TEST REPORT

No. I18D00082-SRD04

For

Client: Shanghai Sunmi Technology Co.,Ltd.

Production: Handheld Wireless Terminal

Model Name: T8A01

Brand Name: SUNMI

FCC ID : 2AH25T8A01

Hardware Version: V1.01

Software Version: L2K_V1.8_20190426

Issued date: 2019-08-13

NOTE

1. The test results in this test report relate only to the devices specified in this report.
2. This report shall not be reproduced except in full without the written approval of East China Institute of Telecommunications.
3. For the test results, the uncertainty of measurement is not taken into account when judging the compliance with specification, and the results of measurement or the average value of measurement results are taken as the criterion of the compliance with specification directly.

Test Laboratory:
East China Institute of Telecommunications
Add: 7-8F, G Area, No.668, Beijing East Road, Huangpu District, Shanghai, P. R. China
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Revision Version

Report Number	Revision	Date	Memo
I18D00082-SRD05	00	2019-07-26	Initial creation of test report
I18D00082-SRD05	01	2019-08-13	second creation of test report

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1. Test Laboratory

1.1. Testing Location

Company Name	East China Institute of Telecommunications
Address	7-8/F., Area G, No.666, Beijing East Road, Shanghai, China
Postal Code	200001
Telephone	+86 21 63843300
Fax	+86 21 63843301
FCC registration No	958356

1.2. Testing Environment

Normal Temperature	15℃-35℃
Relative Humidity	20%-75%

1.3. Project Data

Project Leader	Zhou Yan
Testing Start Date	2019-06-18
Testing End Date	2019-06-30

1.4. Signature

Wang Liang
(Prepared this test report)

Fan Songyan
(Reviewed this test report)

Zheng Zhongbin
(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name	Shanghai Sunmi Technology Co.,Ltd.
Address	Room 605, Block 7, KIC Plaza, No.388 Song Hu Road, Yang Pu District, Shanghai, China
Telephone	86-18721763396
Postcode	/

2.2. Manufacturer Information

Company Name	Shanghai Sunmi Technology Co.,Ltd.
Address	Room 605, Block 7, KIC Plaza, No.388 Song Hu Road, Yang Pu District, Shanghai, China
Telephone	86-18721763396
Postcode	/

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Production	Handheld Wireless Terminal
Model name	T8A01
FCC ID	2AH25T8A01
GSM Frequency Band	GSM850/GSM900/GSM1800/GSM1900
UMTS Frequency Band	Band I/II/IV/V/VIII
CDMA Frequency Band	BC0/BC1
LTE Frequency Band	Band1/2/3/4/5/7/9/12/17/18/19/26/28/38/41(120M:2535~2655MHz)
Additional Communication Function	BT/BLE/2.4G WLAN 802.11 b/g/n20/n40/5G WLAN 802.11 a/n/ac20/40
Extreme Temperature	-20/+60℃
Nominal Voltage	3.8V
Extreme High Voltage	4.35V
Extreme Low Voltage	3.45V

Note: Photographs of EUT are shown in ANNEX A of this test report.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
N02	863036040001356	V1.01	L2K_V1.8_20190426	2019-06-17
N08	863036040001158	V1.01	L2K_V1.8_20190426	2019-06-17

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

AE ID*	Description	Type	Manufacturer
AE1	RF cable	---	AE1

*AE ID: is used to identify the test sample in the lab internally.

4. Reference Documents

4.1. Documents supplied by applicant

All technical documents are supplied by the client or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	2018-10-01
FCC Part 22	PUBLIC MOBILE SERVICES	2018-10-01
FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	2018-10-01

5. Test Results

5.1. Summary of Test Results

Measurement Items	Sub-clause of Part15C	Sub-clause of IC	Verdict
Output Power	2.1046/22.913(a)/24.232(c)	/	P
Peak-to-Average Ratio	24.232(d)	/	P
99%Occupied Bandwidth	2.1049(h)(i)/ 22.917(b)	/	P
-26dB Emission Bandwidth	22.917(b)/§24.238(b)	/	P
Band Edge at antenna terminals	22.917(a)/24.238(a)	/	P
Frequency stability	2.1055/24.235	/	P
Conducted Spurious mission	2.1053/22.917(a)/24.238(a)	/	P
Emission Limit	2.1051/22.917/24.238/22.913/24.232	/	P

Note: please refer to Annex A in this test report for the detailed test results.

The following terms are used in the above table.

P	Pass, the EUT complies with the essential requirements in the standard.
NP	Not Perform, the test was not performed by ECIT.
NA	Not Applicable, the test was not applicable.
F	Fail, the EUT does not comply with the essential requirements in the standard.

Test Conditions

Tnom	Normal Temperature
Tmin	Low Temperature
Tmax	High Temperature
Vnom	Normal Voltage
Vmin	Low Voltage
Vmax	High Voltage
Hnom	Norm Humidity

Anom	Norm Air Pressure

For this report, all the test case listed above are tested under Normal Temperature and Normal Voltage, and also under norm humidity, the specific conditions as following:

Temperature	Tnom	25℃
Voltage	Vnom	3.8V
Humidity	Hnom	48%
Air Pressure	Anom	1010hPa

5.2. Statements

The T8A01 manufactured by Shanghai Sunmi Technology Co.,Ltd. is a parent model for testing.
ECIT only performed test cases which identified with Pass/Fail/Inc result in section 5.1.

ECIT has verified that the compliance of the tested device specified in section 3 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 4 of this test report.

6. Test Equipments Utilized

6.1. Conducted Test System

No.	Equipment	Model	SN	Manufacturer	Cal.date	Cal.interval
1	Spectrum Analyzer	FSQ26	101096	R&S	2019-05-10	1 year
2	Universal Radio Communicatio	CMU200	123124	R&S	2019-05-10	1 year
3	DC Power Supply	ZUP60-14	LOC-220Z006-0007	TDL-Lambda	2019-05-10	1 year

6.2. Radiated Emission Test System

The test equipment and ancillaries used are as follows.

No.	Equipment	Model	SN	Manufacturer	Cal.date	Cal.interval
1	Universal Radio Communicatio n Tester	CMU200	123123	R&S	2019-05-10	1 year
2	EMI Test Receiver	ESU40	100307	R&S	2019-05-10	1 year
3	TRILOG Broadband Antenna	VULB9163	VULB9163-515	Schwarzbeck	2017-02-25	3 years
4	Double-ridged Waveguide Antenna	ETS-3117	00135890	ETS	2017-01-11	3 years
5	2-Line V-Network	ENV216	101380	R&S	2019-05-10	1 year
6	Substitution A ntenna	ETS-3117	00135890	ETS	2017-01-11	3 years

7	RF Signal Generator	SMF100A	102314	R&S	2019-05-10	1 year
8	Substitution A ntenna	VUBA9117	9117-266	Schwarzbeck	2017-11-18	3 years
9	Amplifier	SCU08	10146	R&S	2019-05-10	1 year

Climate chamber

No.	Equipment	Model	SN	Manufacturer	Cal.date	Cal.interval
1	Climate chamber	SH-641	92012011	ESPEC	2017-12-25	2 years

7. Measurement Uncertainty

Measurement uncertainty for all the testing in this report are within the limit specified in ECIT documents .

The detailed measurement uncertainty is defined in ECIT documents.

Measurement Items	Range	Confidence Level	Calculated Uncertainty
Maximum Peak Output Power	30MHz-3600MHz	95%	±0.544dB
EBW and VBW	30MHz-3600MHz	95%	±62.04Hz
Transmitter Spurious Emission-Conducted	30MHz-2GHz	95%	±0.90dB
Transmitter Spurious Emission-Conducted	2GHz-3.6GHz	95%	±0.88dB
Transmitter Spurious Emission-Conducted	3.6GHz-8GHz	95%	±0.96dB
Transmitter Spurious Emission-Conducted	8GHz-20GHz	95%	±0.94dB
Transmitter Spurious Emission-Radiated	9KHz-30MHz	95%	±5.66dB
Transmitter Spurious Emission-Radiated	30MHz-1000MHz	95%	±4.98dB
Transmitter Spurious Emission-Radiated	1000MHz -18000MHz	95%	±5.06dB
Transmitter Spurious Emission-Radiated	18000MHz -40000MHz	95%	±5.20dB
Frequency stability	1MHz-16GHz	95%	±62.04Hz

8. Measurement Uncertainty

Shielding Room1 (6.0 meters×3.0 meters×2.7 meters) did not exceed following limits along the conducted RF performance testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Ground system resistance	< 0.5 Ω

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

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. =25 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω

Fully-anechoic chamber1 (6.9 meters×10.9 meters×5.4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 25 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω
VSWR	Between 0 and 6 dB, from 1GHz to 18GHz
Site Attenuation Deviation	Between -4 and 4 dB,30MHz to 1GHz
Uniformity of field strength	Between 0 and 6 dB, from 80MHz to 3000 MHz

ANNEX A. Detailed Test Results

ANNEX A.1. OUTPUT POWER

A.1.1. Summary

During the process of testing, the EUT was controlled Rhode & Schwarz Digital Radio. Communication tester (CMU-200) to ensure max power transmission and proper modulation.
This result contains peak 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

Method of measurements please refer to CFR47 (FCC) part 2.1046 and part 22.913.
The EUT was set up for the max output power with pseudo random data modulation.
The power was measured with Rhode & Schwarz Spectrum Analyzer FSQ(peak).
These measurements were done at 3 frequencies, 1851.25 MHz, 1880.0MHz and 1908.75MHz for CDMA2000 PCS BC1band; 824.7MHz, 836.52MHz and 848.31MHz for CDMA2000 Cellular BC0 band. (bottom, middle and top of operational frequency range).

A.1.2.2 Test procedures:

1. The transmitter output port was connected to base station.
2. Set the EUT at maximum power through base station.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure the maximum burst average power for CDMA and maximum average power for other modulation signal.

A.1.2.3 Limit:

22.913(a) Mobile stations are limited to 7watts.
24.232(c) Mobile and portable stations are limited to 2 watts.

A.1.2.4 Test Procedure:

The transmitter output power was connected to calibrated attenuator, the other end of which was connected to signal analyzer. Transmitter output power was read off the power in dBm. The power outputs at the transmitter antenna port was determined by adding the value of attenuator to the signal analyzer reading.

A.1.2.5 CDMA2000 Cellular Test Condition:

RBW	VBW	Sweep time	Span
1MHz	3MHz	300ms	10MHz

8.1.2.6 Measurement results:

CDMA2000 Cellular BC0		
Channel/fc(MHz)	Peak power (dBm)	AV power (dBm)
High 777/848.31	24.51	24.10
Mid 384/836.52	24.59	24.06
Low 1013/824.7	24.68	23.98

CDMA2000 PCS BC1		
Channel/fc(MHz)	Peak power (dBm)	AV power (dBm)
Mid 600/1880.0	24.06	23.37
Low 25/1851.25	24.99	23.33
High 1175/1908.75	24.02	23.41

Conclusion: PASS

ANNEX A.2. Peak-to-Average Power Ratio

Method of test measurements please refer to CFR47 (FCC) part 2.1046 and part 22.913.

A.2.1 PAPR Limit

The peak-to-average power ratio (PAPR) of the transmission may not exceed 13dB

A.2.2 Test procedures

1. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
2.
   1) Select the spectrum analyzer CCDF function.
   2) Set RBW⩾signal's occupied bandwidth.
   3) Set the number of counts to a value that stabilizes the measured CCDF cure;
   4) Sweep time ⩾ 1s.
3. Record the maximum PAPR level associated with a probability of 0.1%.

A.2.3 Test results:

CDMA2000 Cellular BC0			
Channel	1013	384	777
Frequency (MHz)	824.7	836.52	848.31
PAPR(dB)	8.56	8.46	8.37

CDMA2000 PCS BC1			
Channel	25	600	1175
Frequency (MHz)	1851.25	1880.0	1908.75
PAPR(dB)	8.46	8.46	8.49

Conclusion: PASS

ANNEX A.3. Occupied Bandwidth

Method of test please refer to CFR 47 (FCC) part 2.1049 and part 22 subpart .

A.3.1. Occupied Bandwidth

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 CDMA2000 Cellular, CDMA2000 PCS.

A.3.2 Test Procedure:

1. The EUT output RF connector was connected with a short cable to the signal analyzer.
2. RBW was set to about 1% of emission BW, VBW >= 3 times RBW,.
3. 99% bandwidth were measured, the occupied bandwidth is delta frequency between the two points where the display line intersects the signal trace.

A.3.3 Test result:

CDMA2000 Cellular BC0		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(MHz)
Low 1013	824.7	1.279
Mid 384	836.52	1.274
High 777	848.31	1.279

Conclusion: PASS

CDMA2000 Cellular

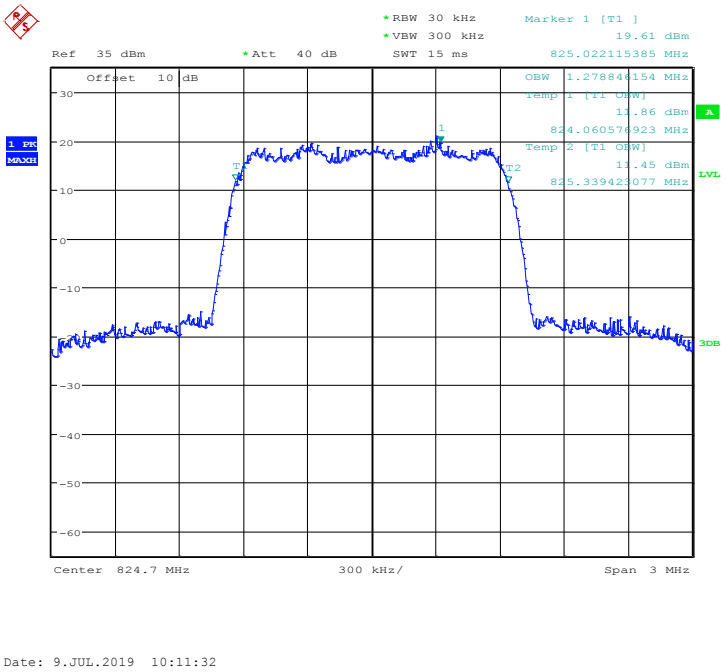


Fig.1 Channel 1013-Occupied Bandwidth (99%)

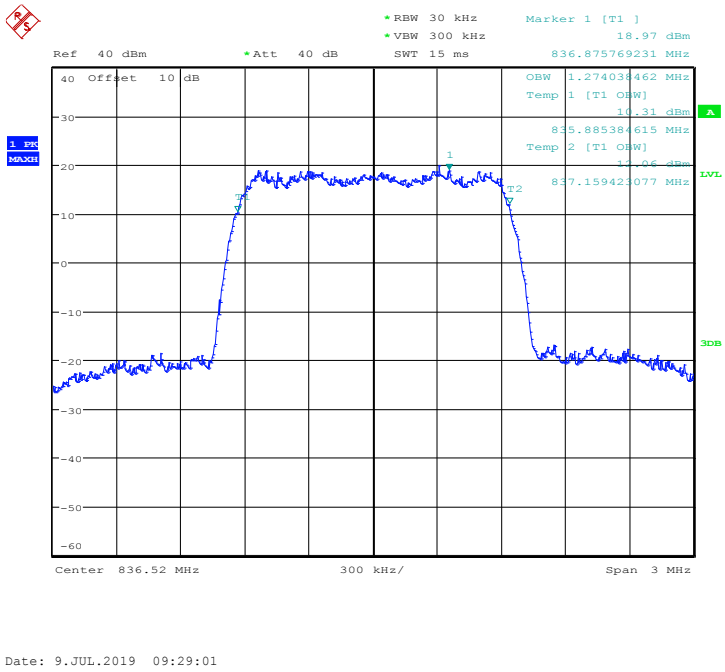


Fig.2 Channel 384-Occupied Bandwidth (99%)

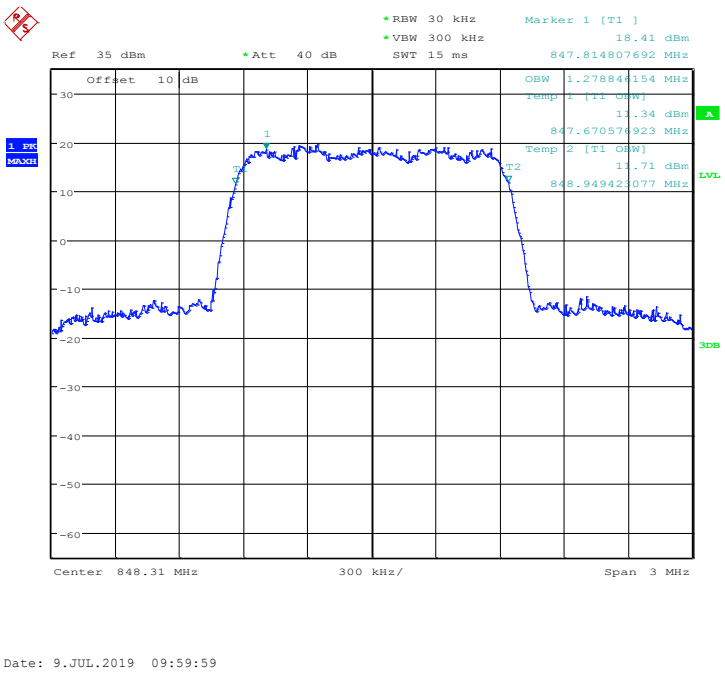


Fig.3 Channel 777-Occupied Bandwidth (99%)

CDMA2000 PCS BC1		
Test channel	Frequency (MHz)	99% Occupied Bandwidth(MHz)
Low 25	1851.25	1.274
Mid 600	1880.0	1.279
High 1175	1908.75	1.293

CDMA2000 PCS

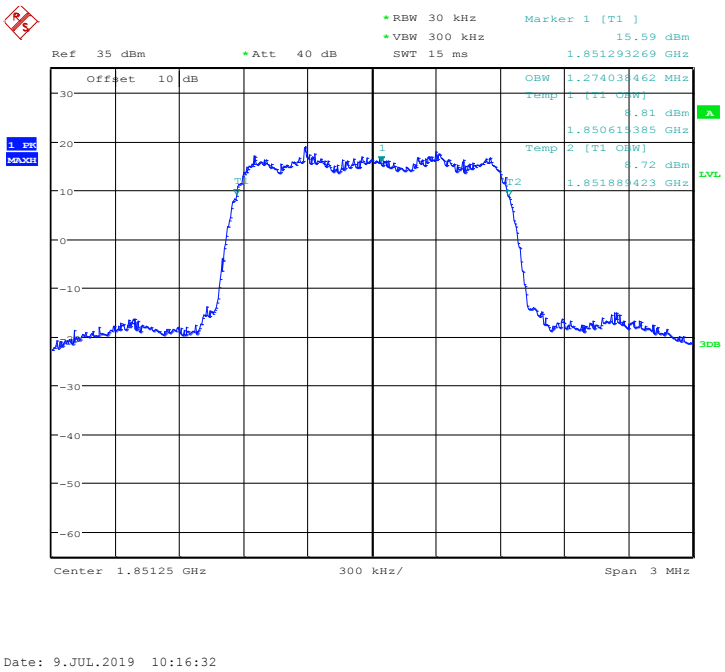


Fig.4 Channel 25-Occupied Bandwidth

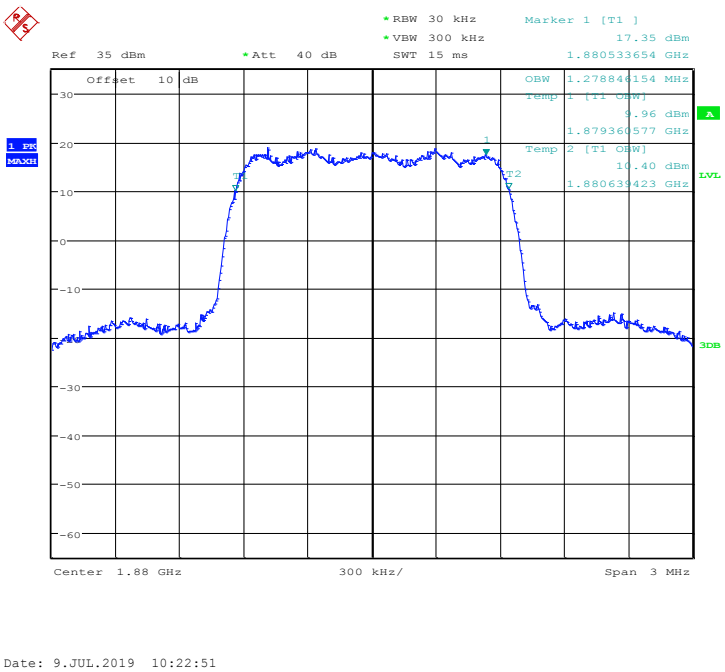


Fig.5 Channel 600-Occupied Bandwidth

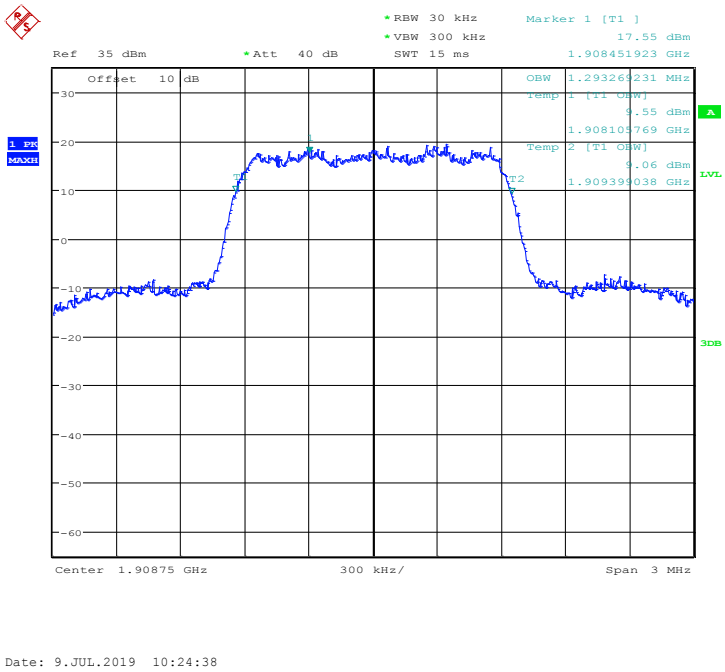


Fig.6 Channel 1175-Occupied Bandwidth

ANNEX A.4. -26dB Emission Bandwidth

Method of test please refer to CFR 47 (FCC) part 2.1049 and part 22 subpart.

A.4.1. -26dB Emission Bandwidth

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 CDMA2000 Cellular, CDMA2000 PCS.

A.4.2 Test Procedure:

1. The EUT output RF connector was connected with a short cable to the signal analyzer.
2. RBW was set to about 1% of emission BW, VBW >= 3 times RBW,.
3. 26dB bandwidth were measured, the occupied bandwidth is delta frequency between the two points where the display line intersects the signal trace.

A.4.3 Measurement methods:

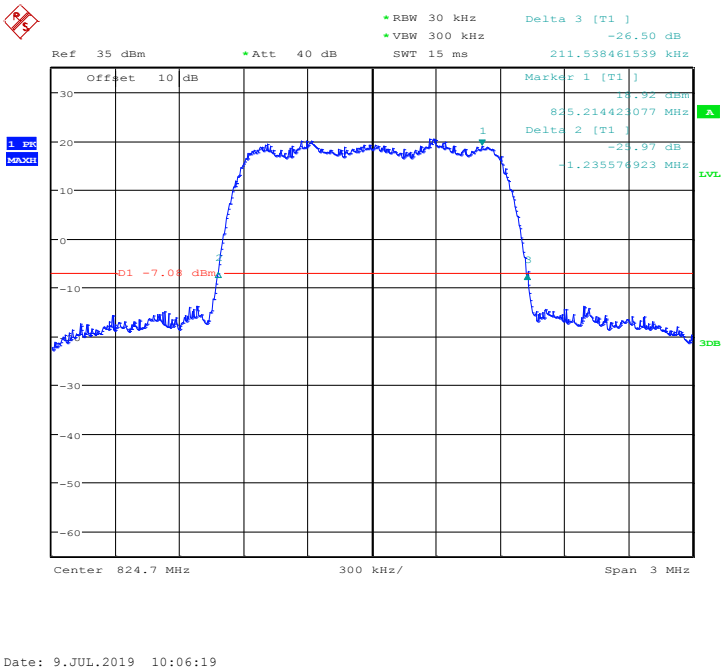
For CDMA: signal analyzer setting as: RBW=20KHz;VBW=200KHz;Span=3MHz.

A.4.4 Test results:

CDMA2000 Cellular BC0		
Test channel	Frequency (MHz)	–26dBc Emission Bandwidth(MHz)
Low 1013	824.7	1.447
Mid 384	836.52	1.433
High 777	848.31	1.451

Conclusion: PASS

CDMA2000 Cellular



Date: 9.JUL.2019 10:06:19

Fig.7 Channel 1013- Emission Bandwidth (-26dBc BW)

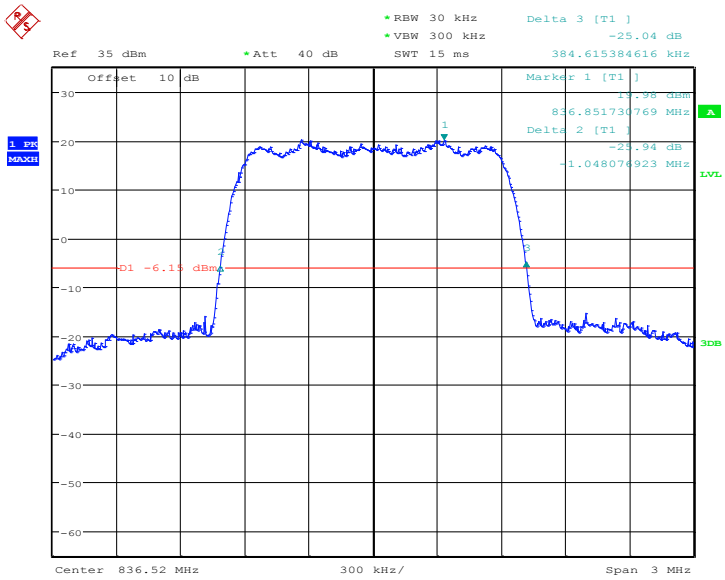


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Fig.8 Channel 384- Emission Bandwidth (-26dBc BW)

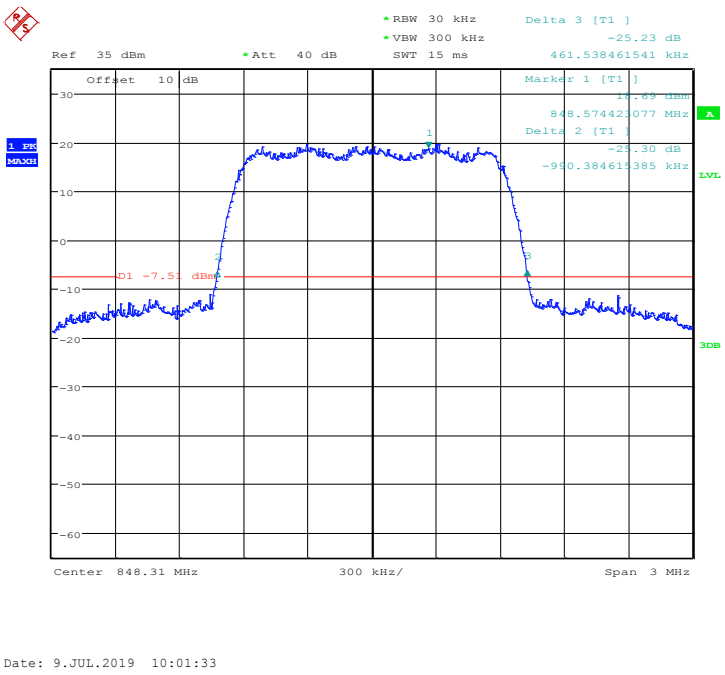


Fig.9 Channel 777- Emission Bandwidth (-26dBc BW)

CDMA2000 PCS BC1		
Test channel	Frequency (MHz)	–26dBc Emission Bandwidth(MHz)
Low 25	1851.25	1.423
Mid 600	1880.0	1.483
High 1175	1908.75	1.490

CDMA2000 PCS BC1

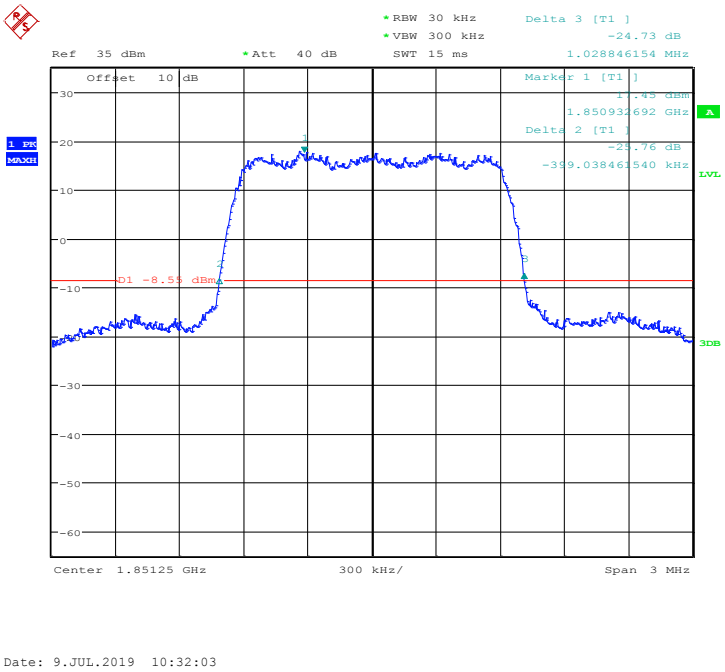


Fig.10 Channel 25- Emission Bandwidth (-26dBc BW)

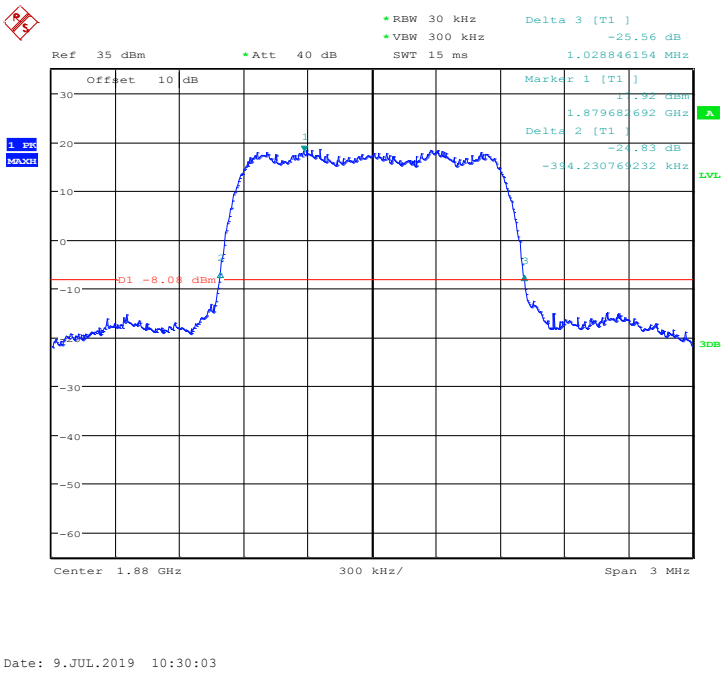


Fig.11 Channel 600- Emission Bandwidth (-26dBc BW)

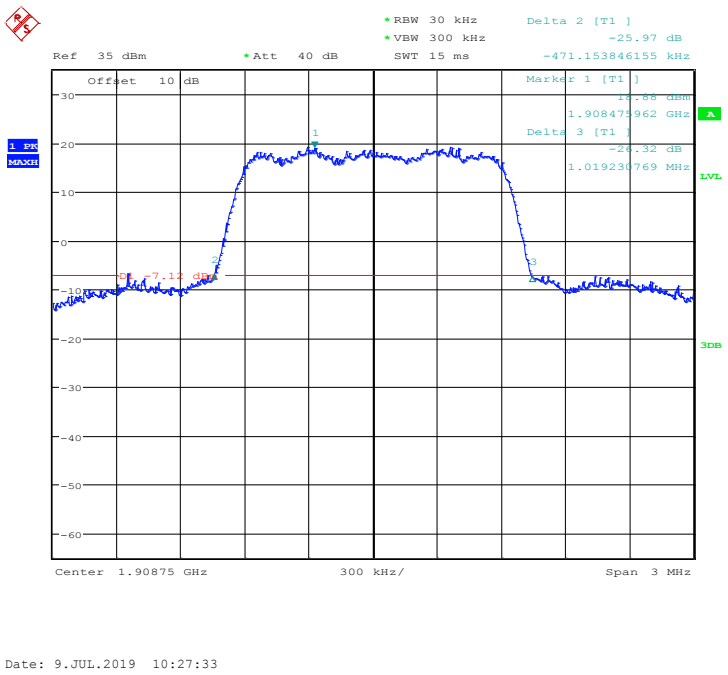


Fig.12 Channel 1175- Emission Bandwidth (-26dBc BW)

ANNEX A.5. Band Edge at antenna terminals

Method of test measurements please refer to CFR 47 (FCC) part 2.1051 and part 22.917.

A.5.1 Limit:

The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specification in the instruction manual and/or alignment procedure, shall not be less than 43+10log (Mean power in watts) dBc below the mean power output outside a license's frequency block(-13dBm).

A.5.2 Test procedure:

1. The RF output of the transceiver was connected to a signal analyzer through appropriate attenuation.
2. In the 1MHz 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.
3. The RF fundamental frequency should be excluded against the limit line in the operating frequency band
4. The limit line is derived from 43+10log(P) Db below the transmitter power P(Watts)
   =P(W)-[43+10log(P)](Db)
   =[30+10log(P)](dBm)-[43+10log(P)](Db)
   =-13dBm

CDMA2000 Cellular BC0

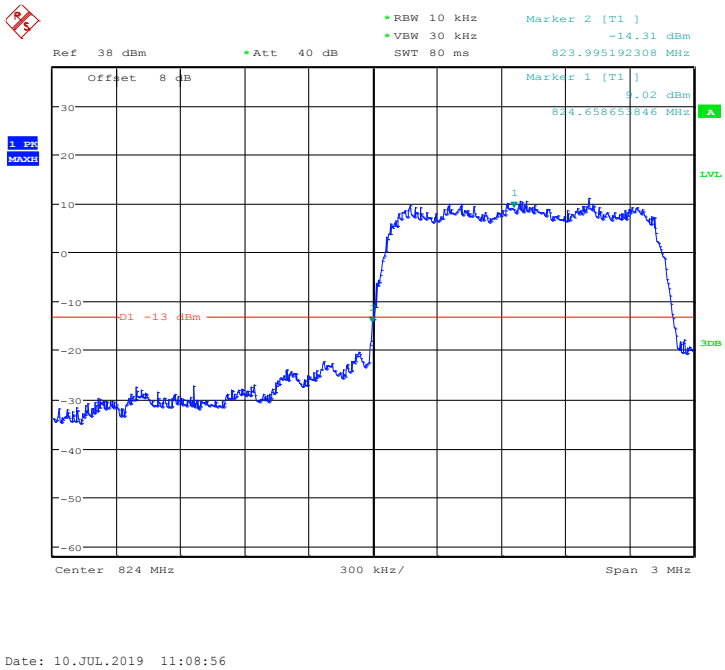


Fig.13 Channel 1013- LOW BAND EDGE BLOCK

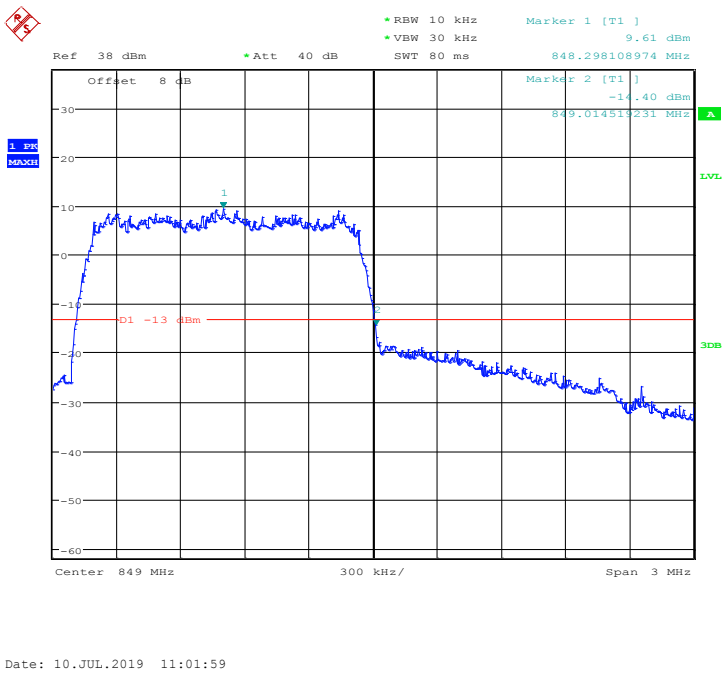


Fig.14 Channel 777- HIGH BAND EDGE BLOCK

CDMA2000 PCS BC1

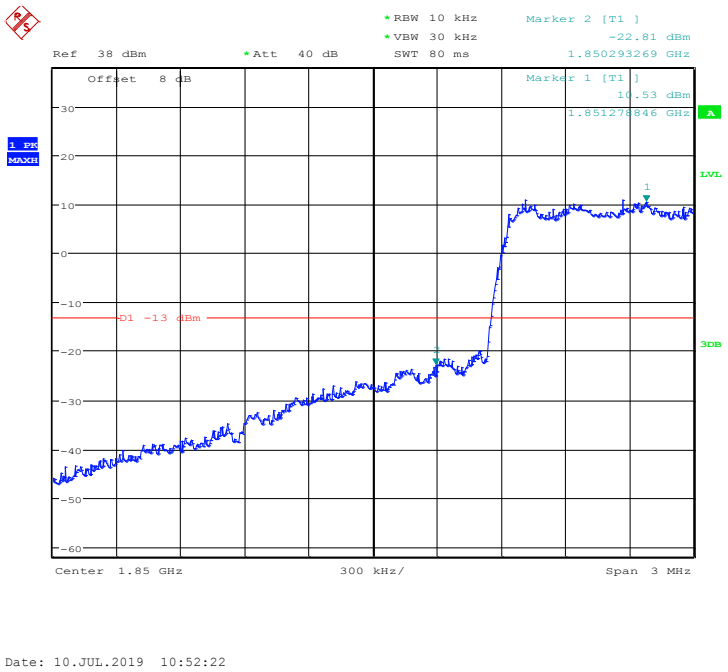


Fig.15 Channel 25- LOW BAND EDGE BLOCK

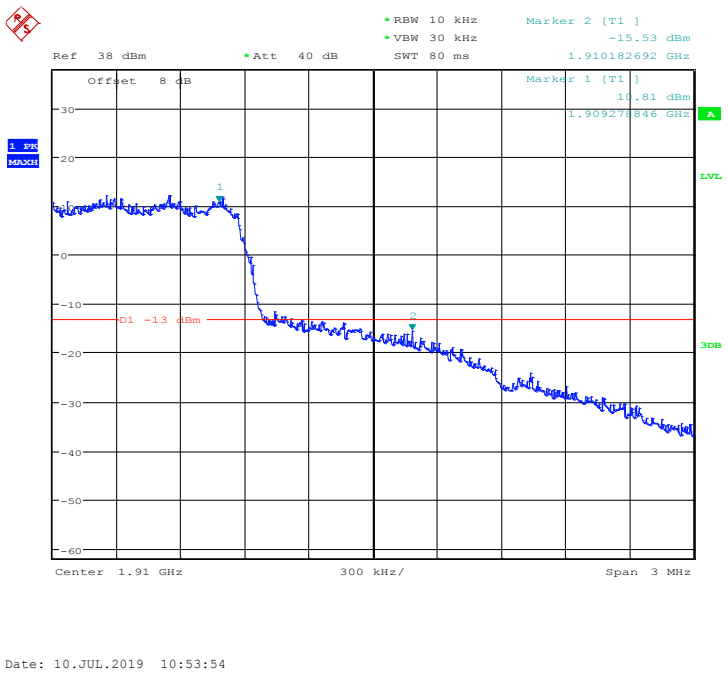


Fig.16 Channel 1175- HIGH BAND EDGE BLOCK

Conclusion: PASS

ANNEX A.6. FREQUENCY STABILITY

Method of test measurements please refer to CFR47 (FCC) part 2.1055 and part 22.355.

A.6.1.Method of Measurement and test procedures

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℃.
3. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on mid channel of CDMA2000 Cellular, CDMA2000 PCS, 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℃ increments from -30℃ to +50℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring 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℃.
7. With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the 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℃ to -30℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

A.6.2. Measurement Limit

A.6.2.1. For Hand carried battery powered equipment

According to the JTC standard the GSM frequency stability of the carrier shall be accurate to within 0.1ppm of the received frequency from the base station. And the WCDMA is 2.5ppm. 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 3.45VDC and 4.35VDC, with a nominal voltage of 3.8VDC. 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 was varied from 85% to 115%.

A.6.2.2. For equipment powered by primary supply voltage

According to the JTC standard the CDMA frequency stability of the carrier shall be accurate to within 0.1ppm 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.

A.6.3 Test results

CDMA2000 Cellular BC0 Mid Channel/fc(MHz) 384/836.52

Frequency Error VS Temperature

Power Supply (VDc)	Environment Temperature(℃)	Frequency error(Hz)	Limit (Hz)
3.8	-30	1.62	84
3.8	-20	-0.64	84
3.8	-10	-2.19	84
3.8	0	-0.48	84
3.8	10	1.24	84
3.8	20	-1.08	84
3.8	30	-1.91	84
3.8	40	1.62	84
3.8	50	-1.38	84

Frequency Error VS Voltage

Power Supply (VDc)	Environment Temperature(℃)	Frequency error(Hz)	Limit (Hz)
3.45	25	-0.15	84
3.8	25	2.13	84
4.35	25	2.01	84

Conclusion: PASS

CDMA2000 PCS BC1 Mid Channel/fc(MHz) 600/1880

Frequency Error VS Temperature

Power Supply (VDc)	Environment Temperature(℃)	Frequency error(Hz)	Limit (Hz)
3.8	-30	-1.92	196
3.8	-20	1.22	196
3.8	-10	-0.58	196
3.8	0	2.91	196
3.8	10	-1.32	196
3.8	20	2.42	196
3.8	30	1.18	196
3.8	40	-2.05	196
3.8	50	2.05	196

Frequency Error VS Voltage

Power Supply (VDc)	Environment Temperature(℃)	Frequency error(Hz)	Limit (Hz)
3.45	25	2.16	196
3.8	25	2.61	196
4.35	25	1.19	196

Conclusion: PASS

ANNEX A.7. CONDUCTED SPURIOUS EMISSION

A.7.1. CDMA Measurement Method and test procedures

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of BC1 band, this equates to a frequency range of 9 kHz to 12.75 GHz, data taken from 9 kHz to 12.75 GHz. For BC0 band, data taken from 9 kHz to 12.75 GHz.
2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; If the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give a optimal sweep time according the selected span and RBW.
3. The procedure to get the conducted spurious emission is as follows:
The trace mode is set to MaxHold to get the highest signal at each frequency;
Wait 25 seconds;Get the result.
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

CDMA2000 Cellular Transmitter

Channel	Frequency(MHz)
1013	824.7
384	836.52
777	848.31

CDMA2000 PCS Transmitter

Channel	Frequency(MHz)
25	1851.25
600	1880.0
1175	1908.75

A.7.1.1. Measurement Limit

Part 24.238 and Part 22.917 specify that 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.

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.7.1.2. Measurement result

Spurious emission limit -13dBm.

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

A.7.1.2.1. CDMA2000 Cellular BC0

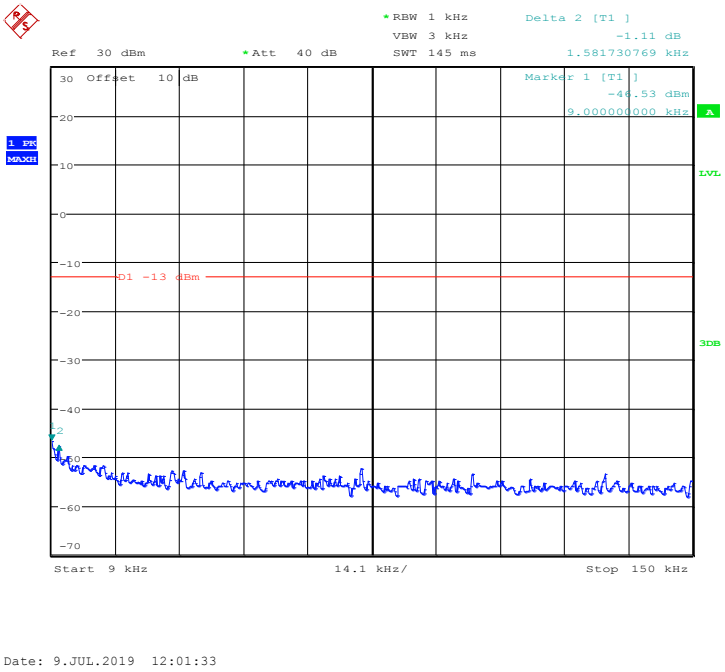


Fig.17 Channel 1013: 9KHz~150KHz

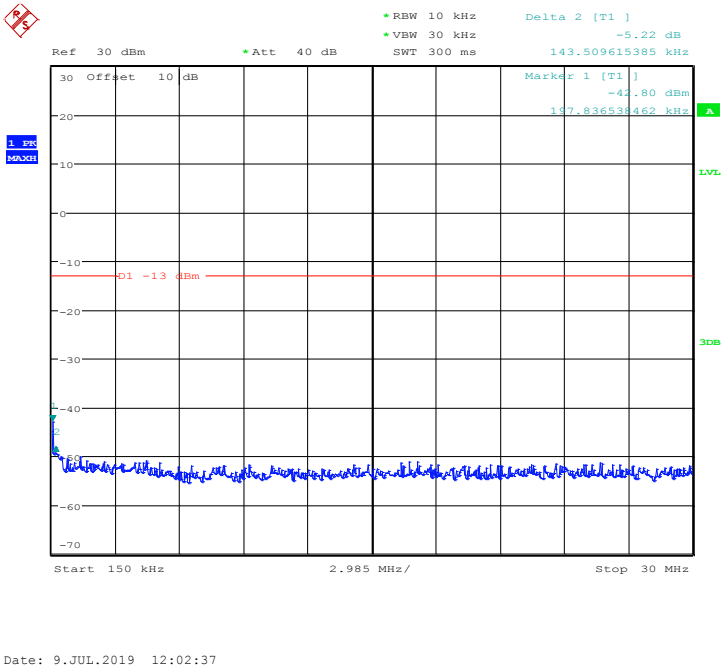


Fig.18 Channel 1013: 150KHz~30MHz

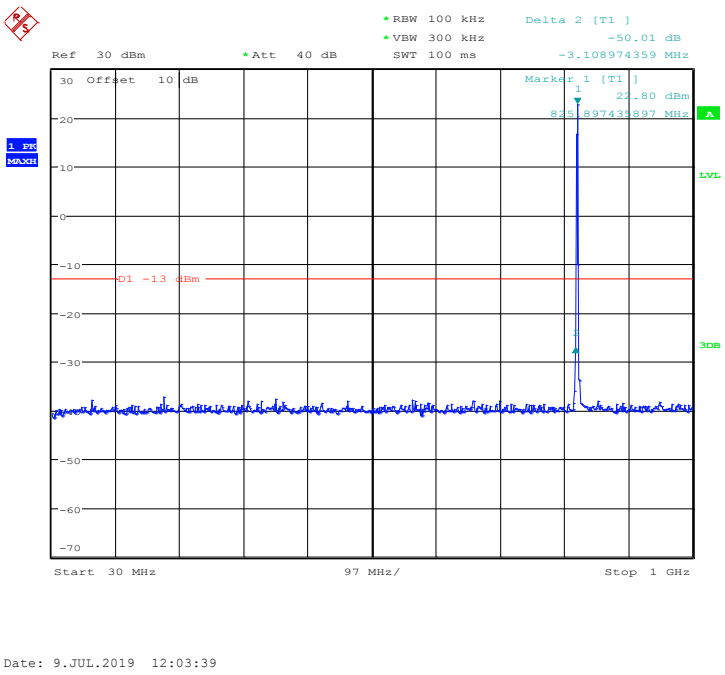


Fig.19 Channel 1013: 30MHz~1GHz

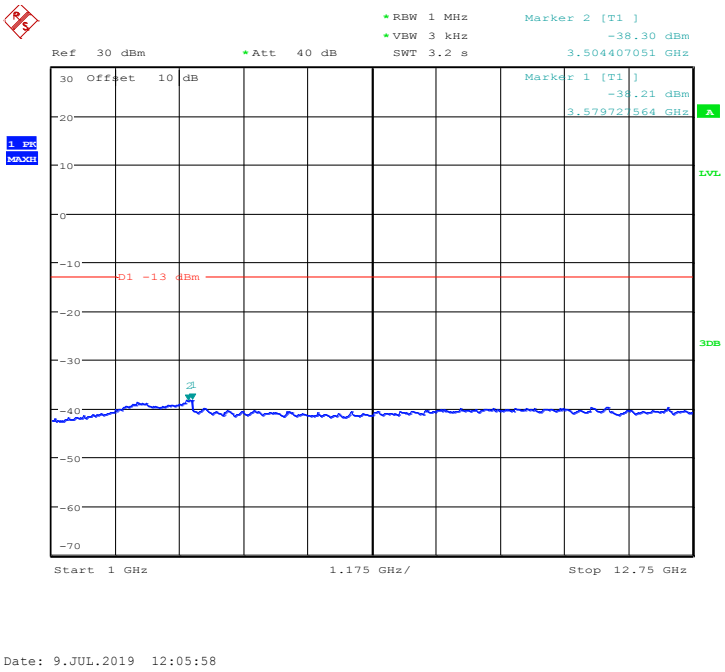


Fig.20 Channel 1013: 1GHz~12.75GHz

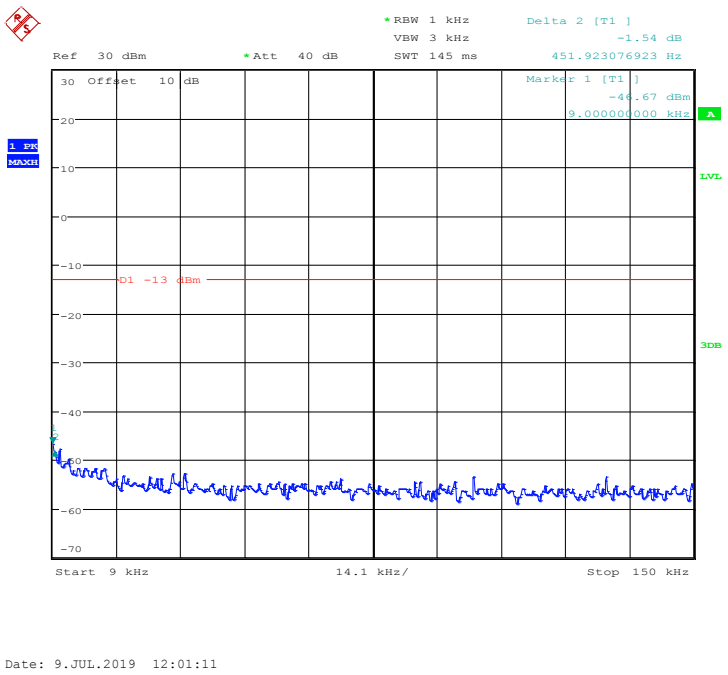


Fig.21 Channel 384: 9KHz~150KHz

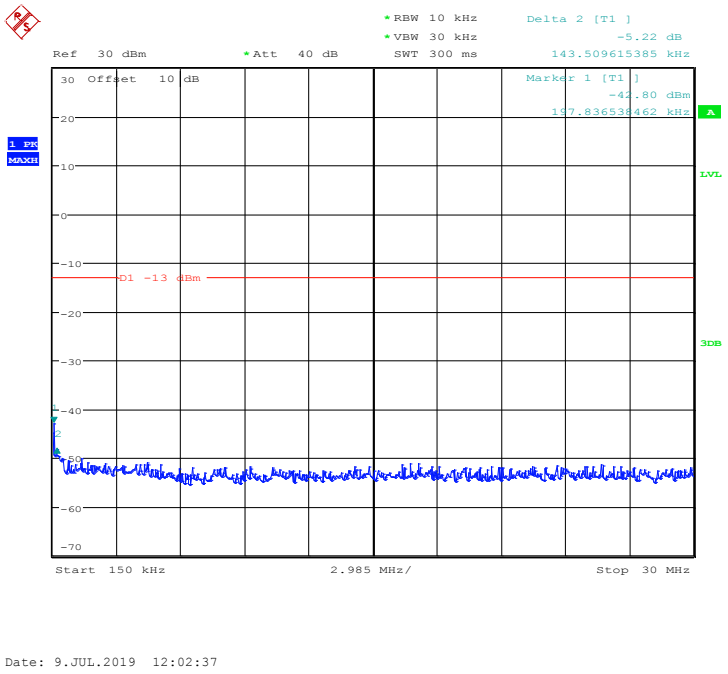


Fig.22 Channel 384: 150KHz~30MHz

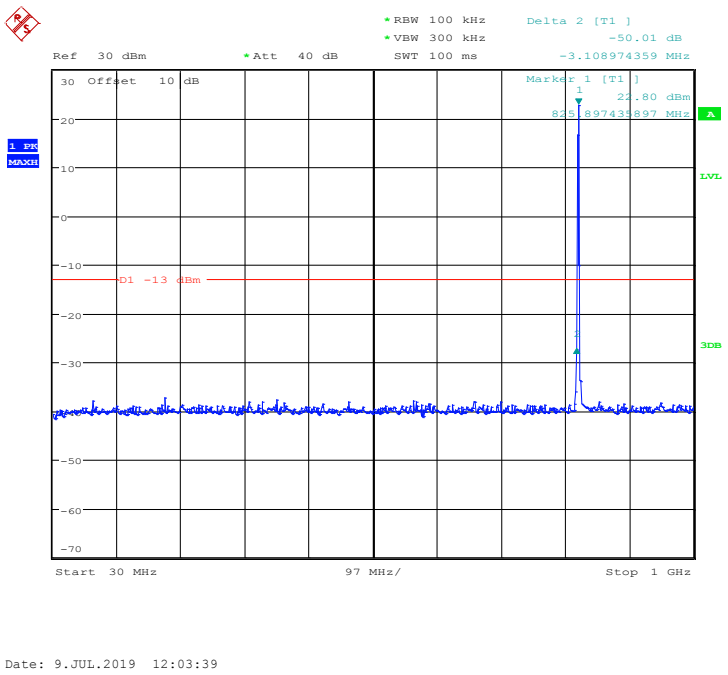


Fig.23 Channel 384: 30MHz~1GHz

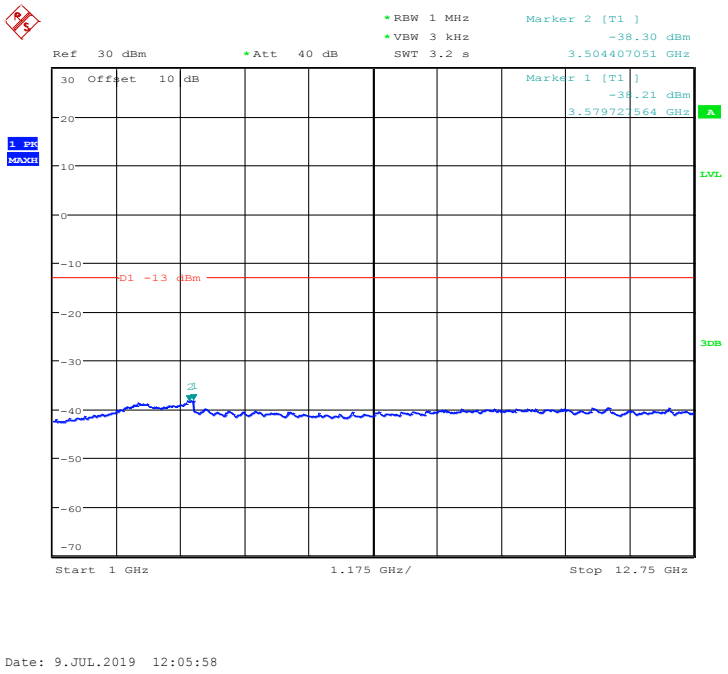


Fig.24 Channel 384: 1GHz~12.75GHz

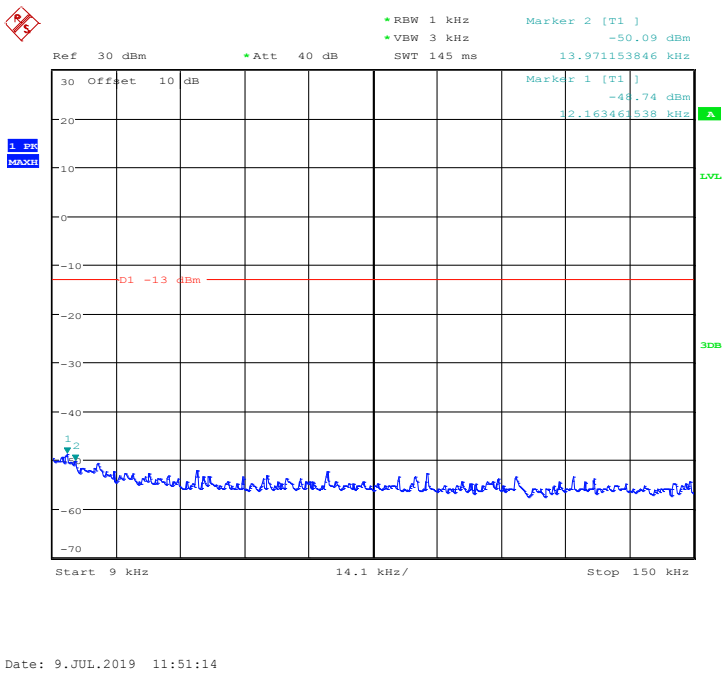


Fig.25 Channel 777: 9KHz~150KHz

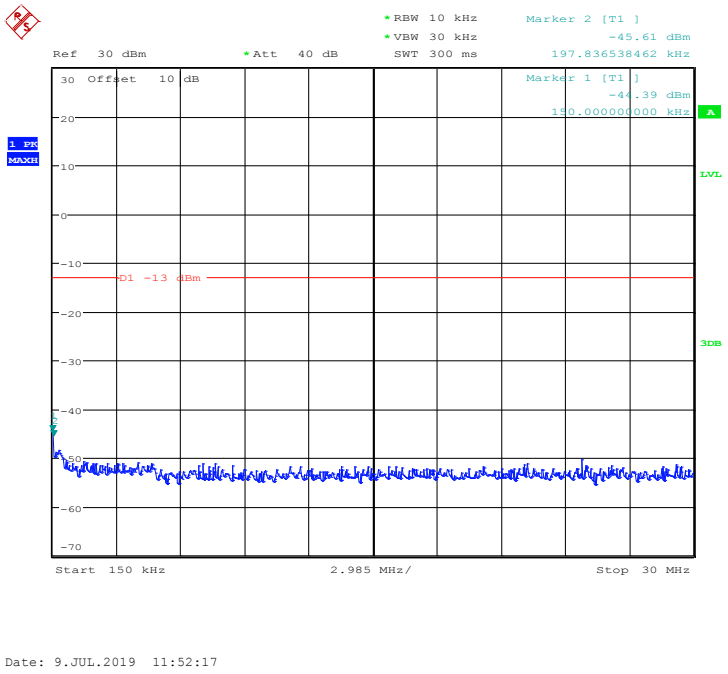


Fig.26 Channel 777: 150KHz~30MHz

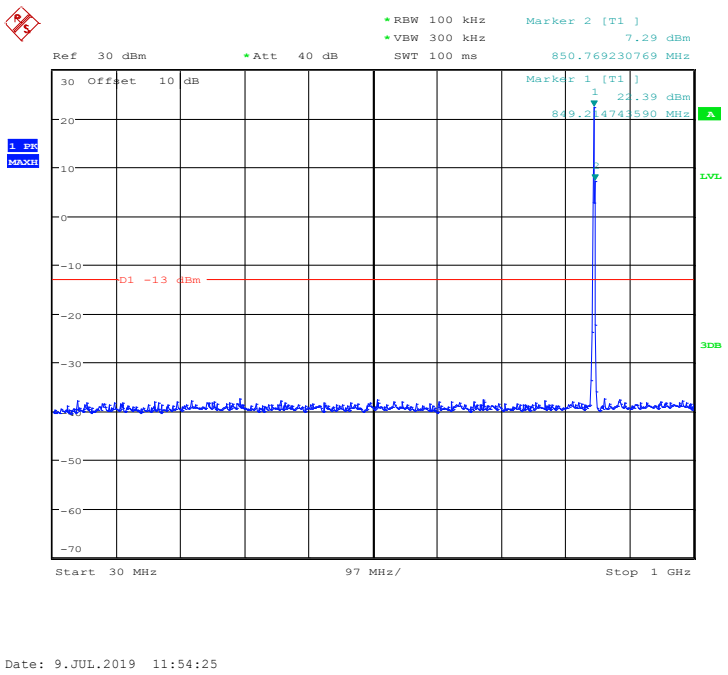


Fig.27 Channel 777: 30MHz~1GHz

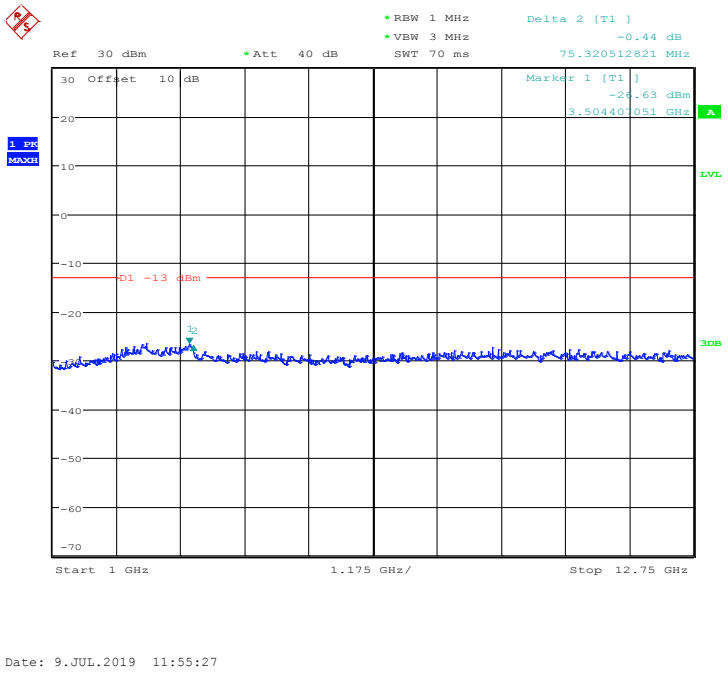


Fig.28 Channel 777: 1GHz~12.75GHz

A.7.1.2.2. CDMA2000 PCS BC1

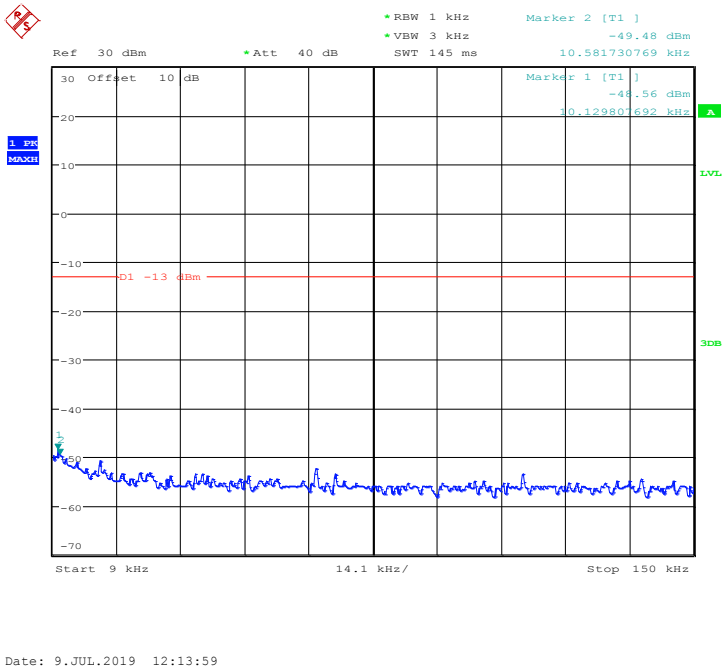


Fig.29 Channel 25: 9KHz~150KHz

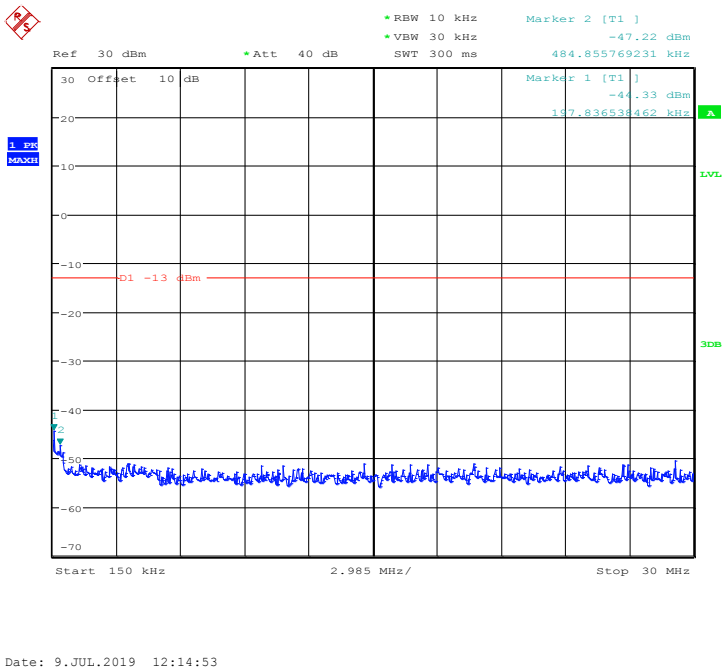


Fig.30 Channel 25: 150KHz~30MHz

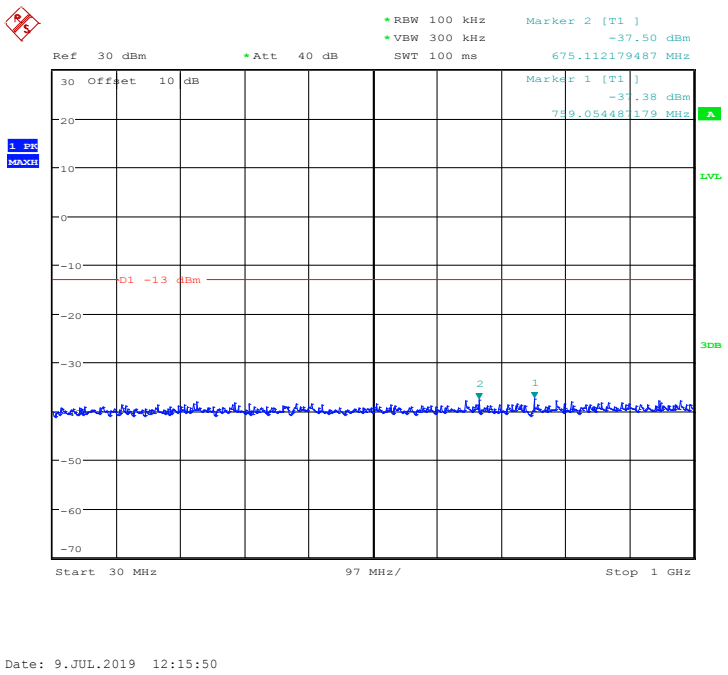


Fig.31 Channel 25: 30MHz~1GHz

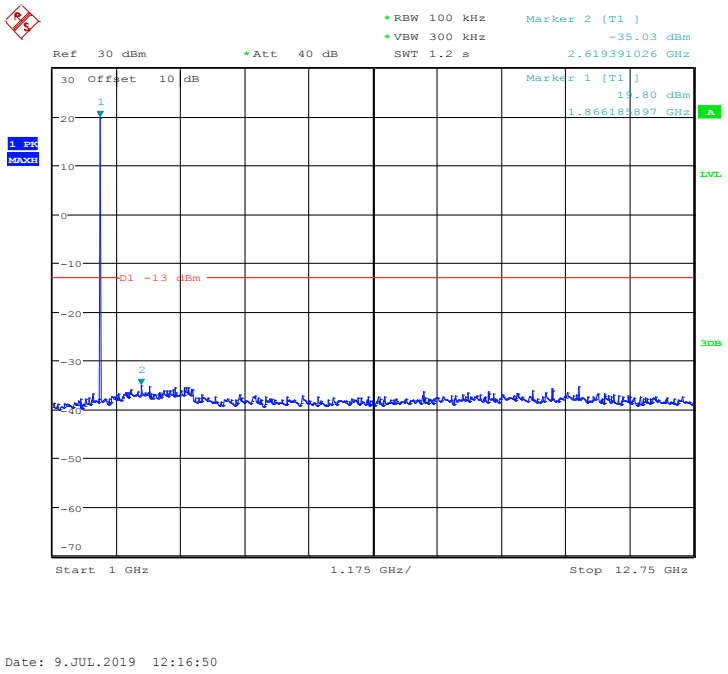


Fig.32 Channel 25: 1GHz~12.75GHz

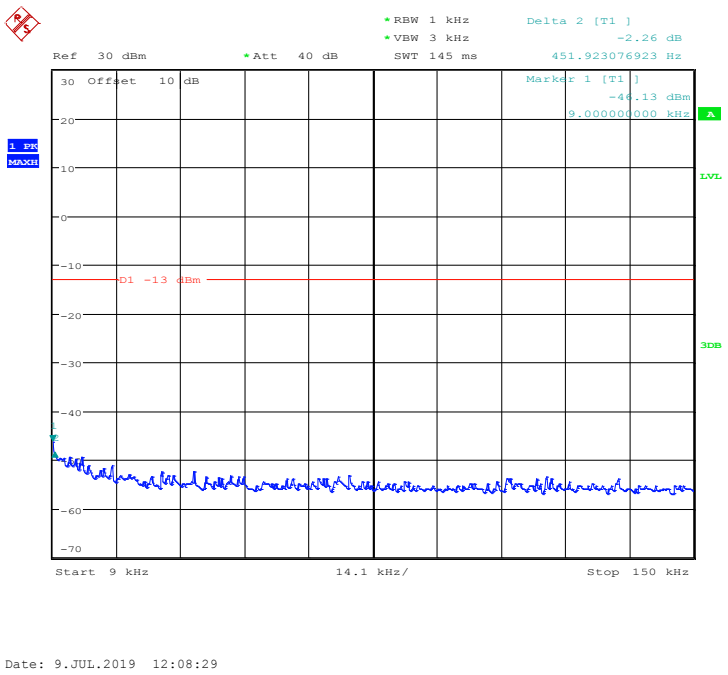


Fig.33 Channel 600: 9KHz~150KHz

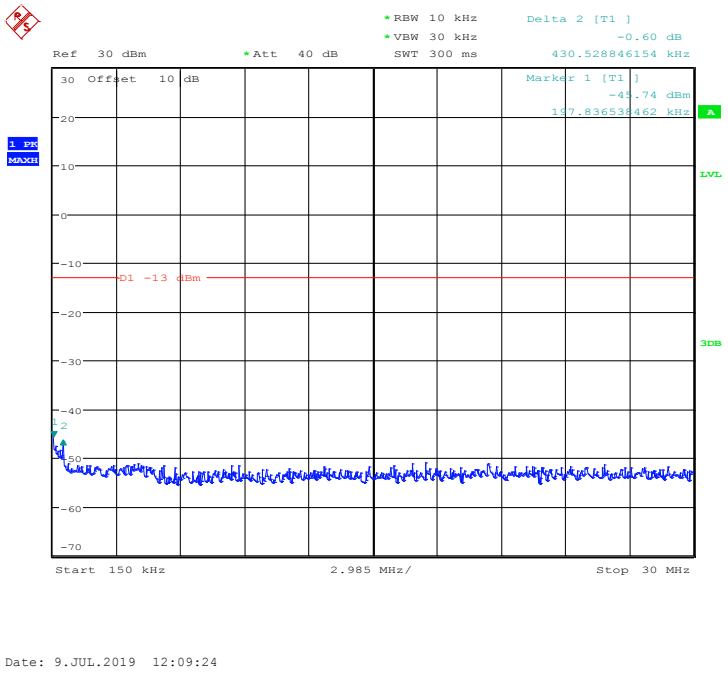


Fig.34 Channel 600: 150KHz~30MHz

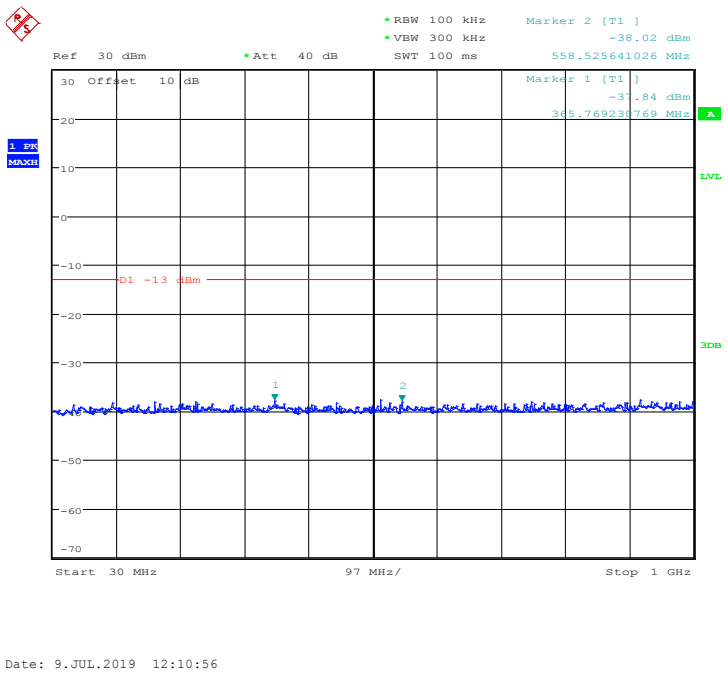


Fig.35 Channel 600: 30MHz~1GHz

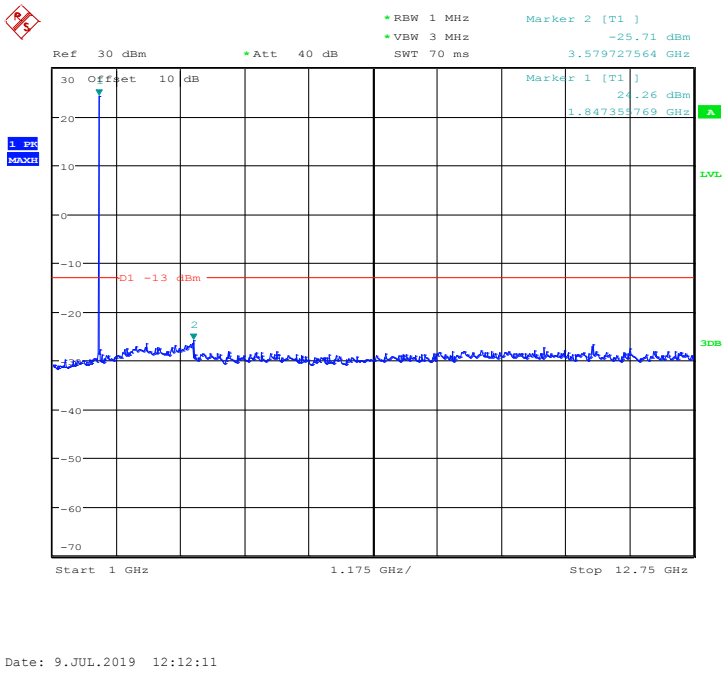


Fig.36 Channel 600: 1GHz~12.75GHz

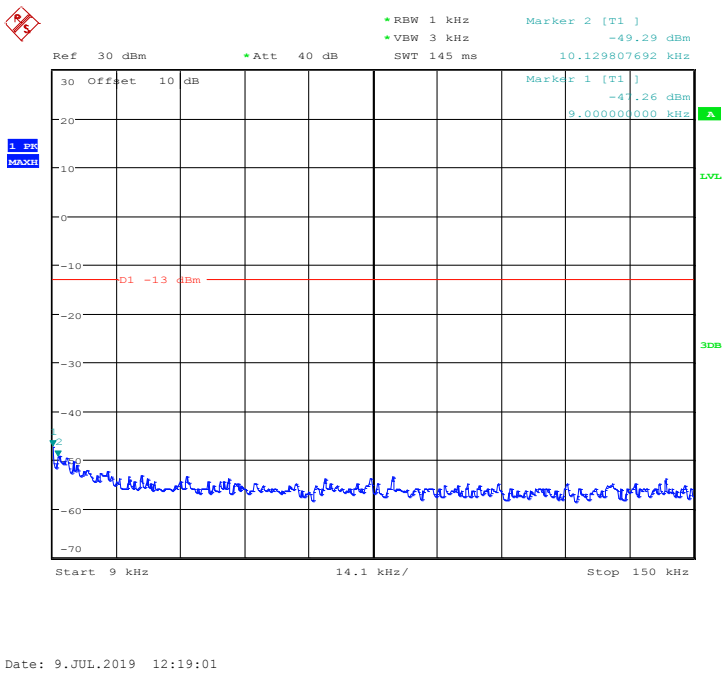


Fig.37 Channel 1175: 9KHz~150KHz

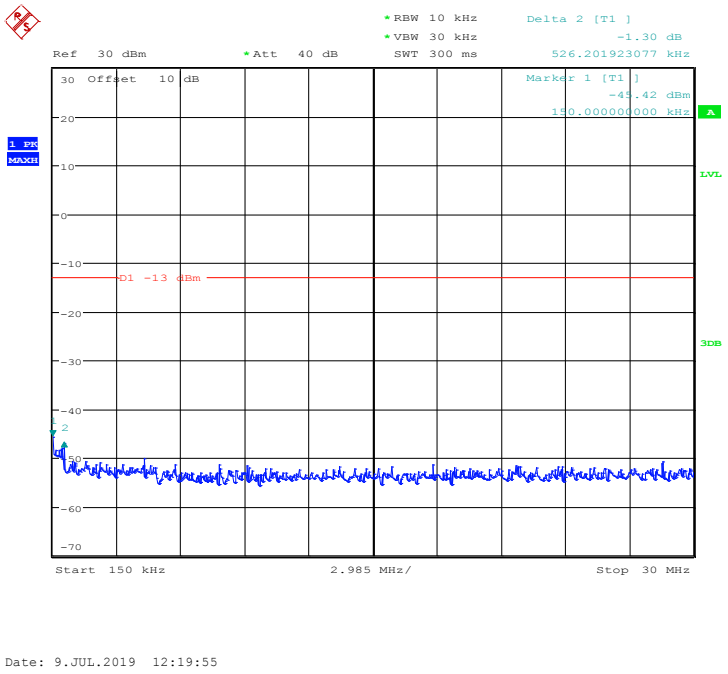


Fig.38 Channel 1175: 150KHz~30MHz

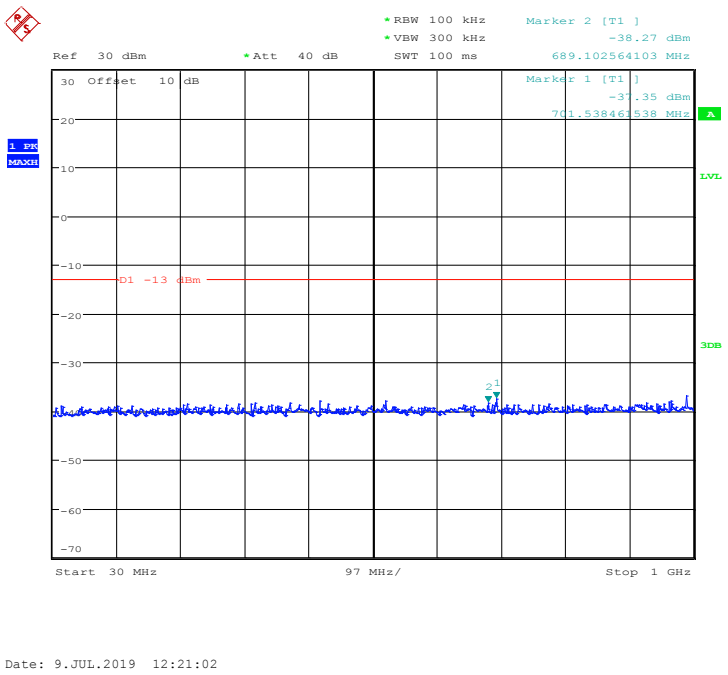


Fig.39 Channel 1175: 30MHz~1GHz

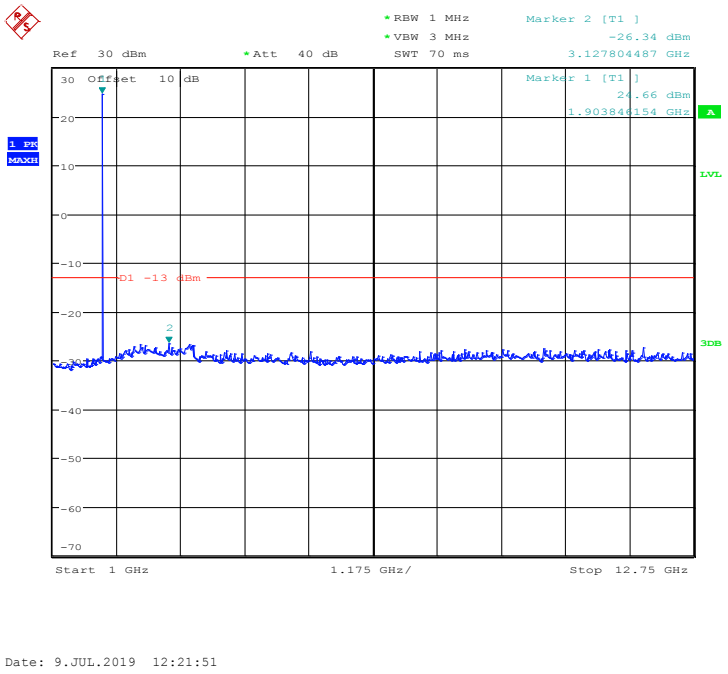


Fig.40 Channel 1175: 1GHz~12.75GHz

Conclusion: PASS

ANNEX A.8. RADIATED

A.8.1. ERP

A.8.1.1. CDMA/1xEV-DO ERP

A.8.1.1.1. Description

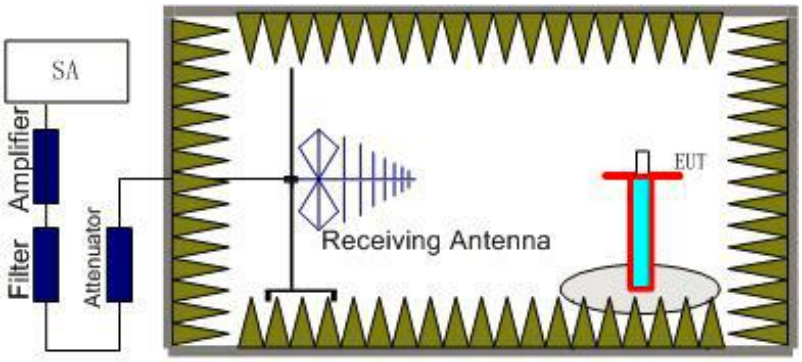
This is the test for the maximum radiated power from the EUT.

Rule Part 24.232(c) 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 ofcontinuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."Rule Part 22.913(a) specifies ” The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.”

A.8.1.1.2. Method of Measurement

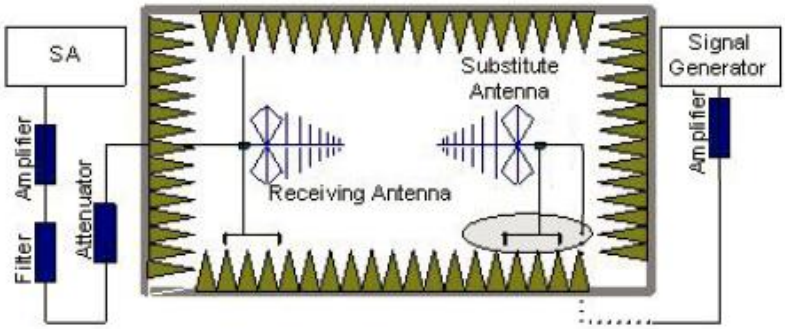
The measurements procedures in TIA-603E-2016 are used.

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from thereceive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUTfor emission measurements. The height of receiving antenna is 1.5m. The test setup refers tofigure below. Detected emissions were maximized at each frequency by rotating the EUTthrough 360 and adjusting the receiving antenna polarization. The radiated emissionmeasurements of all transmit frequencies in three channels (High, Middle, Low) weremeasured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level duringthe test. And the maximum value of the receiver should be recorded as (Pr).

3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at thereference point of the chamber. An RF Signal source for the frequency band of interest isconnected to the substitution

antenna with a cable that has been constructed to not interferewith the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of thesubstitution antenna, and adjust the level of the signal generator output until the value of thereceiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. Thetest should be performed by rotating the test item and adjusting the receiving antennapolarization.

4. A amplifier should be connected to the Signal Source output port. And the cable should beconnect between the Amplifier and the Substitution Antenna.

The cable loss (P_{cl}) ,the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should berecorded after test.

The measurement results are obtained as described below:

Power(EIRP)=P_{Mea}+ P_{Ag}- P_{cl}+ G_a

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15dBi) and known input power.

6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi.

A.8.1.1.3 CDMA2000 Cellular -ERP 22.913(a)

A.8.1.1.3.1 Measurement result

CDMA2000 Cellular BC0

Frequency (MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_aAntenna Gain(dBd)	PeakERP (dBm)	Polarization
824.7	-16.71	3.1	37	3.11	20.30	H
836.52	-17.13	3.1	37	3.11	19.88	H
848.31	-16.89	3.1	37	3.11	20.12	H

Frequency**:** 824.7MHz

Peak ERP(dBm)= P_{Mea}(-16.71dBm) - P_{cl}(3.1dB) +P_{Ag}(37dB) + G_a(3.11dBd)

= 20.30dBm

Note: ANALYZER SETTINGS: RBW = VBW = 3MHz

A.8.1.1.4 CDMA2000 PCS-EIRP 24.232(c)

A.8.1.1.4.1 Measurement result

CDMA2000 PCS BC1

Frequency (MHz)	P_{Mea}(dBm)	P_{cl}(dB)	P_{Ag}(dB)	G_aAntenna Gain(dBi)	PeakEIRP (dBm)	Polarization
1851.25	-10.93	4.6	36	2.8	23.27	V
1880.0	-10.37	4.6	35.6	2.8	23.43	V
1908.75	-10.95	4.7	36	2.8	23.15	H

Frequency**:** 1880.0MHz

Peak EIRP(dBm)= P_{Mea}(-10.37dBm) - P_{cl}(4.7dB)+ P_{Ag}(36dB) +G_a(2.8dB)=23.43dBm

ANALYZER SETTINGS: RBW = VBW = 3MHz

A.8.2 EMISSION LIMIT (§2.1051/§22.917§24.238)

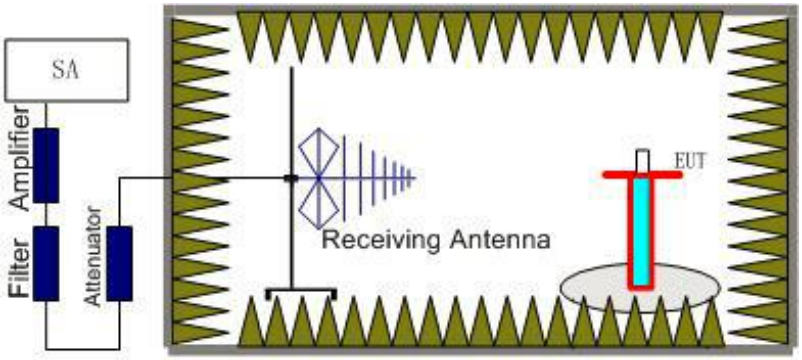
A.8.2.1 CDMA Measurement Method

The measurement procedures in TIA-603E-2016are used.

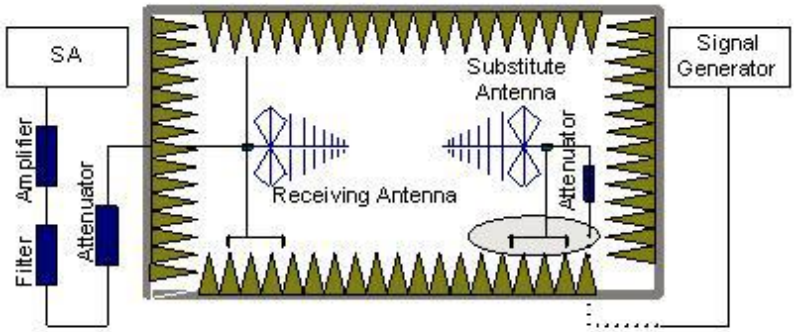
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set as outlined in Part 24.238 and Part 22.917. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of PCS1900 and GSM850.

A.8.2.2 The procedure of radiated spurious emissions is as follows:

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10thharmonic were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The

test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss (P_{pl}) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain (G_a) should be recorded after test.

A amplifier should be connected in for the test.

The Path loss (P_{pl}) is the summation of the cable loss .

The measurement results are obtained as described below:

Power(EIRP)=P_{Mea}- P_{pl}+ G_a

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.

6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi

A.8.2.3 Measurement Limit

Part 24.238 and Part 22.917 specify that 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.

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.8.2.4 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the PCS1900 band (1850.2 MHz, 1880 MHz and 1909.8 MHz) and GSM850 band (824.2MHz, 836.6MHz, 848.8MHz) . 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 PCS1900 ,GSM850 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.

A.8.2.5 Measurement Results

Measurements results:

Frequency	Channel	Frequency Range	Result
CDMA2000 Cellular BC0	Low	30MHz~10GHz	P
	Middle	30MHz~10GHz	P
	High	30MHz~10GHz	P
CDMA2000 PCS BC1	Low	30MHz~20GHz	P
	Middle	30MHz~20GHz	P
	High	30MHz~20GHz	P

CDMA2000 Cellular

BC0 Mode Channel 1013

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBi)	Peak EIRP (dBm)	Limit （dBm）	Polarization
1848.2	-38.15	4.6	2.9	-39.85	-13	H
2630.4	-35.53	5.5	4.1	-36.93	-13	V
3565.4	-46.12	6.4	4.7	-47.82	-13	V
5418.5	-49.81	8.1	9.5	-48.41	-13	V
6901.5	-49.78	9.3	12.9	-46.18	-13	V
8292.3	-52.03	10.1	17.3	-44.83	-13	V

BC0 Mode Channel 384

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBi)	Peak EIRP (dBm)	Limit （dBm）	Polarization
1863.2	-37.75	4.6	2.9	-39.45	-13	V
2715.0	-35.43	5.6	4.1	-36.93	-13	V
3580.4	-46.2	6.5	4.7	-48	-13	H
4570.4	-48.21	7.4	7.3	-48.31	-13	H
5953.8	-49.36	8.5	10.4	-47.46	-13	V
7072.3	-50.67	9.4	12.9	-47.17	-13	H

Note:

BC0, CH384

Power(ERP)= Pmea-Pcl+Ga=-37.75-4.6+2.9=-39.45dbm

This method Applicable to the following table.

BC0 Mode Channel 777

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBi)	Peak EIRP (dBm)	Limit （dBm）	Polarization
1851.4	-38.46	4.6	2.9	-40.16	-13	H
2677.5	-35.96	5.6	4.1	-37.46	-13	V
3191.5	-46.84	6.1	4.7	-48.24	-13	V
4560.0	-48.31	7.4	7.3	-48.41	-13	V
5541.9	-49.42	8.2	9.5	-48.12	-13	H
8038.5	-51.87	9.9	16.6	-45.17	-13	V

CDMA2000 PCS

BC1 Mode Channel 25

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBi)	Peak EIRP (dBm)	Limit （dBm）	Polarization
3816.6	-48.86	6.7	7.7	-47.86	-13	H
5726.4	-30.67	8.5	10.5	-28.67	-13	H
7634.4	-32.42	9.7	15.3	-26.82	-13	H
9543.6	-52.76	10.7	18.6	-44.86	-13	H
10772.4	-48.82	11.7	17.3	-43.22	-13	H
14316.0	-47.85	13.6	23.5	-37.95	-13	H

BC1 Mode Channel 600

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBi)	Peak EIRP (dBm)	Limit （dBm）	Polarization
3825.0	-53.55	6.7	7.7	-52.55	-13	H
5640.0	-46.61	8.3	10.5	-44.41	-13	H
7519.2	-48.16	9.7	14.6	-43.26	-13	H
9489.6	-54.23	10.7	18.6	-46.33	-13	V
11190.0	-50.26	12.1	18.5	-43.86	-13	V
13448.4	-48.76	13.7	23.4	-39.06	-13	V

BC1 Mode Channel 1175

Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBi)	Peak EIRP (dBm)	Limit （dBm）	Polarization
3856.2	-52.96	6.7	7.7	-51.96	-13	V
4542.0	-51.07	7.4	7.3	-51.17	-13	H
5554.2	-45.44	8.2	9.5	-44.14	-13	H
7404.0	-45.33	9.7	14.6	-40.43	-13	V
11289.6	-48.78	12.1	18.5	-42.38	-13	V
14253.6	-47.41	13.7	23.5	-37.61	-13	H

BC0, CH1175

Power(ERP)= Pmea-Pcl+Ga=-47.41-13.6+21.8=-37.61dbm

This method Applicable to the following table.

Conclusion: PASS

Note: the EUT was displayed in several different direction, the worst cases were shown.

ANNEX B. Accreditation Certificate

Accredited Laboratory

A2LA has accredited

EAST CHINA INSTITUTE OF TELECOMMUNICATIONS

Shanghai, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 6th day of May 2019.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3682.01
Valid to February 28, 2021

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

************End of the Report************