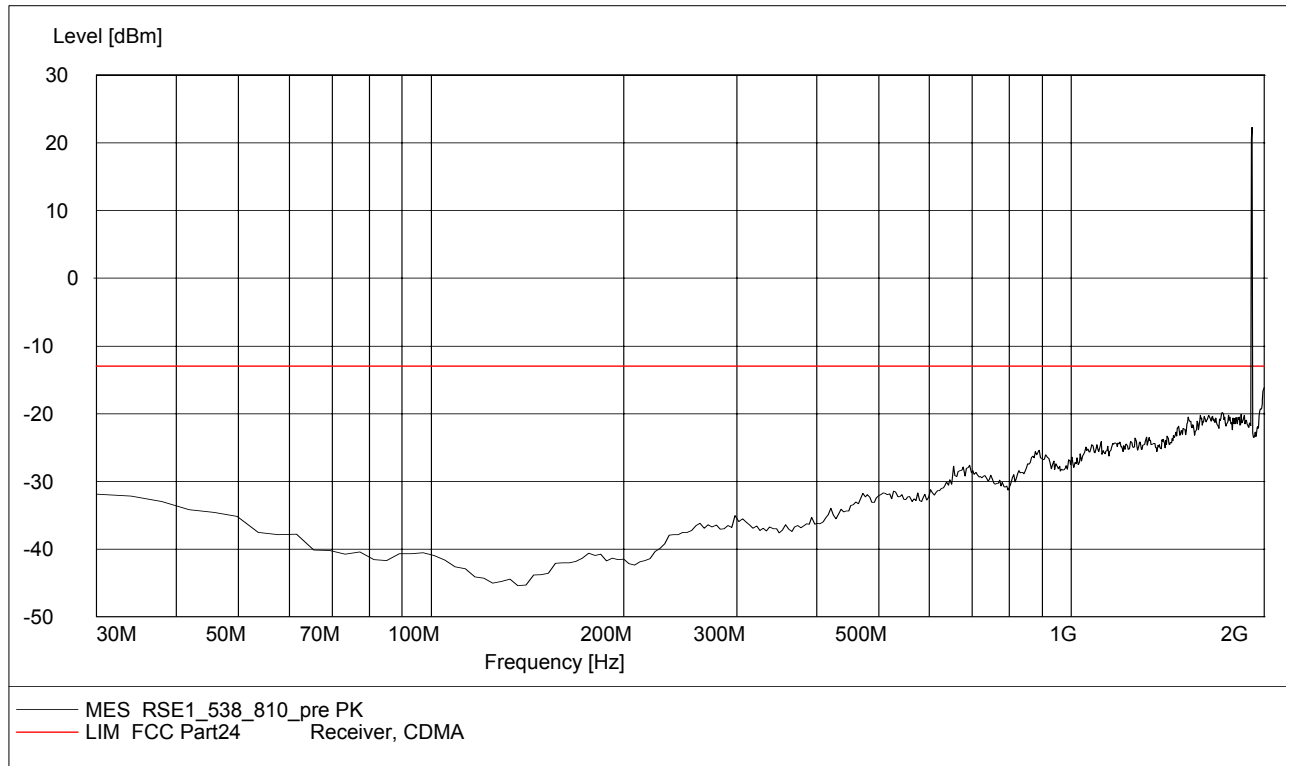
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A.5.3.3 RADIATED SPURIOUS EMISSIONS-Channel 810: 30MHz – 2GHz

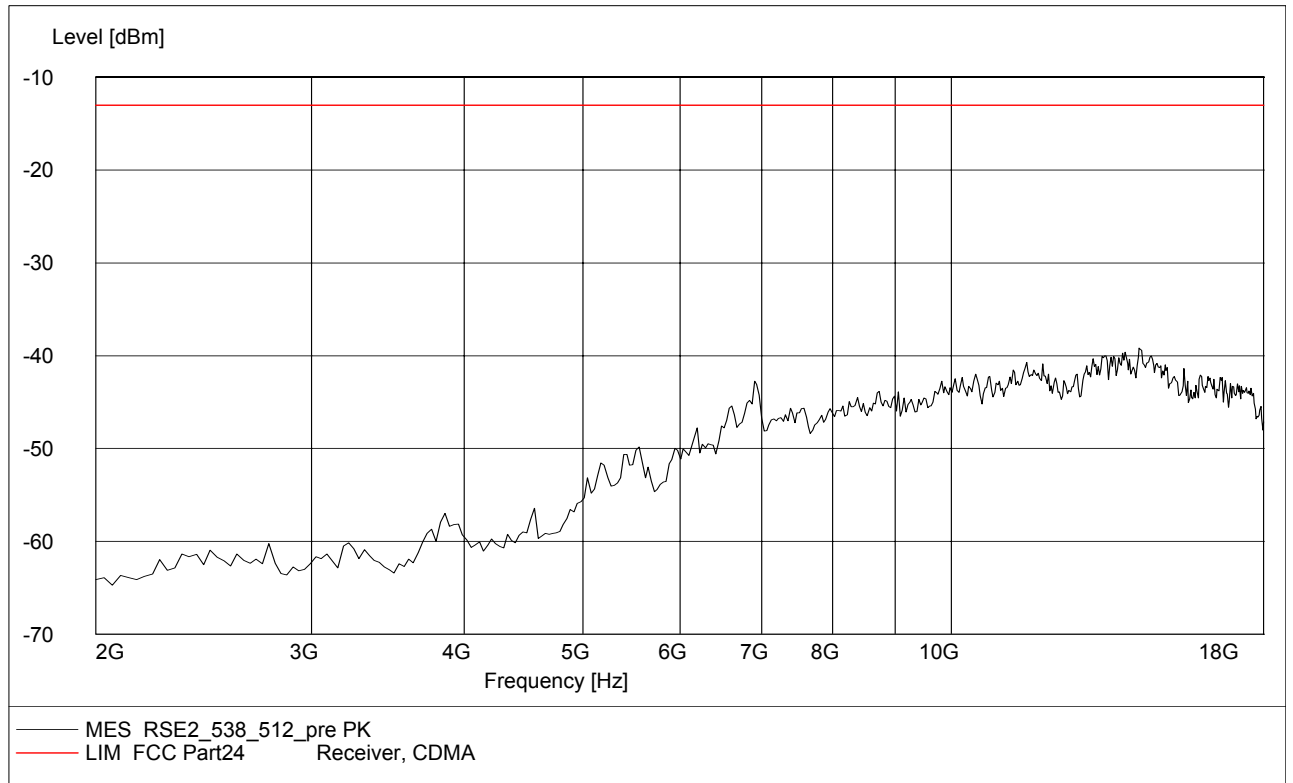
RBW=VBW=1MHz

NOTE: peak above the limit line is the Carrier frequency @ ch-810



A.5.3.4 RADIATED SPURIOUS EMISSIONS-Channel 512: 2GHz – 18GHz

RBW=VBW=1MHz



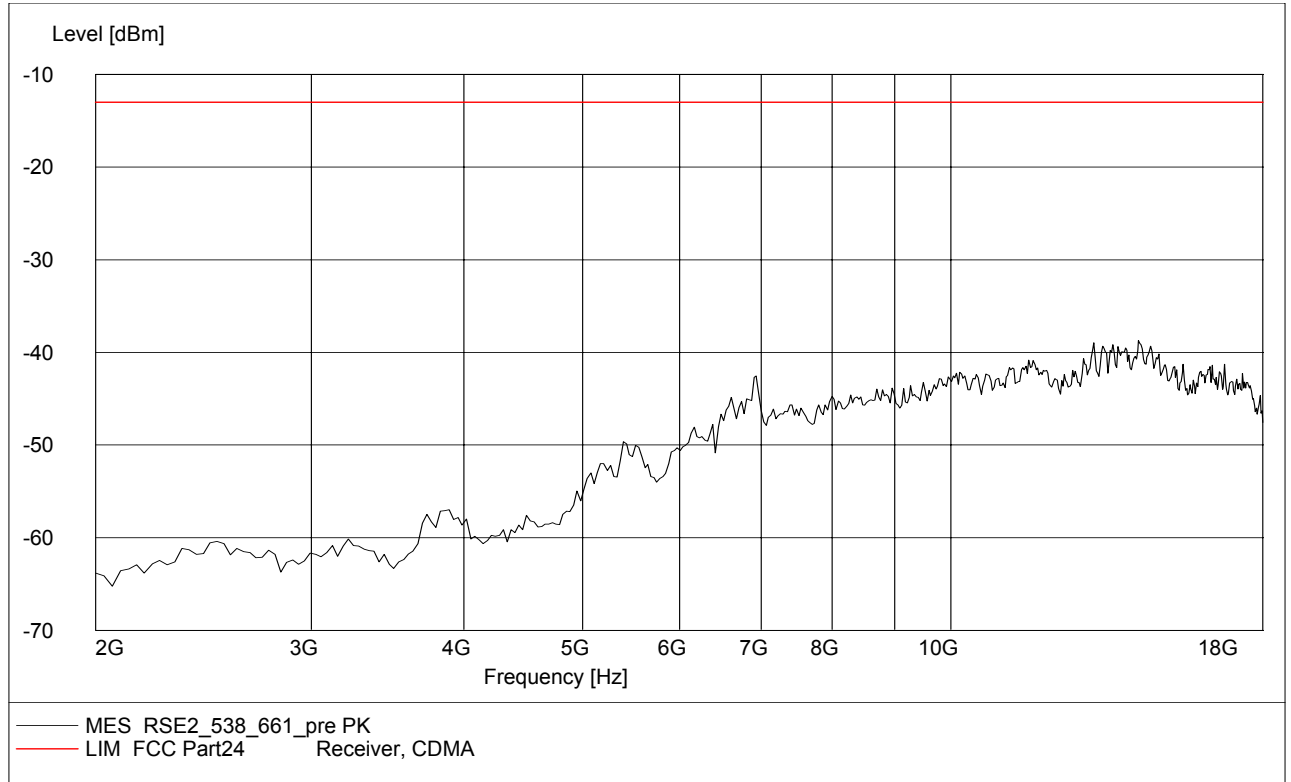
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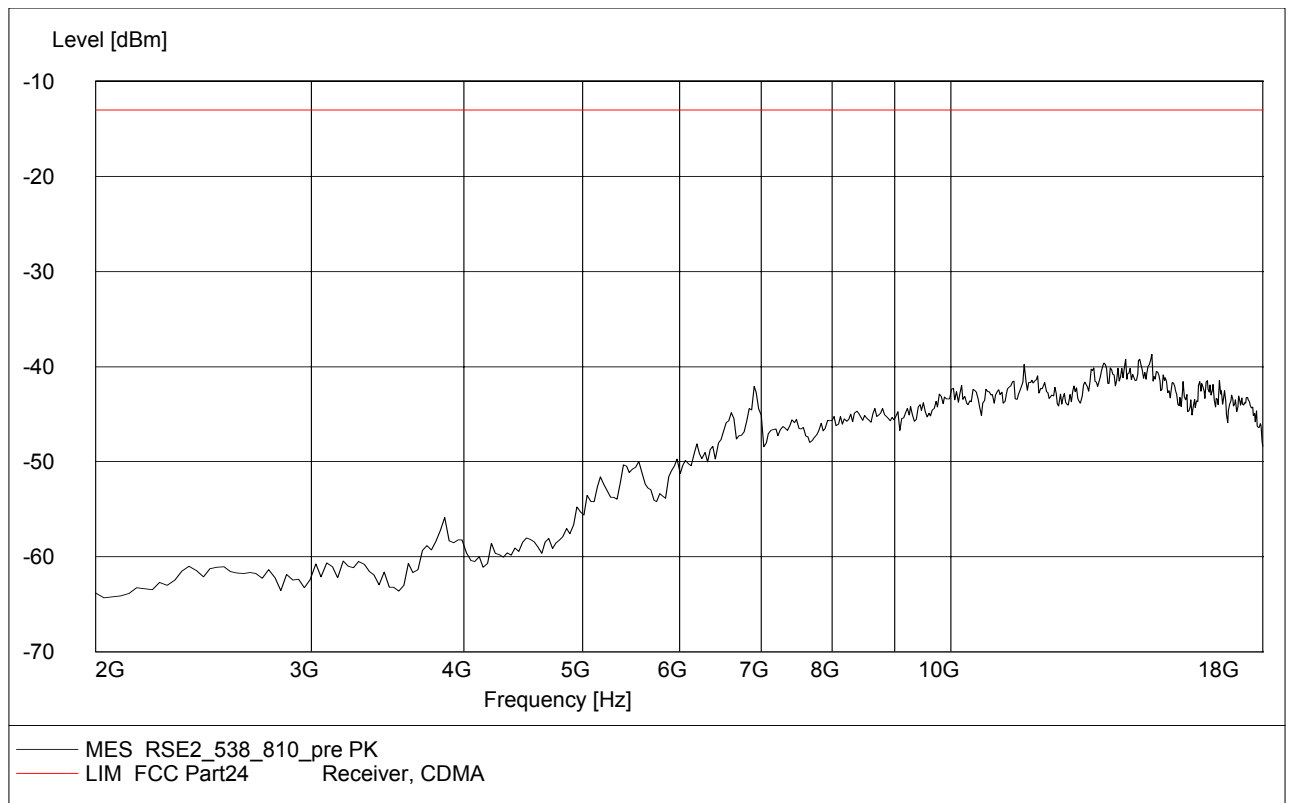
A5.3.5 RADIATED SPURIOUS EMISSIONS-Channel 661: 2GHz – 18GHz

RBW=VBW=1MHz



A.5.3.6 RADIATED SPURIOUS EMISSIONS-Channel 810: 2GHz – 18GHz

RBW=VBW=1MHz



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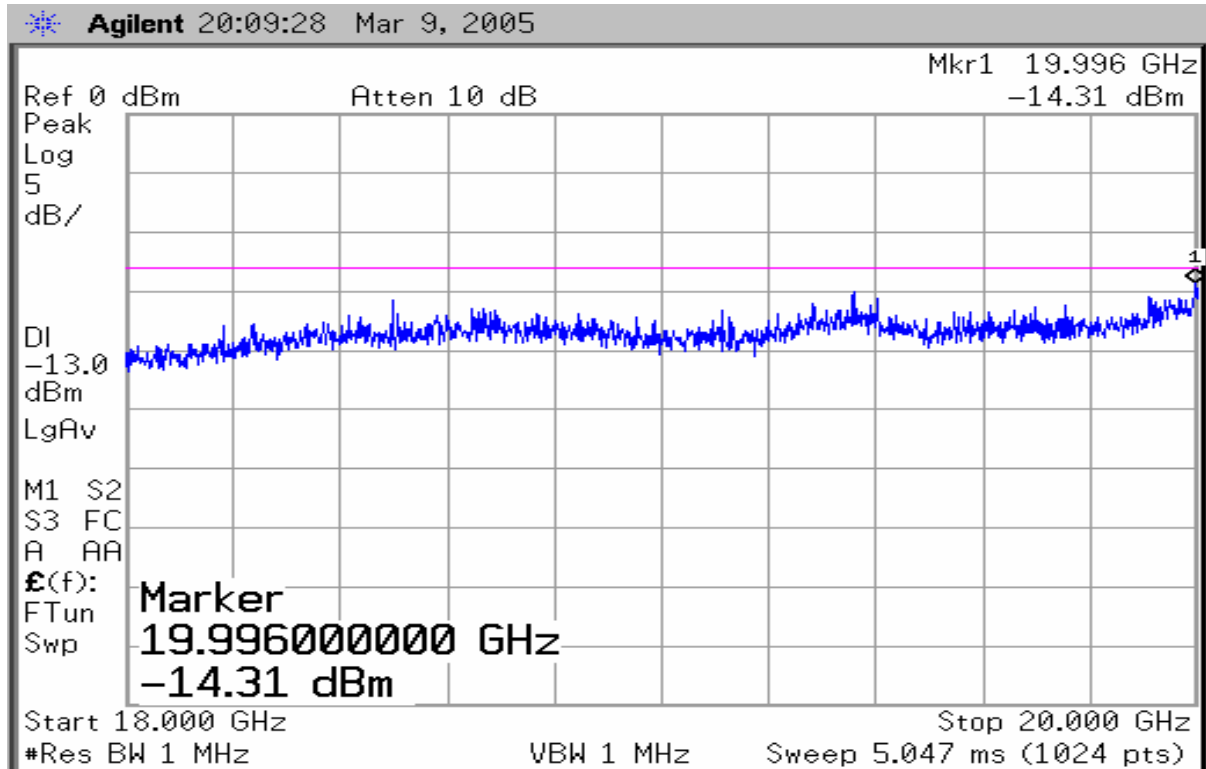
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A.5.3.7 Radiated spurious emission (18GHz-20GHz)

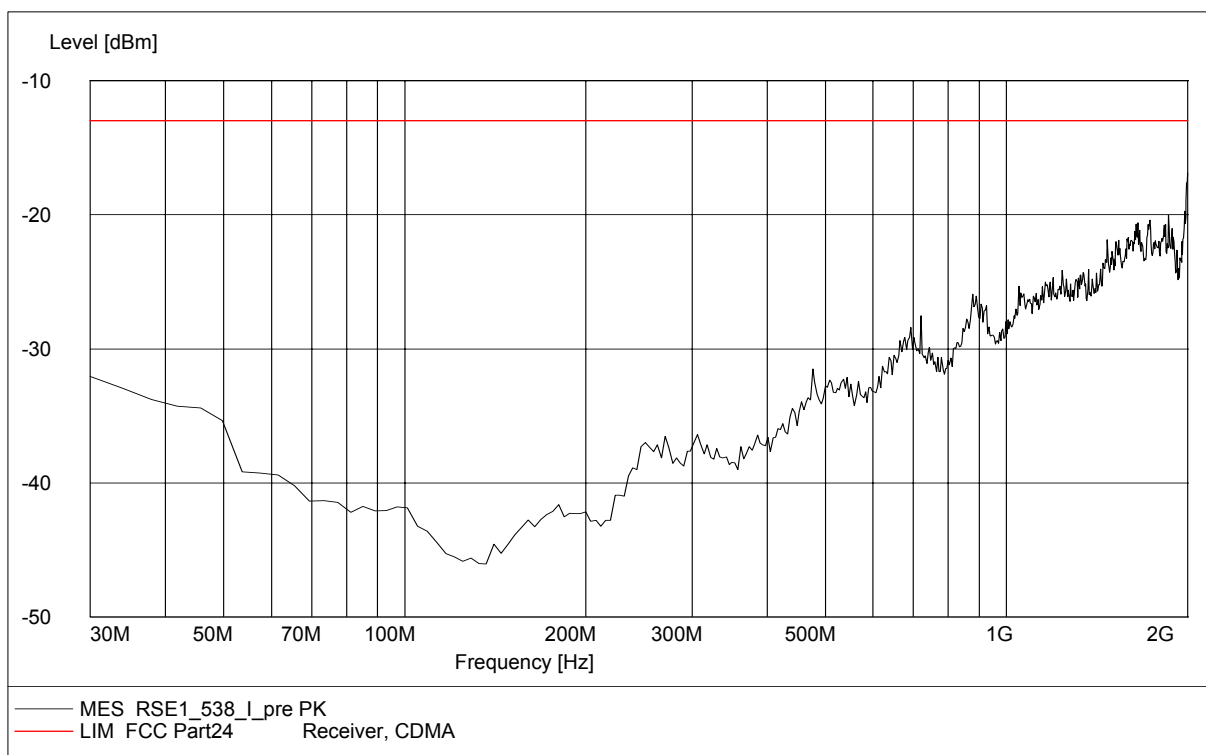
RBW=VBW=1MHz

Note: This plot is valid for low, mid & high channels (worst-case plot). It is same as the floor noise.



A.5.3.8 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 30MHz – 2GHz

RBW=VBW=1MHz



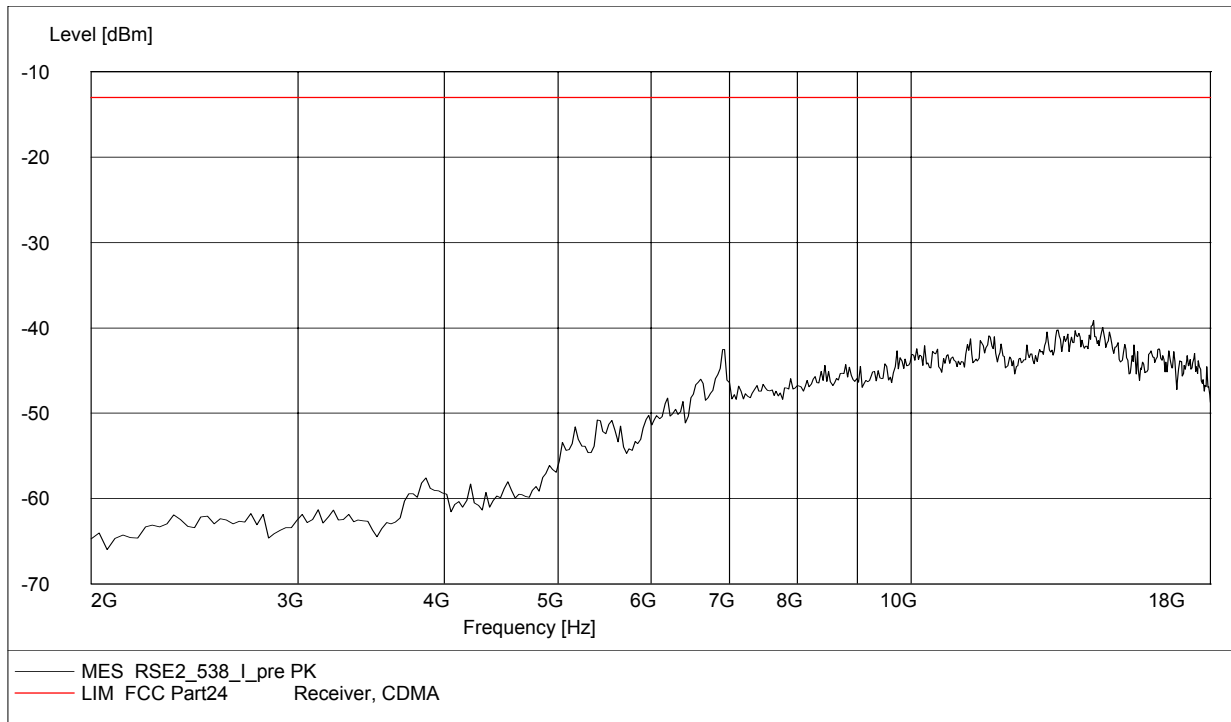
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A.5.3.9 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 2GHz – 18GHz

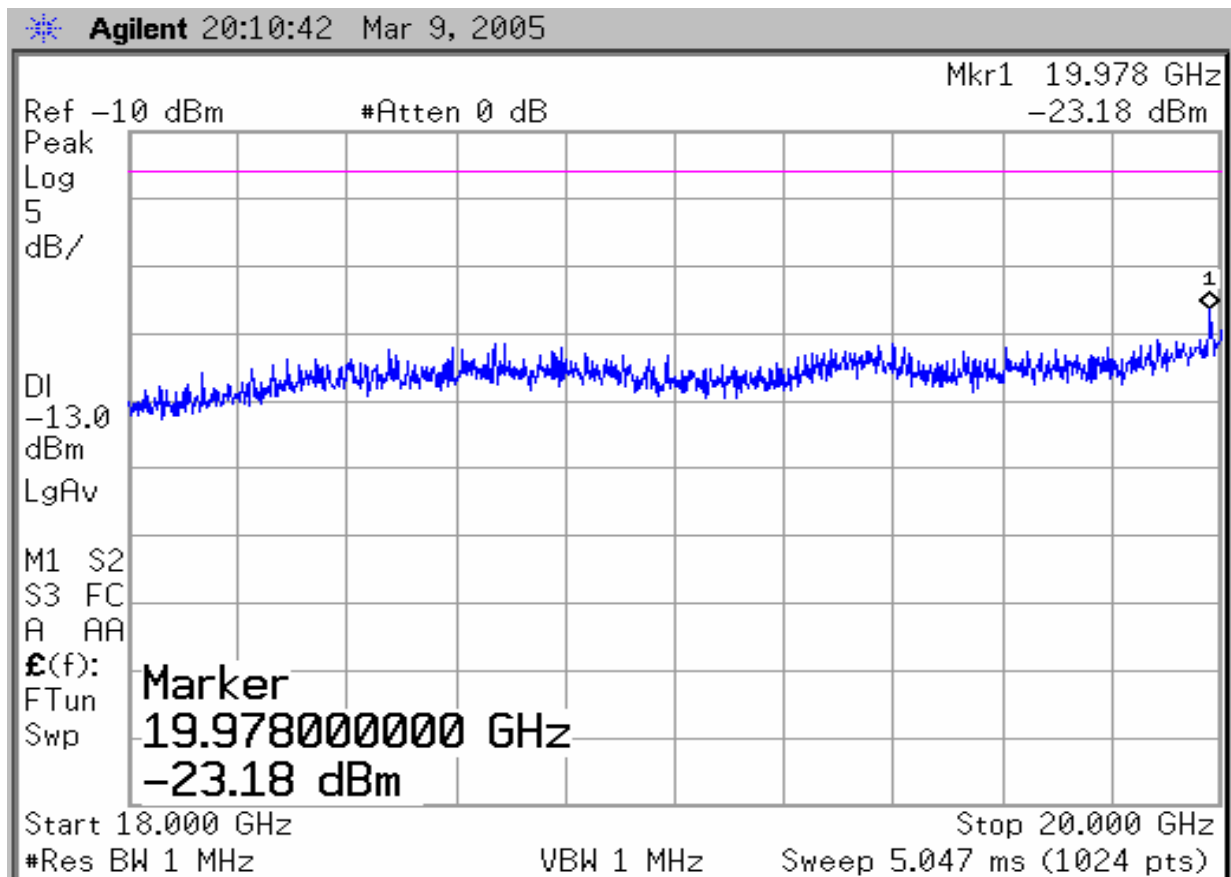
RBW=VBW=1MHz



A.5.3.10 RADIATED SPURIOUS EMISSIONS-EUT in Idle Mode: 18GHz – 20GHz

RBW=VBW=1MHz

Note: It is same as the floor noise.



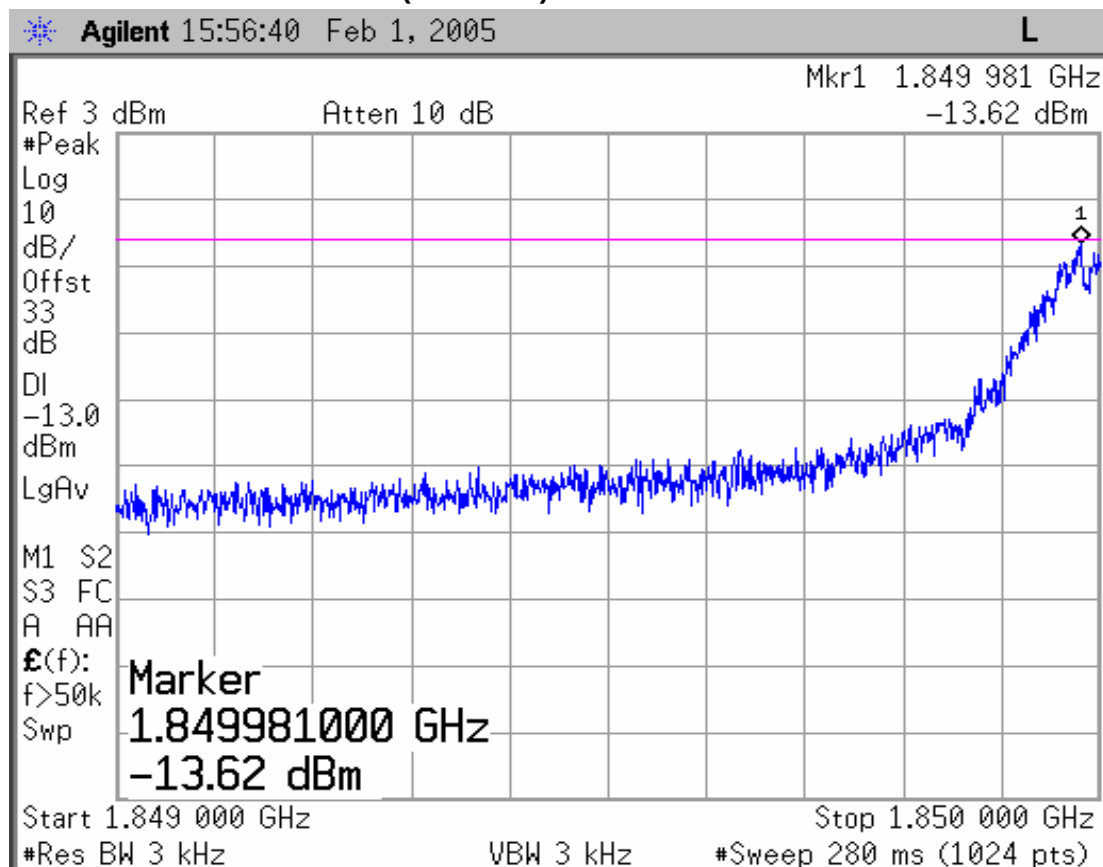
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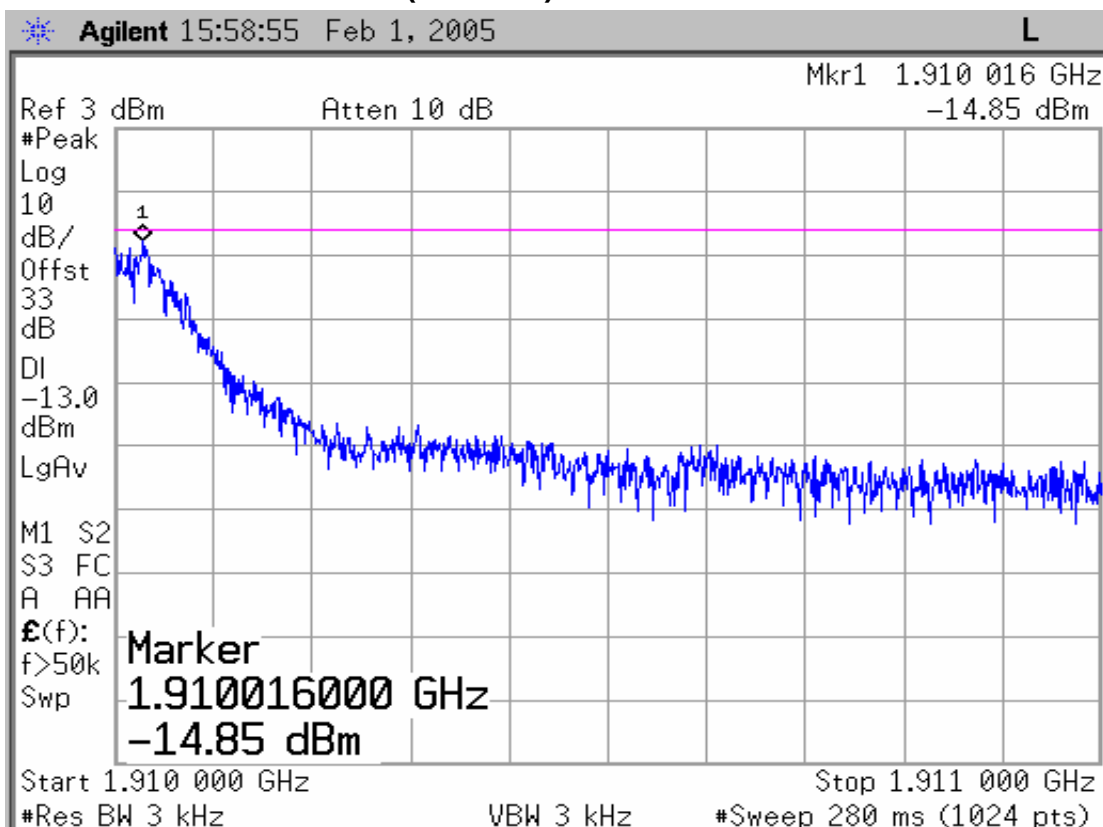
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A.6 BAND EDGE COMPLIANCE (§24.238(b))

A.6.1 LOW BAND EDGE BLOCK-A (PCS-1900)-Channel 512



A.6.2 HIGH BAND EDGE BLOCK-C (PCS-1900) -Channel 810



A.7.3 Measurement result

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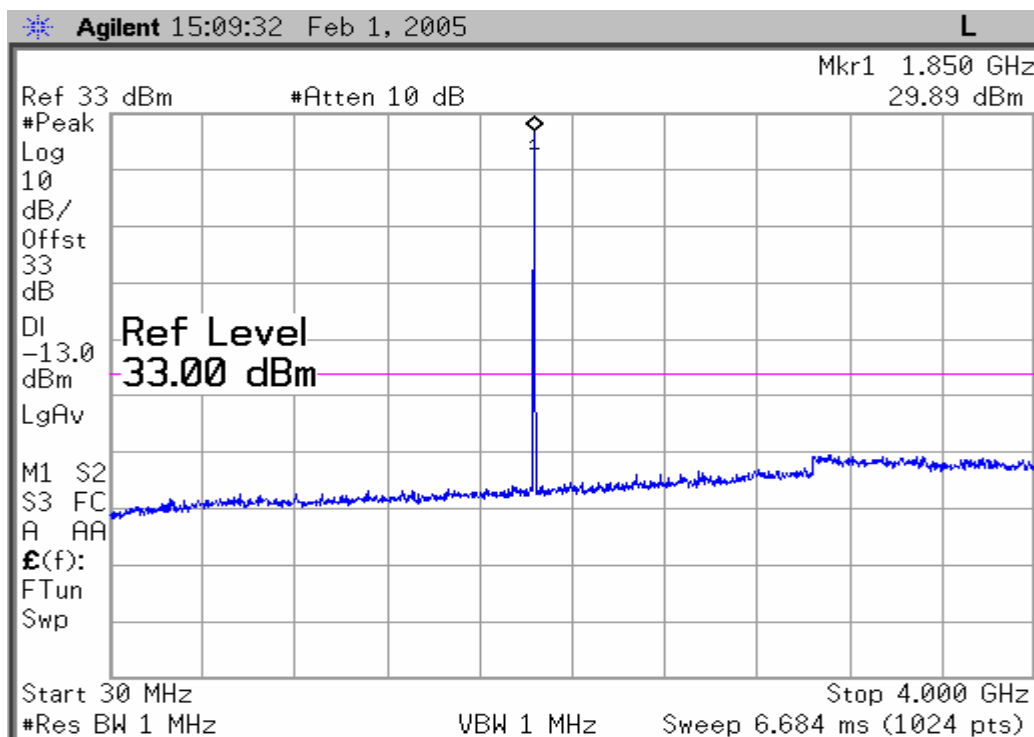
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A.7.3.1 Channel 512: 30MHz – 4GHz

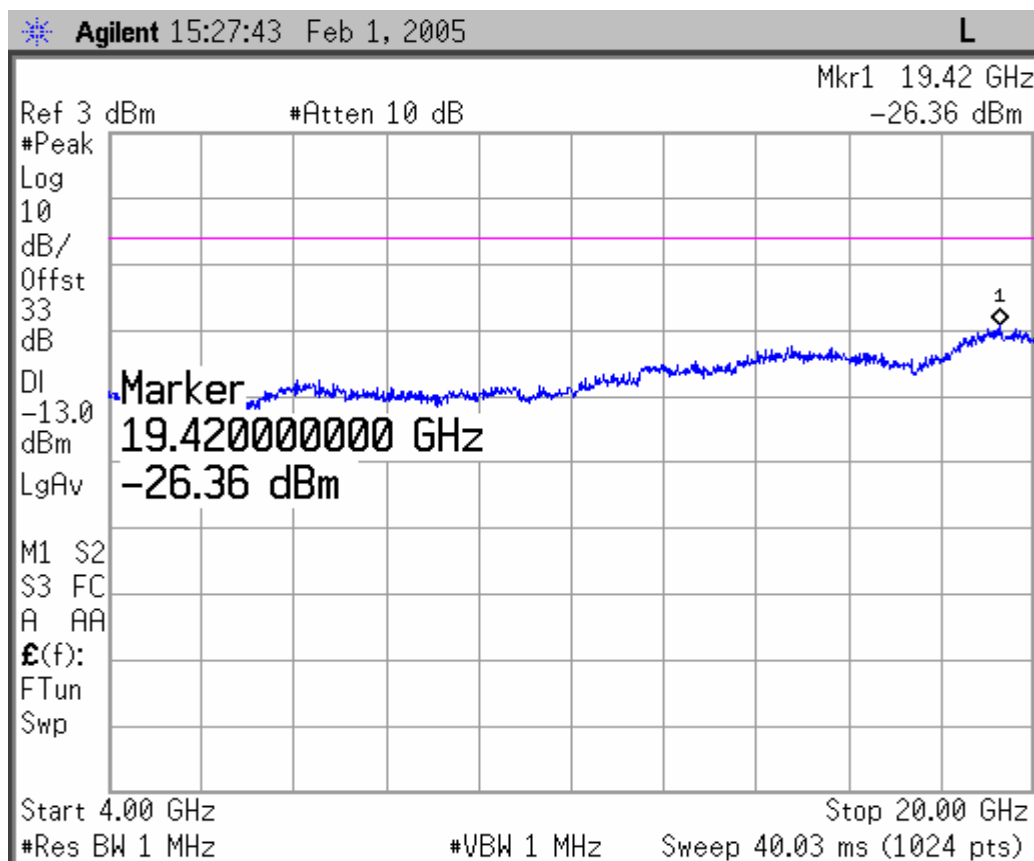
Spurious emission limit –13dBm.

NOTE: peak above the limit line is the carrier frequency.



A.7.3.2 Channel 512: 4GHz – 20GHz

Spurious emission limit –13dBm.



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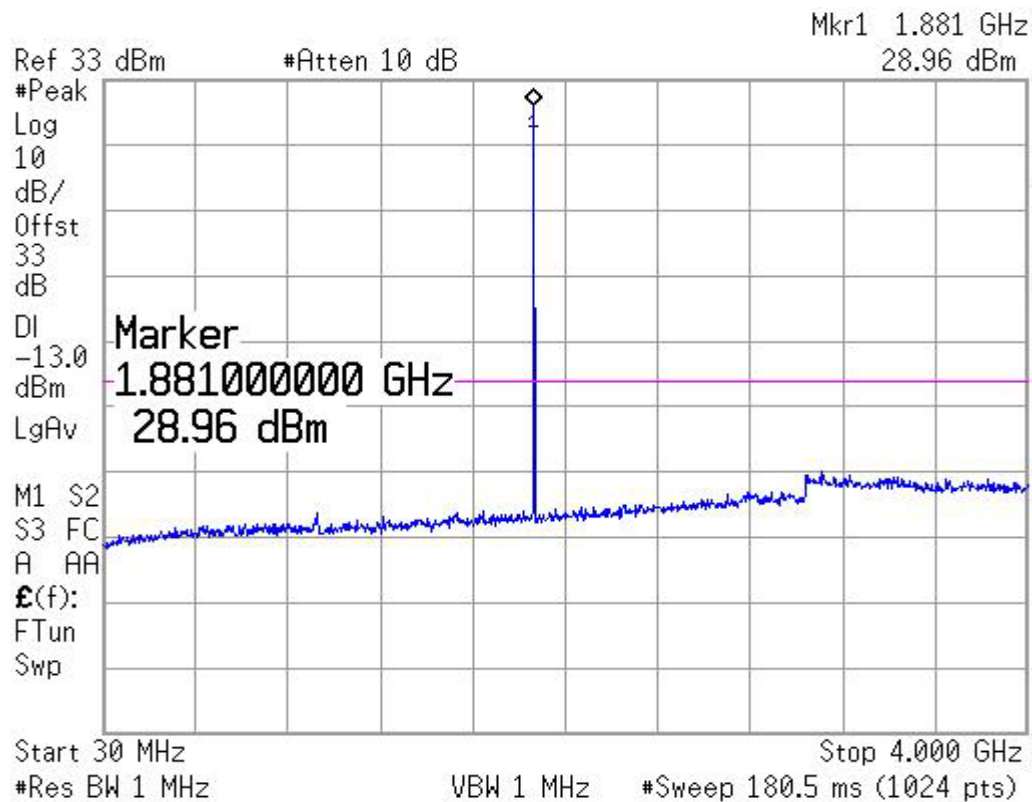
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A.7.3.3 Channel 661: 30MHz – 4GHz

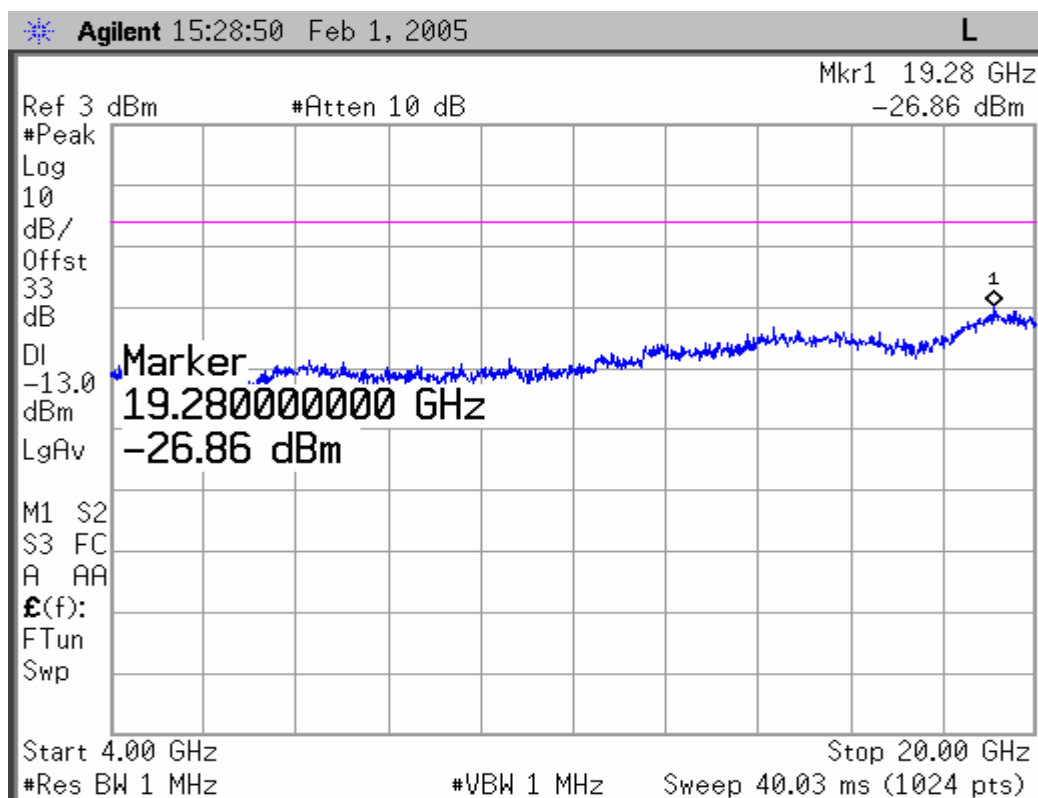
Spurious emission limit –13dBm

NOTE: peak above the limit line is the carrier frequency.



A.7.3.4 Channel 661: 4GHz –20GHz

Spurious emission limit –13dBm



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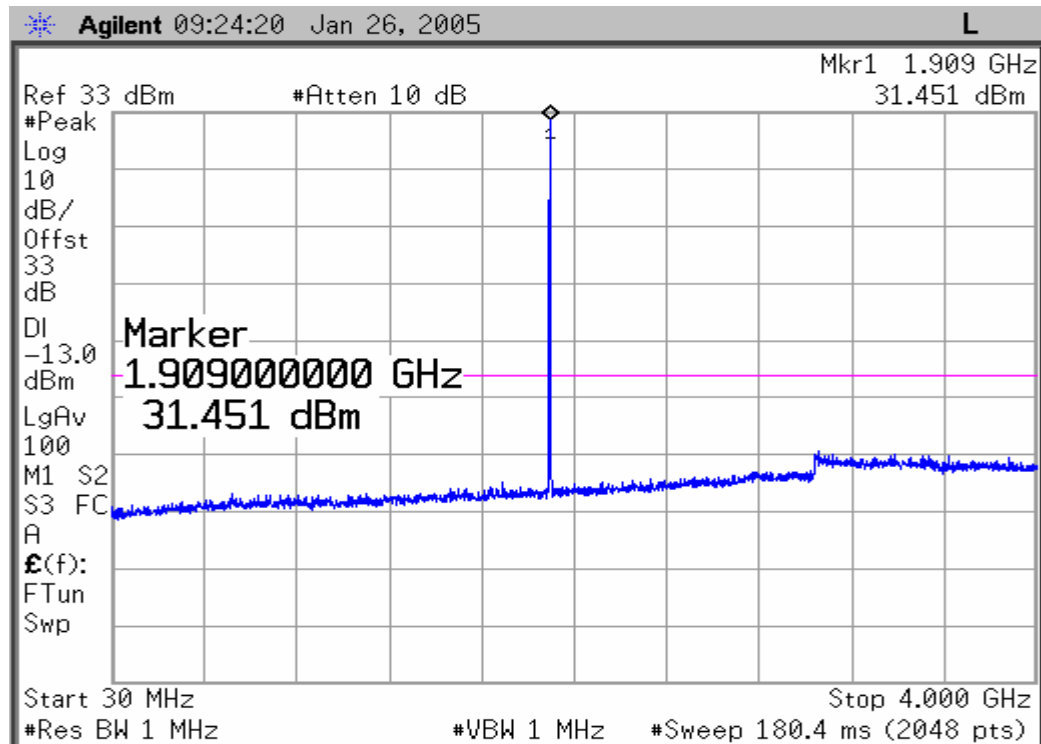
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A.7.3.5 Channel 810: 30MHz – 4GHz

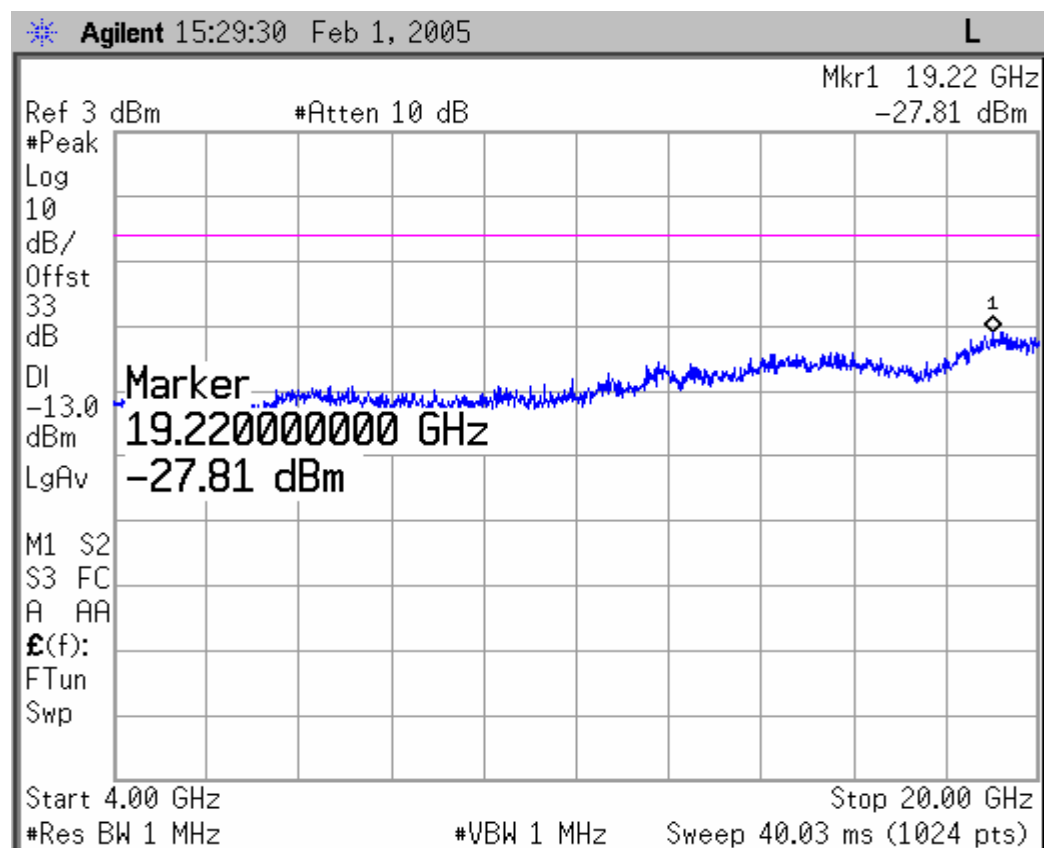
Spurious emission limit –13dBm.

NOTE: peak above the limit line is the carrier frequency.



A.7.3.6 Channel 810: 4GHz – 20GHz

Spurious emission limit –13dBm.



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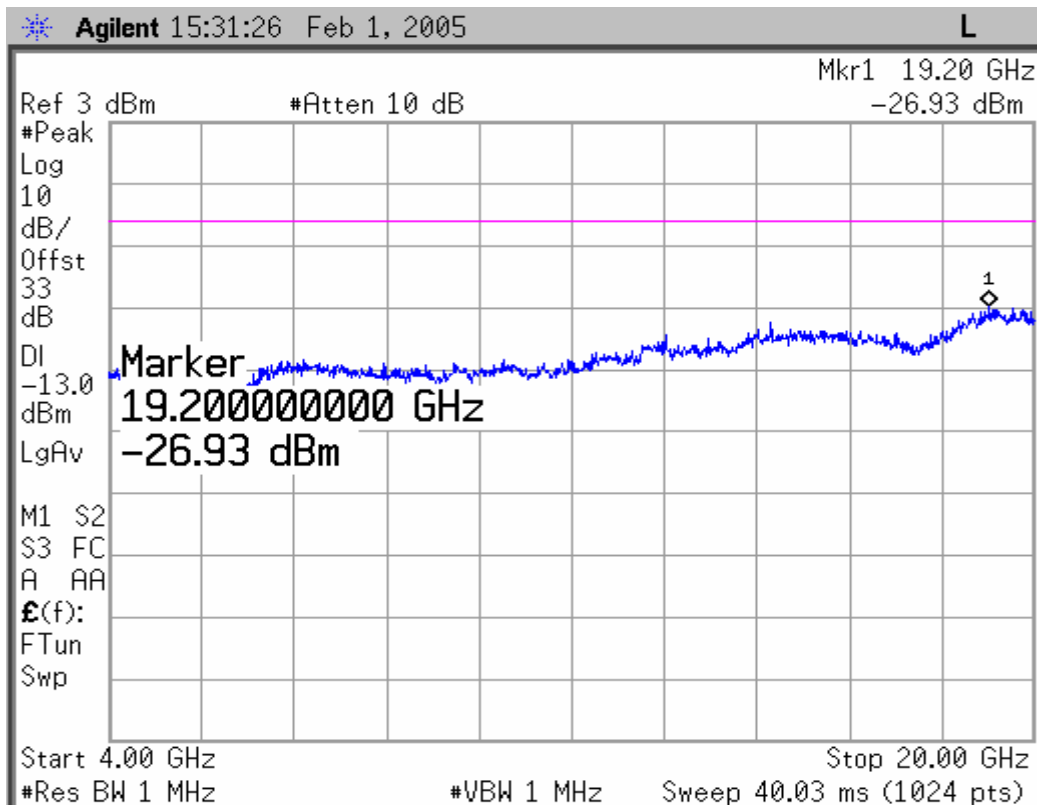
A.7.3.7 Idle mode: 30MHz – 4GHz

Spurious emission limit –13dBm.



A.7.3.8 Idle mode: 4GHz – 20GHz

Spurious emission limit –13dBm.



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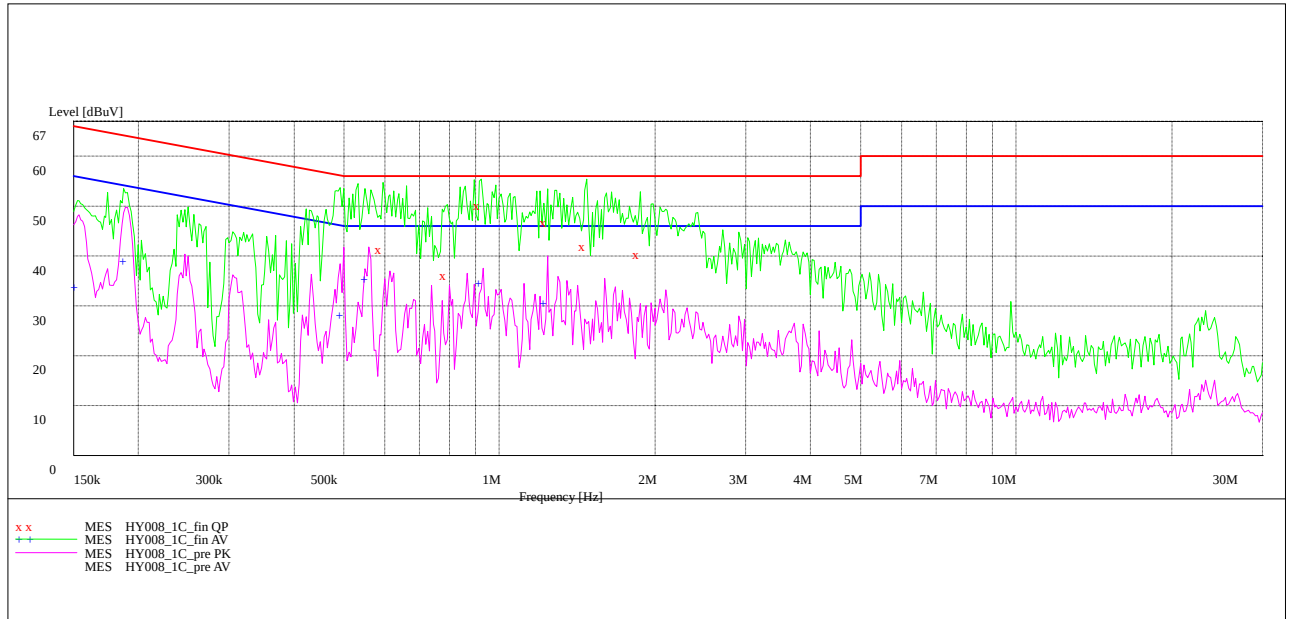
A.8 CONDUCTED EMISSION (§15.107/207)

A.8.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi -Peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

* Decreases with logarithm of the frequency

A.8.2 Measurement result



MEASUREMENT RESULT: "HY008_1C_fin QP"

Frequency MHz	Level dBμV	Transd dB	Limit dB	Margin dBμV	Line dB	PE
0.595338	44.20	20.3	56	11.8	N	FLO
0.793127	39.00	20.3	56	17.0	N	GND
0.922768	53.00	20.3	56	3.0	L1	GND
1.239174	49.50	20.2	56	6.5	L1	FLO
1.476604	44.80	20.2	56	11.2	L1	GND
1.875340	43.10	20.2	56	12.9	L1	FLO

MEASUREMENT RESULT: "HY008_1C_fin AV"

Frequency MHz	Level dBμV	Transd dB	Limit dB	Margin dBμV	Line dB	PE
0.153629	36.50	20.1	56	19.3	L1	FLO
0.190505	41.60	20.2	54	12.4	L1	GND
0.499611	30.90	20.3	46	15.1	N	FLO
0.558572	38.20	20.3	46	7.8	L1	GND
0.930150	37.20	20.3	46	8.8	L1	GND
1.239174	33.30	20.2	46	12.7	L1	FLO

ANNEX B EUT PHOTO

TCL 538 External photo



TCL538 front view



TCL538 rear view



AC/DC Adapter



AC/DC Adapter

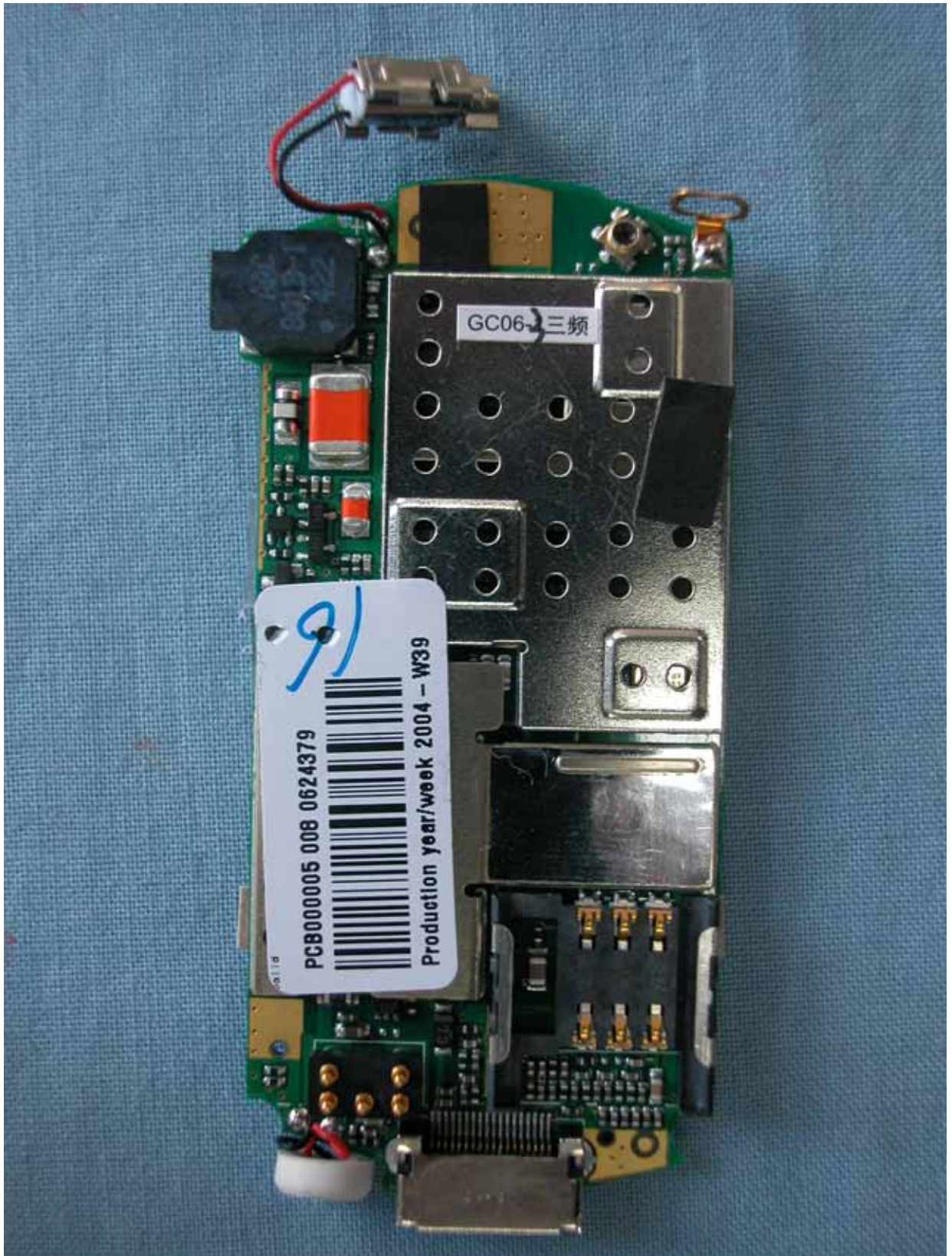
TCL538 Internal Photo



TCL538 disassembly



TCL538 PCB front view



TCL538 PCB rear view

ANNEX C TEST LAYOUT

TCL538 test setup



TCL538 Conducted Emission Test Setup



TCL538 Radiated Spurious Emission Test Setup

END OF REPORT BODY