



FCC RF Test Report

APPLICANT : SHARP CORPORATION, Mobile
Communication B.U.
EQUIPMENT : Smart Phone
BRAND NAME : SHARP
FCC ID : APYHRO00289
STANDARD : 47 CFR Part 2, 22(H), 24(E)
CLASSIFICATION : PCS Licensed Transmitter Held to Ear (PCE)

The product was received on Aug. 01, 2020 and completely tested on Sep. 08, 2020. We, Sporton International (ShenZhen) Inc., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.26-2015 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (ShenZhen) Inc., the test report shall not be reproduced except in full.

Derreck Chen

Reviewed by: Derreck Chen / Supervisor

Eric Shih

Approved by: Eric Shih / Manager



Sporton International (ShenZhen) Inc.

1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055

People's Republic of China



TABLE OF CONTENTS

REVISION HISTORY	3
SUMMARY OF TEST RESULT	4
1 GENERAL DESCRIPTION	5
1.1 Applicant.....	5
1.2 Manufacturer	5
1.3 Product Feature of Equipment Under Test	5
1.4 Product Specification of Equipment Under Test	6
1.5 Modification of EUT	6
1.6 Maximum ERP/EIRP Power, Frequency Tolerance, and Emission Designator	7
1.7 Testing Location	7
1.8 Test Software	7
1.9 Applicable Standards	8
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST	9
2.1 Test Mode.....	9
2.2 Connection Diagram of Test System	9
2.3 Support Unit used in test configuration	10
2.4 Measurement Results Explanation Example	10
2.5 Frequency List of Low/Middle/High Channels	11
3 CONDUCTED TEST RESULT.....	12
3.1 Measuring Instruments.....	12
3.2 Test Setup	12
3.3 Test Result of Conducted Test.....	12
3.4 Conducted Output Power and ERP/EIRP	13
3.5 Peak-to-Average Ratio	14
3.6 99% Occupied Bandwidth and 26dB Bandwidth Measurement.....	15
3.7 Conducted Band Edge	16
3.8 Conducted Spurious Emission	17
3.9 Frequency Stability	18
4 RADIATED TEST ITEMS	19
4.1 Measuring Instruments.....	19
4.2 Test Setup	19
4.3 Test Result of Radiated Test.....	19
4.4 Field Strength of Spurious Radiation Measurement	20
5 LIST OF MEASURING EQUIPMENT	21
6 UNCERTAINTY OF EVALUATION	22
APPENDIX A. TEST RESULTS OF CONDUCTED TEST	
APPENDIX B. TEST RESULTS OF RADIATED TEST	
APPENDIX C. TEST SETUP PHOTOGRAPHS	



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG080102A	Rev. 01	Initial issue of report	Sep. 23, 2020

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	Reporting Only	PASS	-
	§22.913(a)(5)	Effective Radiated Power	< 7 Watts	PASS	-
	§24.232(c)	Equivalent Isotropic Radiated Power	< 2 Watts	PASS	-
3.5	§24.232(d)	Peak-to-Average Ratio	< 13 dB	PASS	-
3.6	§2.1049	Occupied Bandwidth	Reporting Only	PASS	-
3.7	§2.1051 §22.917(a) §24.238(a)	Band Edge Measurement	< 43+10log10(P[Watts])	PASS	-
3.8	§2.1051 §22.917(a) §24.238(a)	Conducted Emission	< 43+10log10(P[Watts])	PASS	-
3.9	§2.1055 §22.355	Frequency Stability for Temperature & Voltage	< 2.5 ppm for Part 22	PASS	-
	§2.1055 §24.235		Within Authorized Band		
4.4	§2.1053; §22.917(a); §24.238(a)	Field Strength of Spurious Radiation	< 43+10log10(P[Watts])	PASS	Under limit 29.85 dB at 5640.000 MHz

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.



1 General Description

1.1 Applicant

SHARP CORPORATION, Mobile Communication B.U.

2-13-1, Hachihonmatsu-lida, Higashi-hiroshima-shi, Hiroshima 739-0192, Japan

1.2 Manufacturer

SHARP CORPORATION

1 Takumi-cho, Sakai-ku, Sakai-shi, Osaka 590-8522, Japan

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Smart Phone
Brand Name	SHARP
FCC ID	APYHRO00289
EUT supports Radios application	GSM/WCDMA/LTE/NFC WLAN 2.4GHz 802.11b/g/n HT20 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE FM Receiver and GNSS
IMEI Code	Conducted: 004401117394748 Radiation: 004401117393187
HW Version	DVT
SW Version	A729S
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	GSM/GPRS/EDGE: 850: 824.2 MHz ~ 848.8 MHz 1900: 1850.2 MHz ~ 1909.8MHz WCDMA: Band V: 826.4 MHz ~ 846.6 MHz Band II: 1852.4 MHz ~ 1907.6 MHz
Rx Frequency	GSM/GPRS/EDGE: 850: 869.2 MHz ~ 893.8 MHz 1900: 1930.2 MHz ~ 1989.8 MHz WCDMA: Band V: 871.4 MHz ~ 891.6 MHz Band II: 1932.4 MHz ~ 1987.6 MHz
Maximum Output Power to Antenna	GSM/GPRS/EDGE: 850: 32.56 dBm 1900: 29.52 dBm WCDMA: Band II: 22.54 dBm WCDMA Band V: Top Antenna: 17.72 dBm Bottom Antenna: 23.81 dBm
Antenna Type	IFA Antenna
Antenna Gain	Cellular Band: -4.80 dBi PCS Band: -1.60 dBi
Type of Modulation	GSM: GMSK GPRS: GMSK WCDMA: BPSK (Uplink) HSDPA: QPSK (Uplink) HSUPA: QPSK (Uplink)

1.5 Modification of EUT

No modifications are made to the EUT during all test items.



1.6 Maximum ERP/EIRP Power, Frequency Tolerance, and Emission Designator

FCC Rule	System	Type of Modulation	Maximum ERP/EIRP (W)	Frequency Tolerance (ppm)	Emission Designator
Part 22	GSM850 GSM	GMSK	0.3639	0.0063 ppm	240KGXW
Part 22	WCDMA Band V RMC 12.2Kbps	BPSK	0.0485	0.0016 ppm	4M15F9W
Part 24	GSM1900 GSM	GMSK	0.6194	0.0035 ppm	250KGXW
Part 24	WCDMA Band II RMC 12.2Kbps	BPSK	0.1242	0.0027 ppm	4M16F9W

1.7 Testing Location

Sporton International (Shenzhen) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International (Shenzhen) Inc.		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	TH01-SZ	CN1256	421272

Test Firm	Sporton International (Shenzhen) Inc.		
Test Site Location	No. 3 Bldg the third floor of south, Shahe River west, Fengzeyuan Warehouse, Nanshan Shenzhen, 518055 People's Republic of China TEL: +86-755-33202398		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	03CH04-SZ	CN1256	421272

1.8 Test Software

Item	Site	Manufacture	Name	Version
1.	03CH04-SZ	AUDIX	E3	6.2009-8-24



1.9 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 2, 22(H), 24(E)
- ♦ ANSI C63.26-2015
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- ♦ FCC KDB 412172 D01 Determining ERP and EIRP v01r01

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

Radiated emissions were investigated as following frequency range:

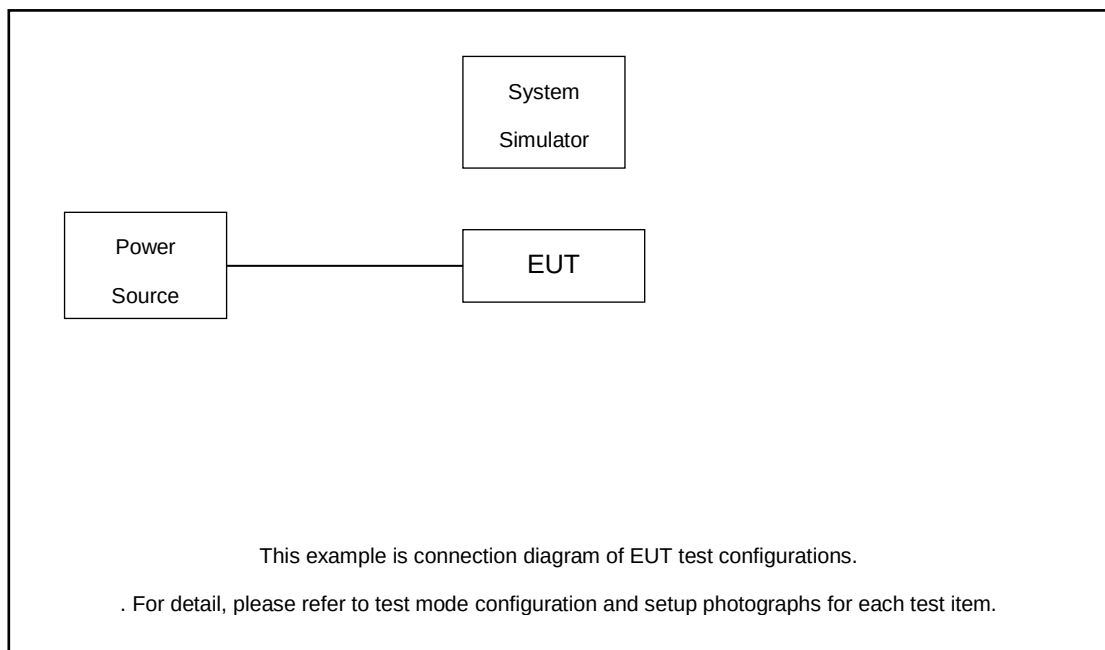
1. 30 MHz to 9000 MHz for GSM850 and WCDMA Band V.
2. 30 MHz to 19100 MHz for GSM1900 and WCDMA Band II.

All modes and data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

Test Modes		
Band	Radiated TCs	Conducted TCs
GSM 850	■ GSM Link	■ GSM Link
GSM 1900	■ GSM Link	■ GSM Link
WCDMA Band V	■ RMC 12.2Kbps Link	■ RMC 12.2Kbps Link
WCDMA Band II	■ RMC 12.2Kbps Link	■ RMC 12.2Kbps Link

2.2 Connection Diagram of Test System





2.3 Support Unit used in test configuration

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	Power Supply	GWINSTEK	PSS-2002	N/A	N/A	Unshielded, 1.8 m
2.	LTE Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between RF conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level will be exactly the RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

The following shows an offset computation example with RF cable loss 4 dB and a 10dB attenuator.

Example :

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 4 + 10 = 14 \text{ (dB)}\end{aligned}$$



2.5 Frequency List of Low/Middle/High Channels

Frequency List				
Band	Channel/Frequency(MHz)	Lowest	Middle	Highest
GSM850	Channel	128	189	251
	Frequency	824.2	836.4	848.8
WCDMA Band V	Channel	4132	4182	4233
	Frequency	826.4	836.4	846.6
GSM1900	Channel	512	661	810
	Frequency	1850.2	1880.0	1909.8
WCDMA Band II	Channel	9262	9400	9538
	Frequency	1852.4	1880.0	1907.6

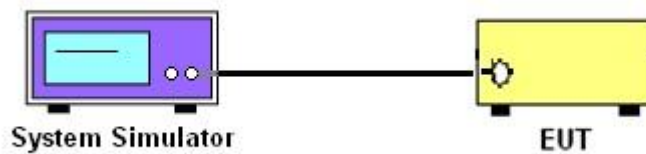
3 Conducted Test Result

3.1 Measuring Instruments

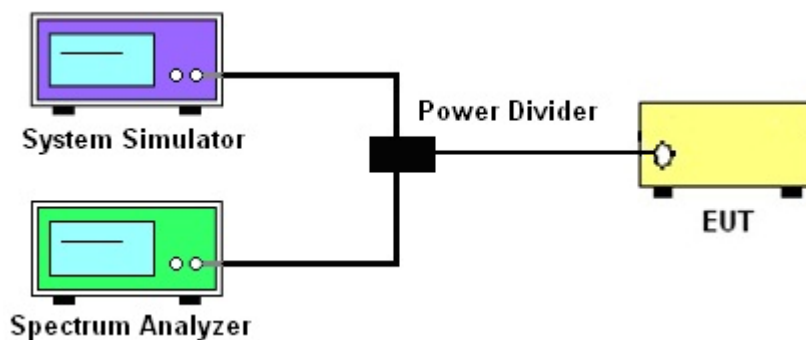
See list of measuring instruments of this test report.

3.2 Test Setup

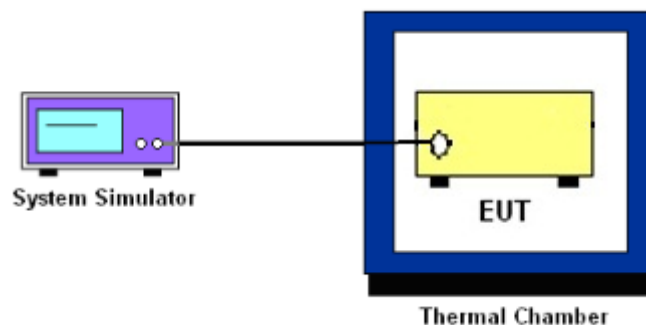
3.2.1 Conducted Output Power



3.2.2 Peak-to-Average Ratio, Occupied Bandwidth, Conducted Band-Edge and Conducted Spurious Emission



3.2.3 Frequency Stability



3.3 Test Result of Conducted Test

Please refer to Appendix A.



3.4 Conducted Output Power and ERP/EIRP

3.4.1 Description of the Conducted Output Power and ERP/EIRP

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The ERP of mobile transmitters must not exceed 7 Watts for GSM850 and WCDMA Band V.

The EIRP of mobile transmitters must not exceed 2 Watts for GSM1900 and WCDMA Band II.

The EIRP of mobile transmitters must not exceed 1 Watts for WCDMA Band IV.

According to KDB 412172 D01 Power Approach,

$EIRP = P_T + G_T - L_C$, $ERP = EIRP - 2.15$, where

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

3.4.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.2
2. The transmitter output port was connected to the system simulator.
3. Set EUT at maximum power through the system simulator.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure and record the power level from the system simulator.



3.5 Peak-to-Average Ratio

3.5.1 Description of the PAR Measurement

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

3.5.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.2.3.4 (CCDF).
2. The EUT was connected to spectrum and system simulator via a power divider.
3. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
4. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
5. Record the deviation as Peak to Average Ratio.

3.6 99% Occupied Bandwidth and 26dB Bandwidth Measurement

3.6.1 Description of 99% Occupied Bandwidth and 26dB Bandwidth Measurement

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

3.6.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.4
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.
4. The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
5. Set the detection mode to peak, and the trace mode to max hold.
6. Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace.
(this is the reference value)
7. Determine the “-26 dB down amplitude” as equal to (Reference Value – X).
8. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “-X dB down amplitude” determined in step 6. If a marker is below this “-X dB down amplitude” value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.
9. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.



3.7 Conducted Band Edge

3.7.1 Description of Conducted Band Edge Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB.

3.7.2 Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator.
The path loss was compensated to the results for each measurement.
4. The band edges of low and high channels for the highest RF powers were measured.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
6. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)

3.8 Conducted Spurious Emission

3.8.1 Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10th harmonic.

3.8.2 Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. The middle channel for the highest RF power within the transmitting frequency was measured.
5. The conducted spurious emission for the whole frequency range was taken.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
7. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)

3.9 Frequency Stability

3.9.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ ($\pm 2.5\text{ppm}$) of the center frequency.

3.9.2 Test Procedures for Temperature Variation

1. The testing follows ANSI C63.26 section 5.6.4
2. The EUT was set up in the thermal chamber and connected with the system simulator.
3. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
4. With power OFF, the temperature was raised in 10°C step up to 50°C . The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

3.9.3 Test Procedures for Voltage Variation

1. The testing follows ANSI C63.26 section 5.6.5
2. The EUT was placed in a temperature chamber at $20\pm 5^{\circ}\text{C}$ and connected with the system simulator.
3. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value for other than hand carried battery equipment.
4. For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.
5. The variation in frequency was measured for the worst case.

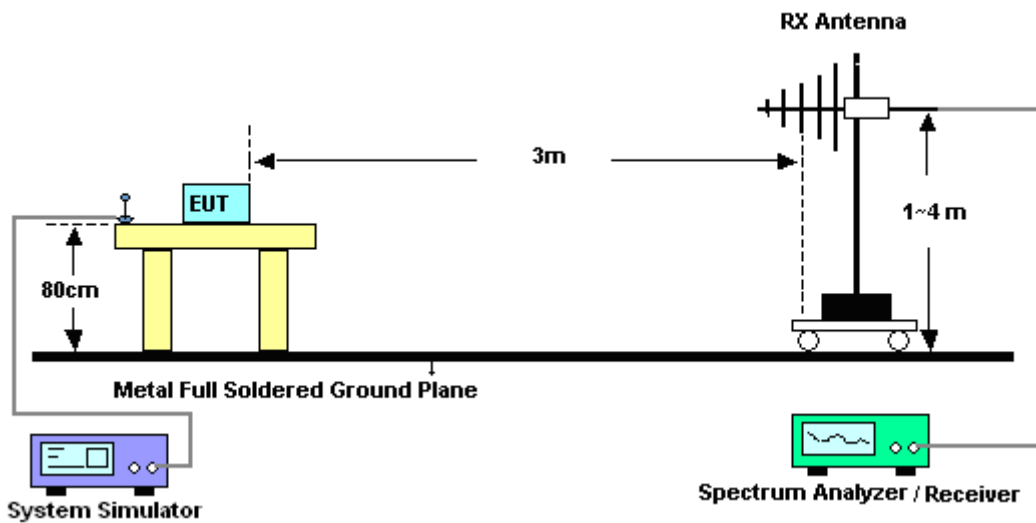
4 Radiated Test Items

4.1 Measuring Instruments

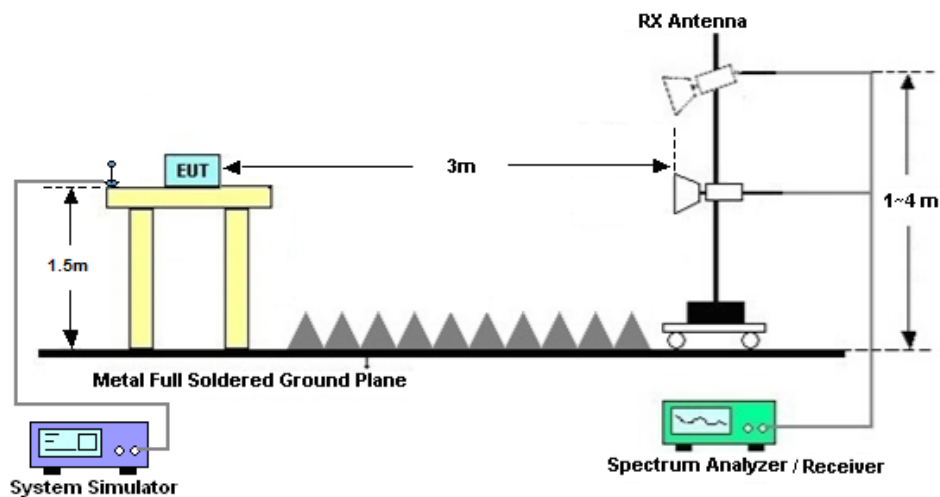
See list of measuring instruments of this test report.

4.2 Test Setup

4.2.1 For radiated test from 30MHz to 1GHz



4.2.2 For radiated test above 1GHz



4.3 Test Result of Radiated Test

Please refer to Appendix B.

4.4 Field Strength of Spurious Radiation Measurement

4.4.1 Description of Field Strength of Spurious Radiated Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

4.4.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.5
2. The EUT was placed on a rotatable wooden table 0.8 meters for frequency below 1GHz and 1.5 meter for frequency above 1GHz above the ground.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.
7. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
9. Taking the record of output power at antenna port.
10. Repeat step 7 to step 8 for another polarization.
11. $EIRP \text{ (dBm)} = S.G. \text{ Power} - Tx \text{ Cable Loss} + Tx \text{ Antenna Gain}$
12. $ERP \text{ (dBm)} = EIRP - 2.15$
13. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
14. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)



5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 17, 2020	Sep. 02, 2020	Apr. 16, 2021	Conducted (TH01-SZ)
DC Power Supply	GWINSTEK	AnritsuGPS-3030D	EM882636	Max 30V	Apr. 17, 2020	Sep. 02, 2020	Apr. 16, 2021	Conducted (TH01-SZ)
Thermal Chamber	Ten Billion Hongzhangroup	LP-150U	H2014081803	-40~+150°C	Dec. 22, 2020	Sep. 02, 2020	Dec. 21, 2021	Conducted (TH01-SZ)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz	Oct. 16, 2019	Sep. 08, 2020	Oct. 15, 2020	Radiation (03CH04-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Jul. 21, 2020	Sep. 08, 2020	Jul. 20, 2021	Radiation (03CH04-SZ)
Bilog Antenna	TeseQ	CBL6111D	41909	30MHz~1GHz	Nov. 07, 2019	Sep. 08, 2020	Nov. 06, 2020	Radiation (03CH04-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1474	1GHz~18GHz	May 23, 2020	Sep. 08, 2020	Mar. 22, 2021	Radiation (03CH04-SZ)
Horn Antenna	SCHWARZBECK	BBHA9170	9170#679	15GHz~40GHz	Jul. 26, 2020	Sep. 08, 2020	Jul. 25, 2021	Radiation (03CH04-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz ~3000MHz	Oct. 17, 2019	Sep. 08, 2020	Oct. 16, 2020	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	AMF-7D-00 101800-30-1 0P-R	1943528	1GHz~18GHz	Oct. 17, 2019	Sep. 08, 2020	Oct. 16, 2020	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	TTA1840-35 -HG	1871923	18GHz~40GHz	Jul. 21, 2020	Sep. 08, 2020	Jul. 20, 2021	Radiation (03CH04-SZ)
Amplifier	Agilent Technologies	83017A	MY53270156	500MHz~26.5GHz	Oct. 17, 2019	Sep. 08, 2020	Oct. 16, 2020	Radiation (03CH04-SZ)
AC Power Source	Chroma	61601	N/A	N/A	NCR	Sep. 08, 2020	NCR	Radiation (03CH04-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Sep. 08, 2020	NCR	Radiation (03CH04-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Sep. 08, 2020	NCR	Radiation (03CH04-SZ)

NCR: No Calibration Required

6 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.26-2015. All the measurement uncertainty value were shown with a coverage $K=2$ to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.8dB
---	-------

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.1dB
---	-------

Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.9dB
---	-------

Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power)

Conducted Power (*Unit: dBm)						
Band	GSM850			GSM1900		
Channel	128	189	251	512	661	810
Frequency	824.2	836.4	848.8	1850.2	1880.0	1909.8
GSM	32.46	32.56	32.55	29.52	29.27	29.50
GPRS 1 Tx slots	32.40	32.55	32.53	29.51	29.22	29.48
GPRS 2 Tx slots	30.31	30.27	30.20	26.97	27.00	26.85
GPRS 3 Tx slots	28.17	28.22	28.20	25.17	25.07	25.06
GPRS 4 Tx slots	26.82	26.84	26.60	23.78	23.76	23.63

Conducted Power (*Unit: dBm)			
Band	WCDMA Band II		
Channel	9262	9400	9538
Frequency	1852.4	1880	1907.6
AMR 12.2K	22.50	22.48	22.44
RMC 12.2K	22.54	22.46	22.43
HSDPA Subtest-1	21.67	21.58	21.52
HSDPA Subtest-2	21.70	21.62	21.54
HSDPA Subtest-3	21.16	21.13	21.13
HSDPA Subtest-4	21.13	21.12	21.13
HSUPA Subtest-1	21.64	21.60	21.56
HSUPA Subtest-2	19.63	19.58	19.65
HSUPA Subtest-3	20.66	20.61	20.55
HSUPA Subtest-4	19.65	19.60	19.64
HSUPA Subtest-5	21.70	21.60	21.60



Bottom Antenna

Conducted Power (*Unit: dBm)			
Band	WCDMA Band V		
Channel	4132	4182	4233
Frequency	826.4	836.4	846.6
AMR 12.2K	23.80	23.77	23.78
RMC 12.2K	23.81	23.78	23.78
HSDPA Subtest-1	22.92	22.85	22.88
HSDPA Subtest-2	22.96	22.87	22.86
HSDPA Subtest-3	22.50	22.53	22.52
HSDPA Subtest-4	22.50	22.51	22.50
HSUPA Subtest-1	22.95	22.89	22.90
HSUPA Subtest-2	20.90	20.83	20.86
HSUPA Subtest-3	21.96	21.90	21.88
HSUPA Subtest-4	20.93	20.89	20.90
HSUPA Subtest-5	23.00	22.90	23.00

Top Antenna

Conducted Power (*Unit: dBm)			
Band	WCDMA Band V		
Channel	4132	4182	4233
Frequency	826.4	836.4	846.6
AMR 12.2K	17.65	17.62	17.55
RMC 12.2K	17.72	17.64	17.57
HSDPA Subtest-1	16.69	16.61	16.51
HSDPA Subtest-2	16.64	16.60	16.53
HSDPA Subtest-3	16.22	16.10	16.07
HSDPA Subtest-4	16.16	16.13	16.01
HSUPA Subtest-1	16.68	16.62	16.56
HSUPA Subtest-2	14.72	14.61	14.49
HSUPA Subtest-3	15.63	15.62	15.55
HSUPA Subtest-4	14.68	14.56	14.51
HSUPA Subtest-5	16.71	16.58	16.53

ERP/EIRP

GSM850 ($G_T - L_C = -4.80$ dB)			
Channel	128	189	251
	(Low)	(Mid)	(High)
Frequency	824.2	836.4	848.8
(MHz)			
Conducted Power (dBm)	32.46	32.56	32.55
Conducted Power (Watts)	1.7620	1.8030	1.7989
ERP(dBm)	25.51	25.61	25.60
ERP(Watts)	0.3556	0.3639	0.3631

GSM1900 ($G_T - L_C = -1.60$ dB)			
Channel	512	661	810
	(Low)	(Mid)	(High)
Frequency	1850.2	1880	1909.8
(MHz)			
Conducted Power (dBm)	29.52	29.27	29.50
Conducted Power (Watts)	0.8954	0.8453	0.8913
EIRP(dBm)	27.92	27.67	27.90
EIRP(Watts)	0.6194	0.5848	0.6166



WCDMA Band V ($G_T - L_C = -4.80$ dB)			
Channel	4132	4182	4233
	(Low)	(Mid)	(High)
Frequency	826.4	836.4	846.6
(MHz)			
Conducted Power (dBm)	23.81	23.78	23.78
Conducted Power (Watts)	0.2404	0.2388	0.2388
ERP(dBm)	16.86	16.83	16.83
ERP(Watts)	0.0485	0.0482	0.0482

WCDMA Band II ($G_T - L_C = -1.60$ dB)			
Channel	9262	9400	9538
	(Low)	(Mid)	(High)
Frequency	1852.4	1880	1907.6
(MHz)			
Conducted Power (dBm)	22.54	22.46	22.43
Conducted Power (Watts)	0.1795	0.1762	0.1750
EIRP(dBm)	20.94	20.86	20.83
EIRP(Watts)	0.1242	0.1219	0.1211

**Peak-to-Average Ratio**

Mode	GSM850(dB)	Limit: 13dB
Mod.	GSM	Result
Lowest CH	0.29	PASS
Middle CH	0.29	
Highest CH	0.29	

Mode	GSM1900(dB)	Limit: 13dB
Mod.	GSM	Result
Lowest CH	0.26	PASS
Middle CH	0.23	
Highest CH	0.26	

Mode	WCDMA Band V(dB)	WCDMA Band II(dB)	Limit: 13dB
Mod.	RMC 12.2Kbps	RMC 12.2Kbps	Result
Lowest CH	3.07	2.61	PASS
Middle CH	3.07	2.90	
Highest CH	3.01	2.75	



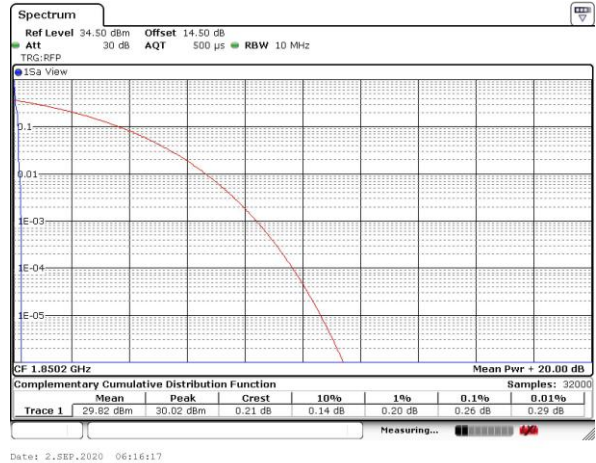
GSM850 (GSM)

Lowest Channel

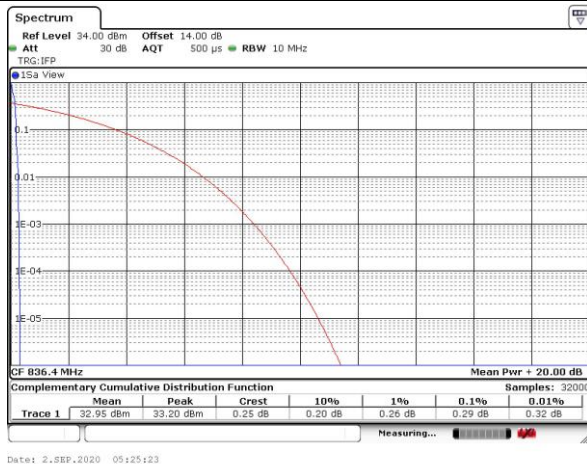


GSM1900 (GSM)

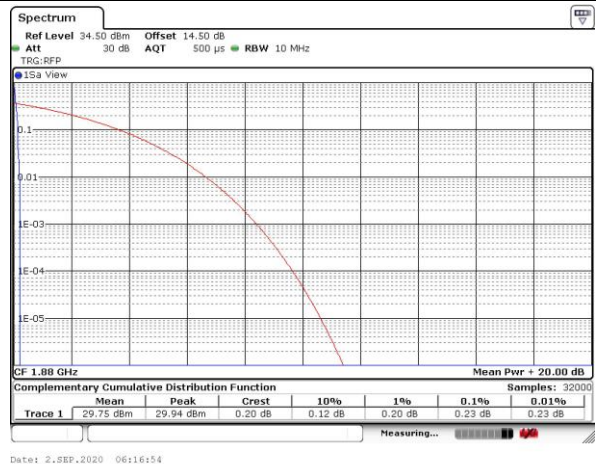
Lowest Channel



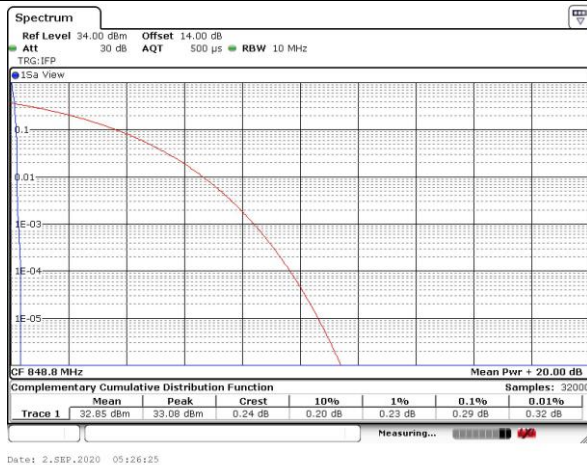
Middle Channel



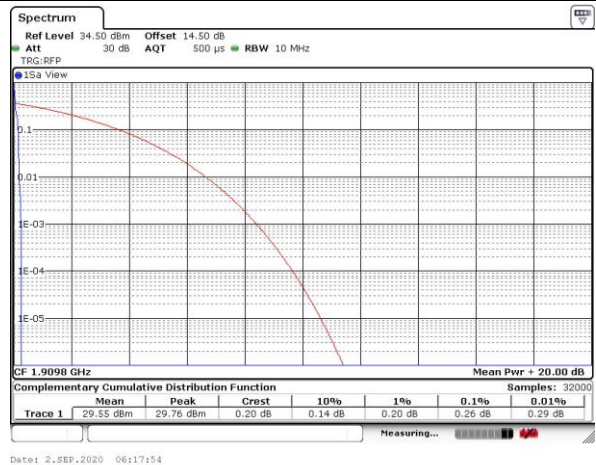
Middle Channel



Highest Channel



Highest Channel





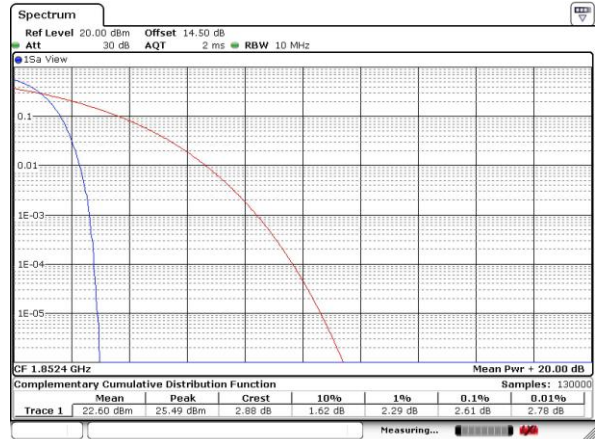
WCDMA Band V (RMC 12.2Kbps)

Lowest Channel



WCDMA Band II (RMC 12.2Kbps)

Lowest Channel



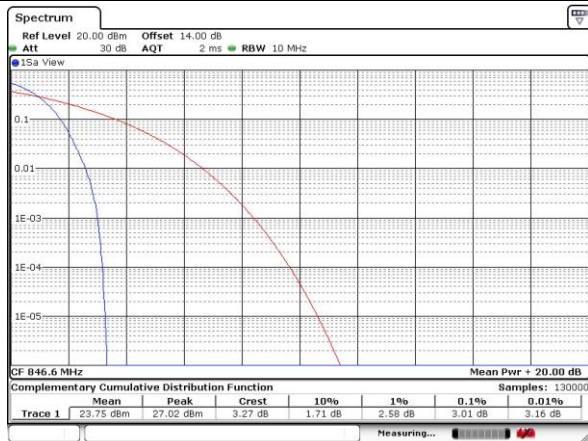
Middle Channel



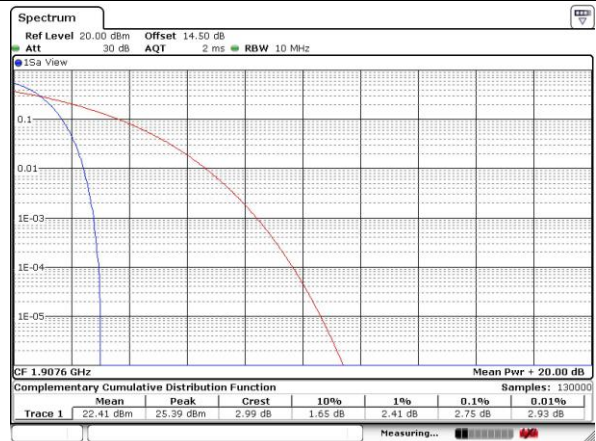
Middle Channel



Highest Channel



Highest Channel



26dB Bandwidth

Mode	GSM850(MHz)
Mod.	GSM
Lowest CH	0.30
Middle CH	0.30
Highest CH	0.30

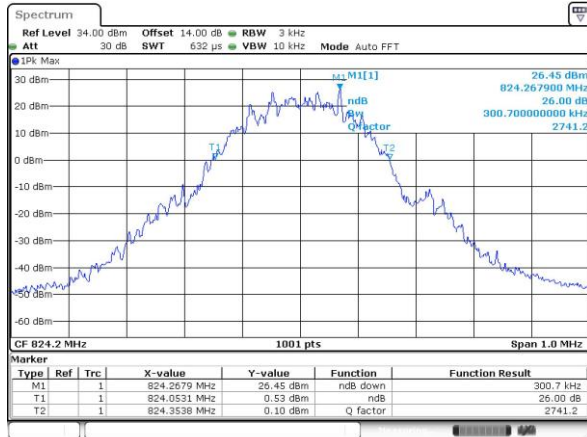
Mode	GSM1900(MHz)
Mod.	GSM
Lowest CH	0.31
Middle CH	0.31
Highest CH	0.32

Mode	WCDMA Band V(MHz)	WCDMA Band II(MHz)
Mod.	RMC 12.2Kbps	RMC 12.2Kbps
Lowest CH	4.72	4.75
Middle CH	4.72	4.74
Highest CH	4.72	4.76



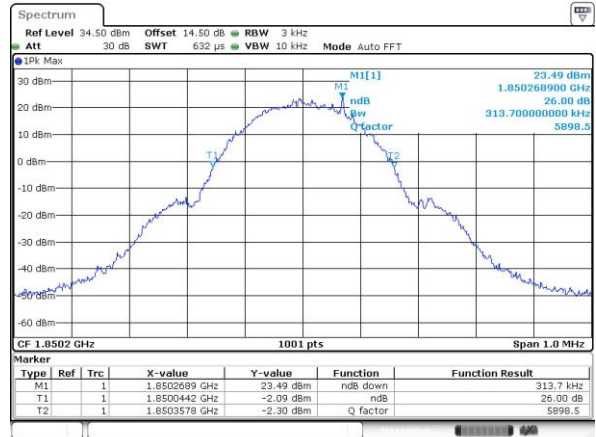
GSM850 (GSM)

Lowest Channel

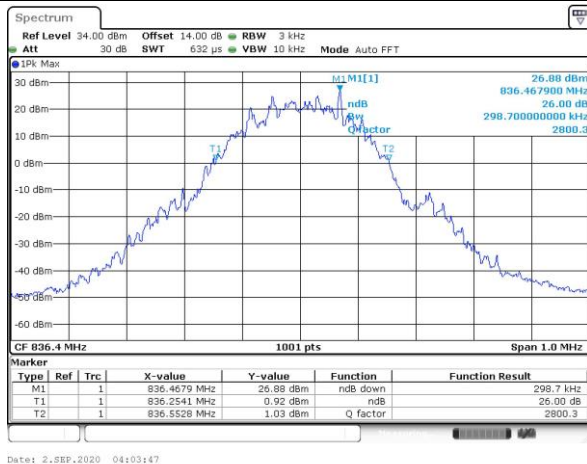


GSM1900 (GSM)

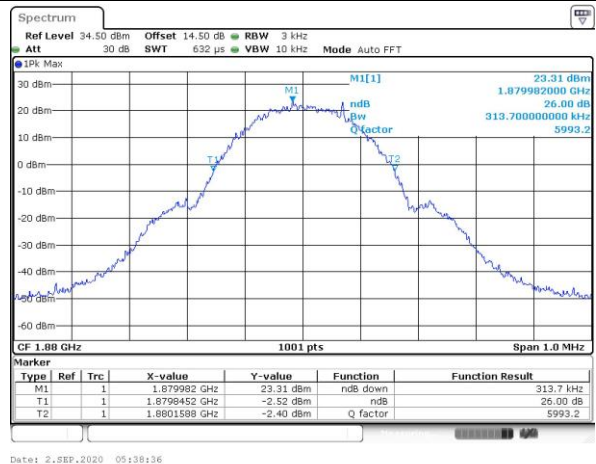
Lowest Channel



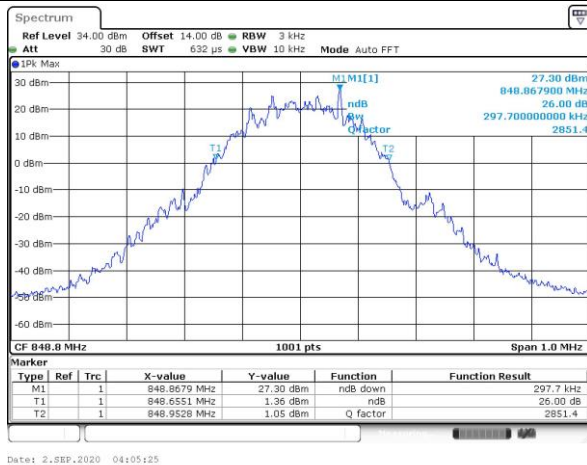
Middle Channel



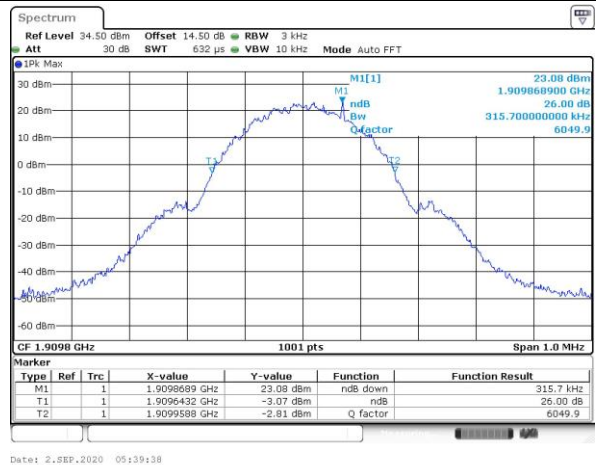
Middle Channel



Highest Channel



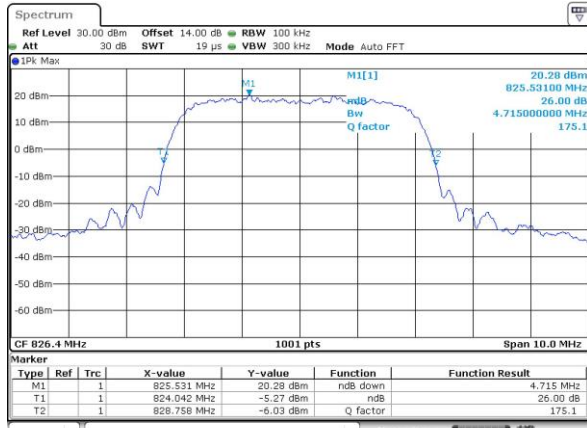
Highest Channel





WCDMA Band V (RMC 12.2Kbps)

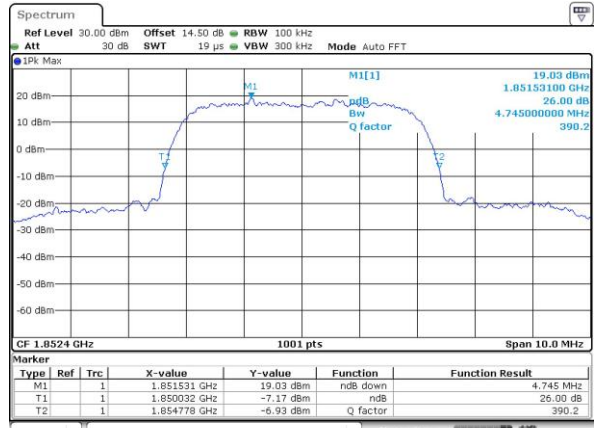
Lowest Channel



Date: 2.SEP.2020 03:07:24

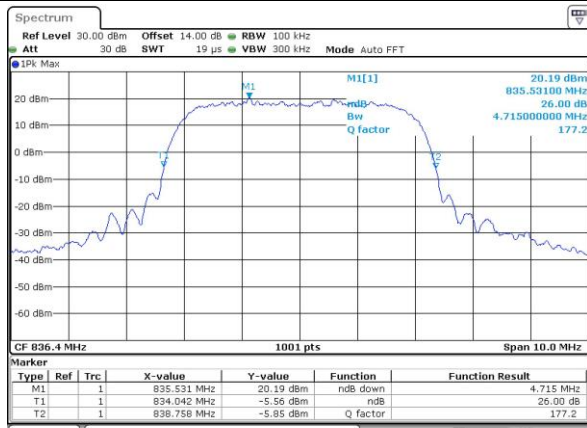
WCDMA Band II (RMC 12.2Kbps)

Lowest Channel



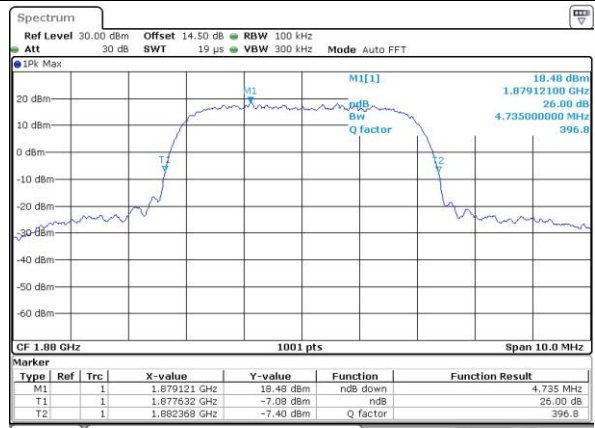
Date: 2.SEP.2020 02:31:48

Middle Channel



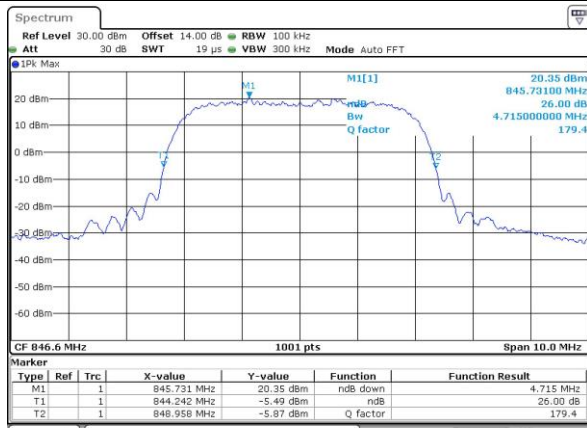
Date: 2.SEP.2020 03:08:19

Middle Channel



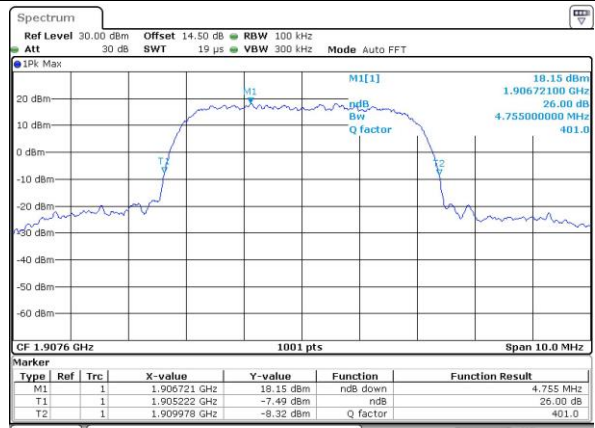
Date: 2.SEP.2020 02:32:13

Highest Channel



Date: 2.SEP.2020 03:09:10

Highest Channel



Date: 2.SEP.2020 02:32:48

Occupied Bandwidth

Mode	GSM850(MHz)
Mod.	GSM
Lowest CH	0.24
Middle CH	0.24
Highest CH	0.24

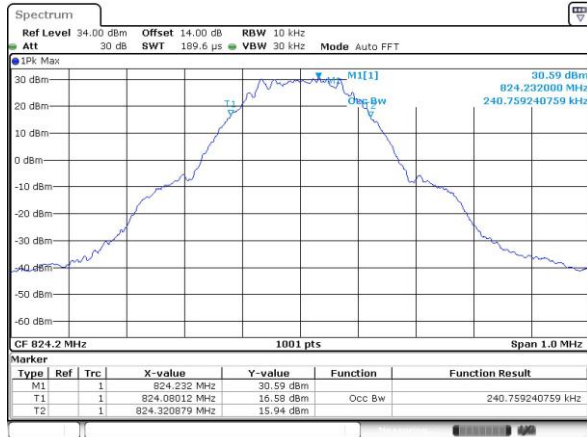
Mode	GSM1900(MHz)
Mod.	GSM
Lowest CH	0.25
Middle CH	0.24
Highest CH	0.24

Mode	WCDMA Band V(MHz)	WCDMA Band II(MHz)
Mod.	RMC 12.2Kbps	RMC 12.2Kbps
Lowest CH	4.15	4.16
Middle CH	4.14	4.14
Highest CH	4.14	4.15



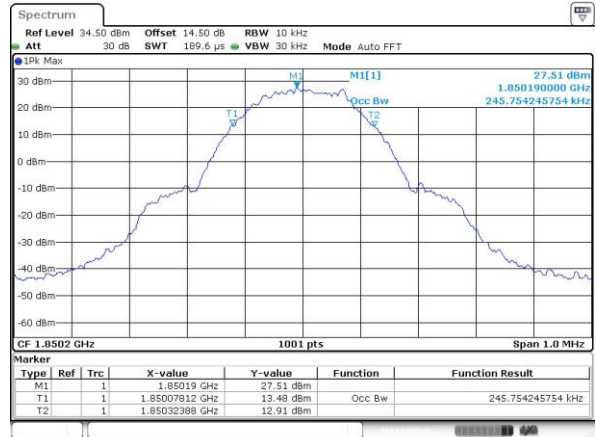
GSM850 (GSM)

Lowest Channel

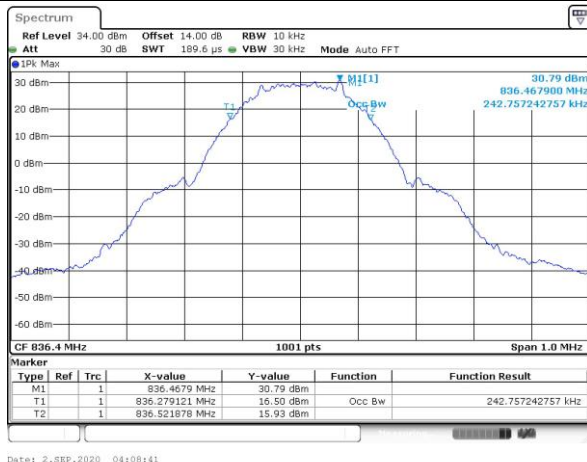


GSM1900 (GSM)

Lowest Channel



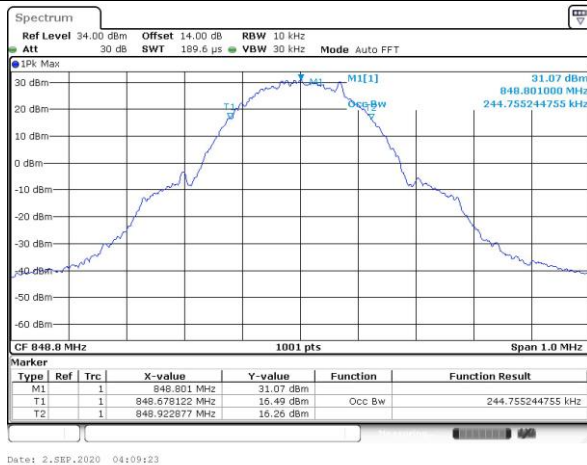
Middle Channel



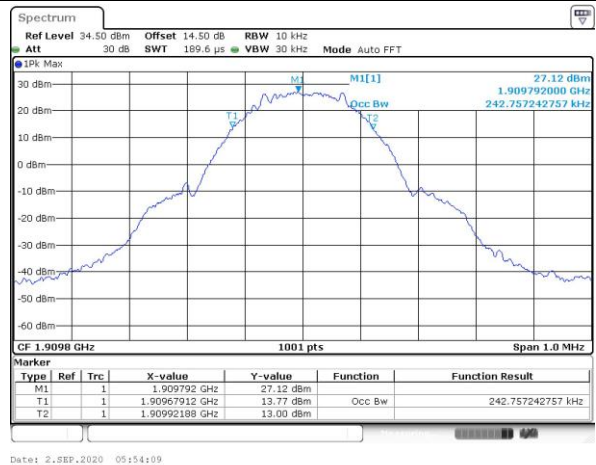
Middle Channel



Highest Channel



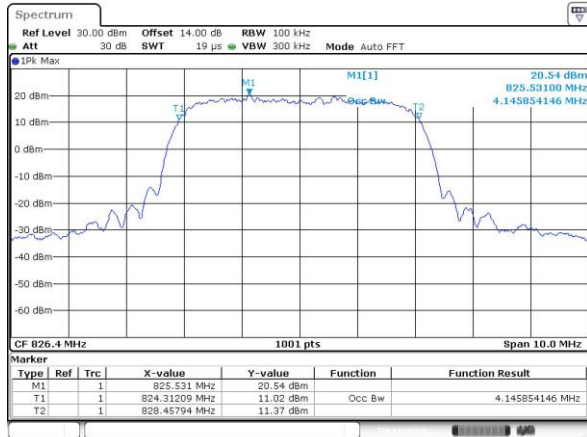
Highest Channel





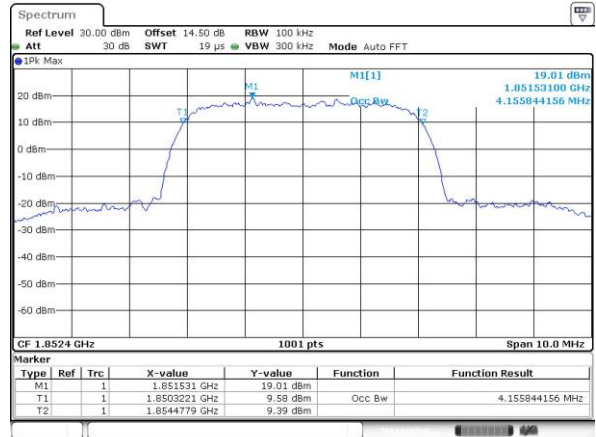
WCDMA Band V (RMC 12.2Kbps)

Lowest Channel

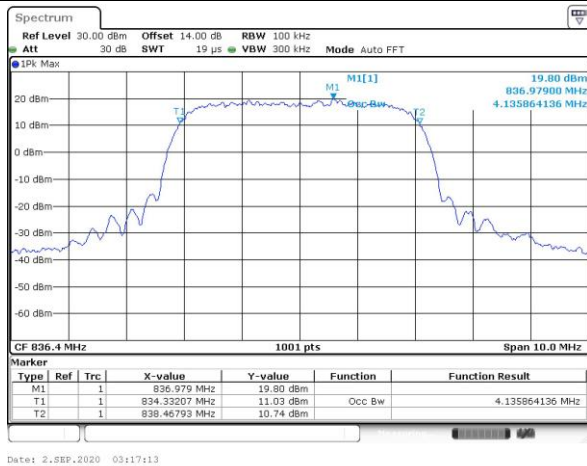


WCDMA Band II (RMC 12.2Kbps)

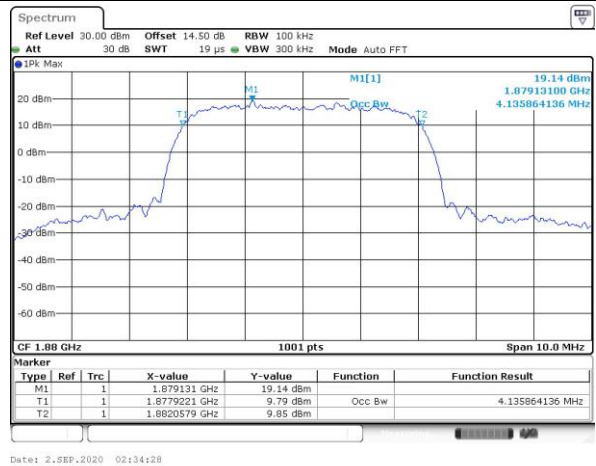
Lowest Channel



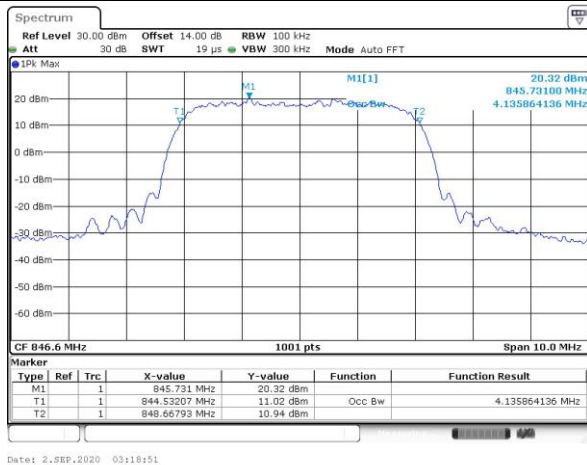
Middle Channel



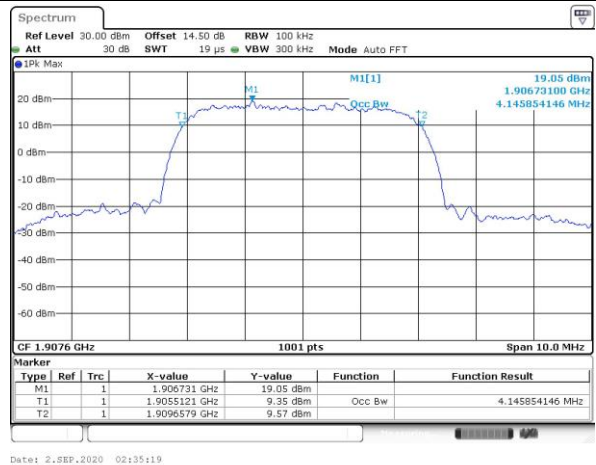
Middle Channel

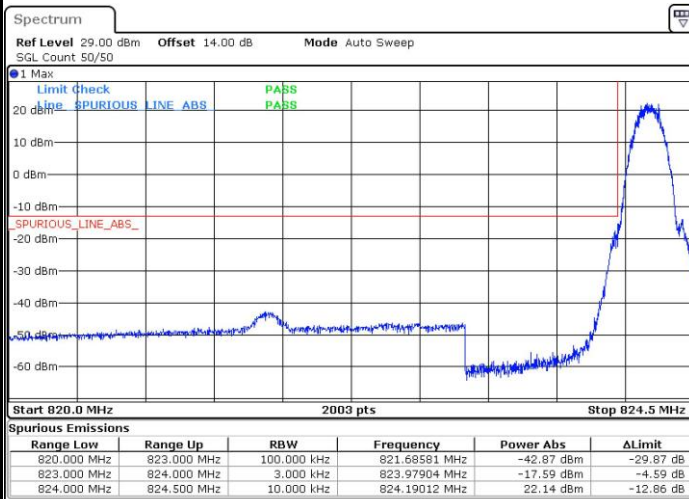
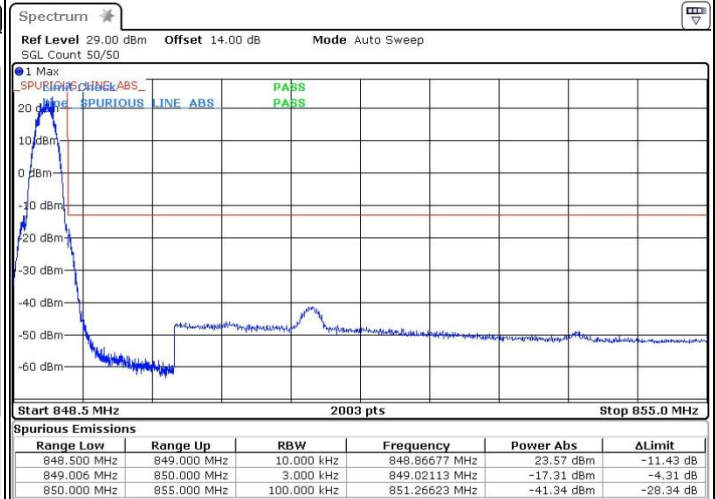
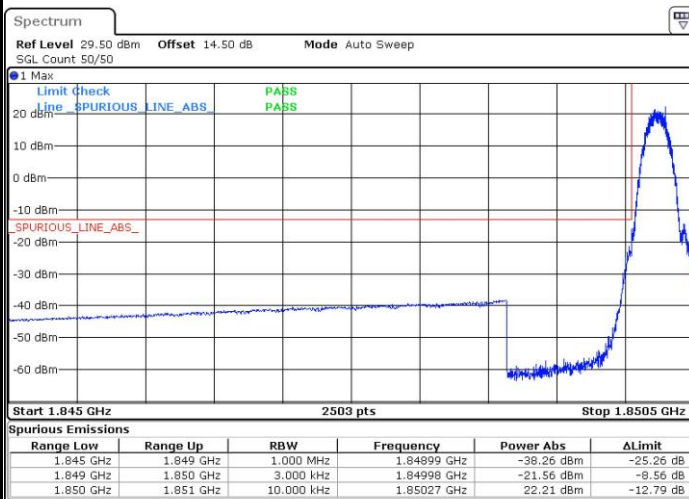
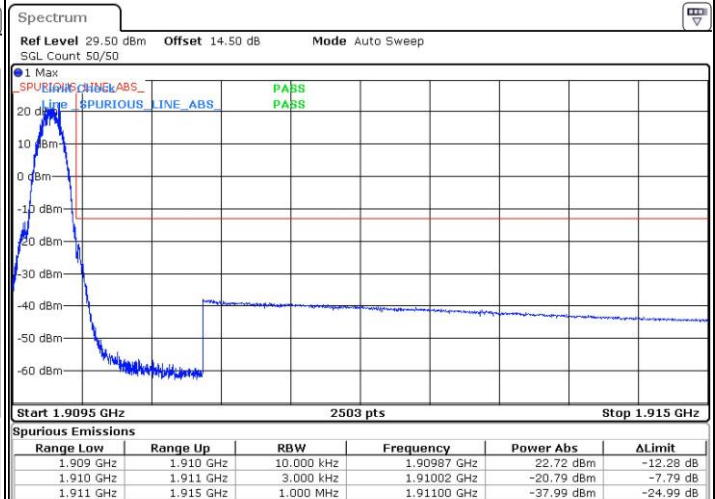


Highest Channel



Highest Channel

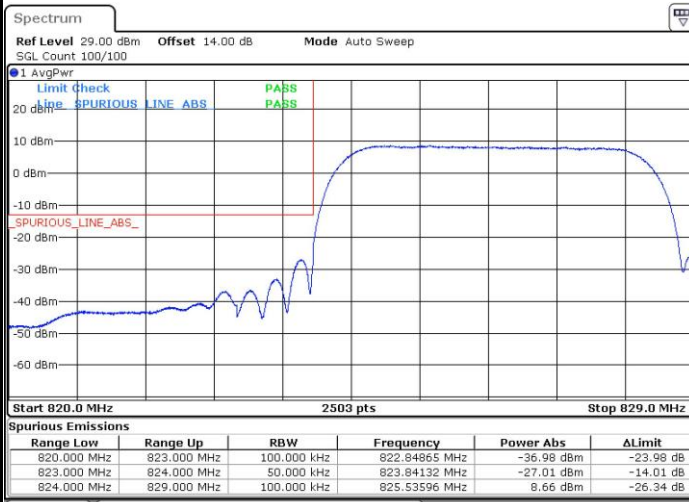


**Conducted Band Edge****GSM850 (GSM)****Lowest Band Edge****Highest Band Edge****GSM1900 (GSM)****Lowest Band Edge****Highest Band Edge**



WCDMA Band V (RMC 12.2Kbps)

Lowest Band Edge



Highest Band Edge

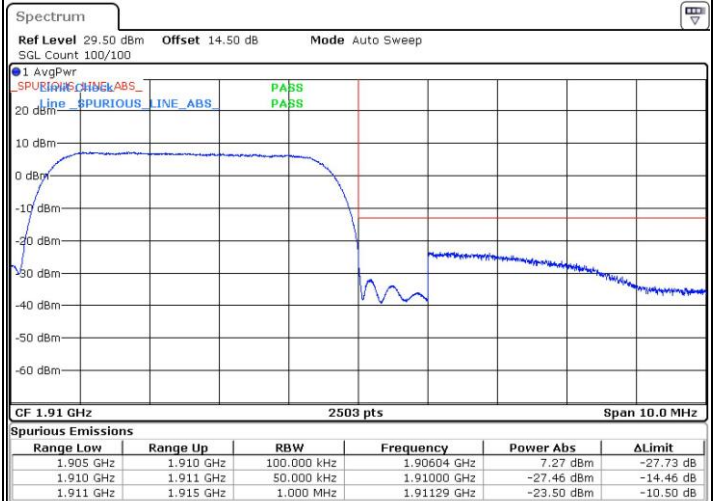


WCDMA Band II (RMC 12.2Kbps)

Lowest Band Edge



Highest Band Edge

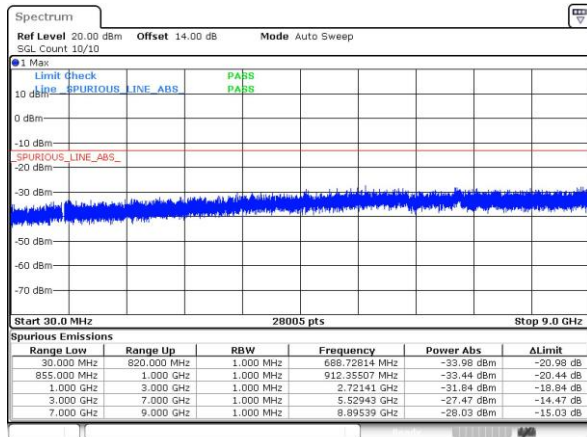




Conducted Spurious Emission

GSM850 (GSM)

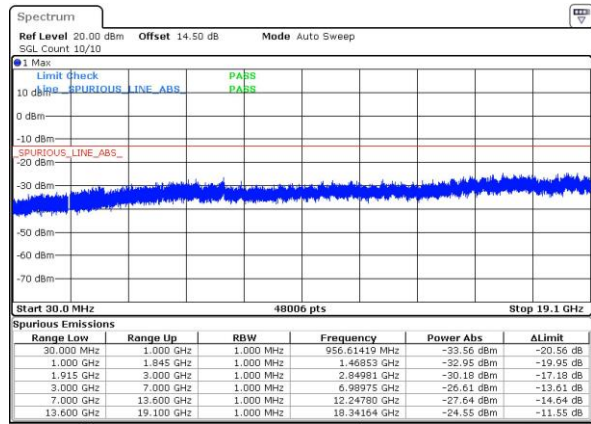
Lowest Channel



Date: 2.SEP.2020 05:11:37

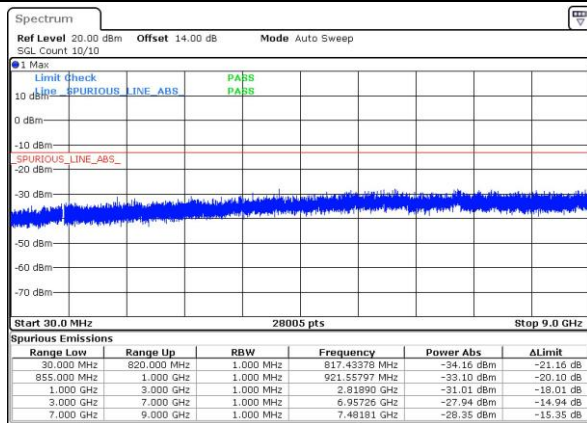
GSM1900 (GSM)

Lowest Channel



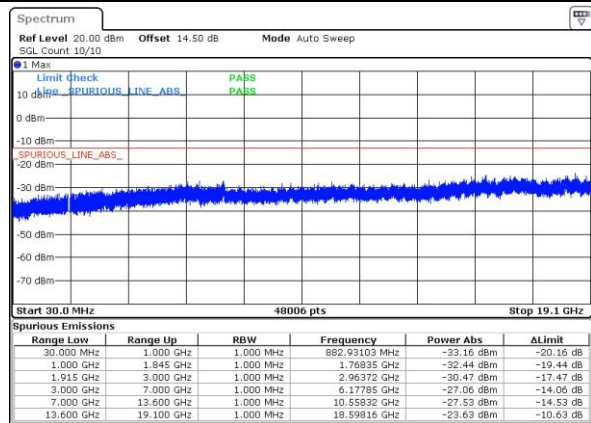
Date: 2.SEP.2020 06:07:51

Middle Channel



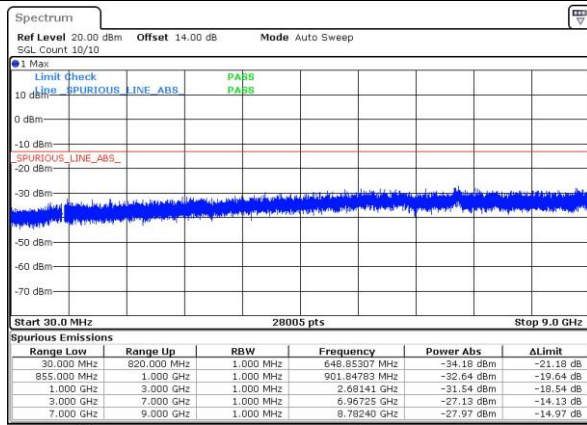
Date: 2.SEP.2020 05:14:27

Middle Channel

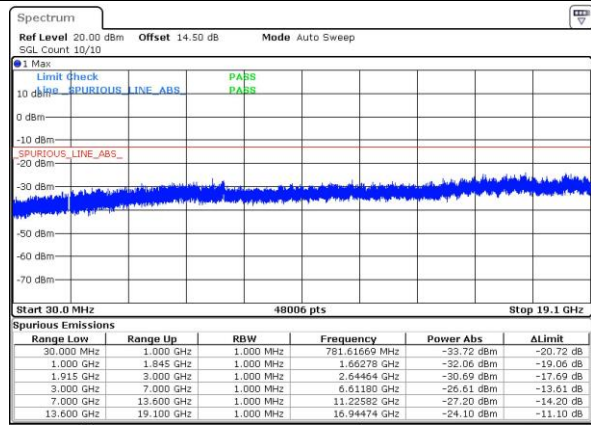


Date: 2.SEP.2020 06:10:58

Highest Channel



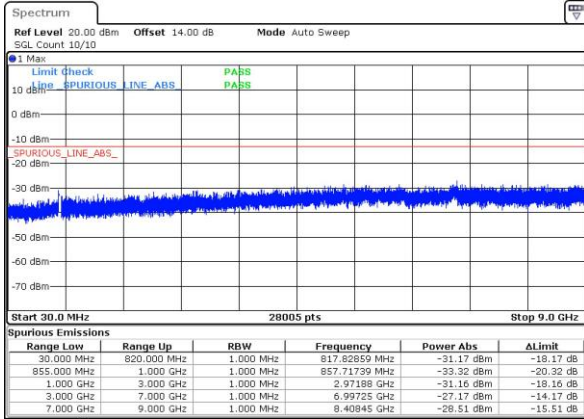
Highest Channel





WCDMA Band V (RMC 12.2Kbps)

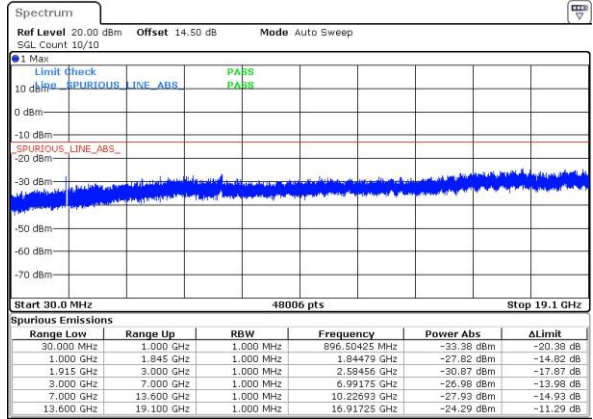
Lowest Channel



Date: 2.SEP.2020 03:36:14

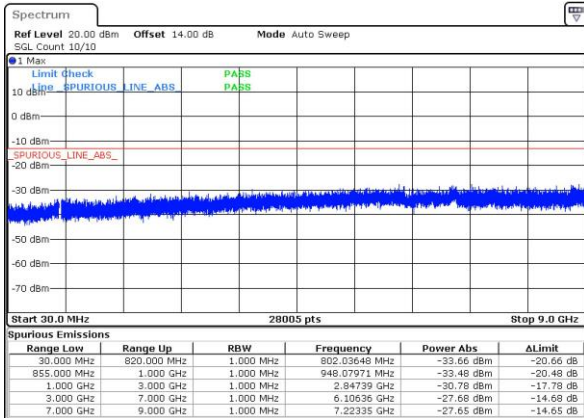
WCDMA Band II (RMC 12.2Kbps)

Lowest Channel



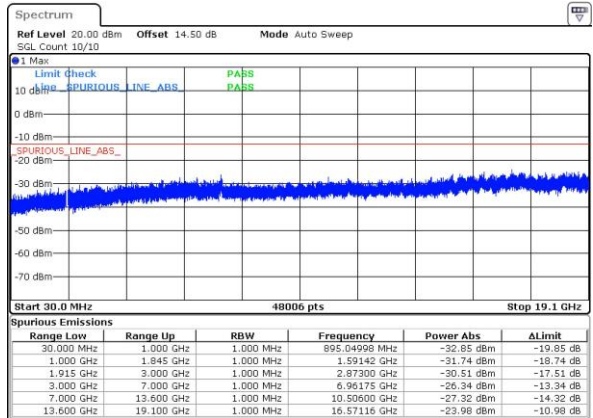
Date: 2.SEP.2020 02:45:23

Middle Channel



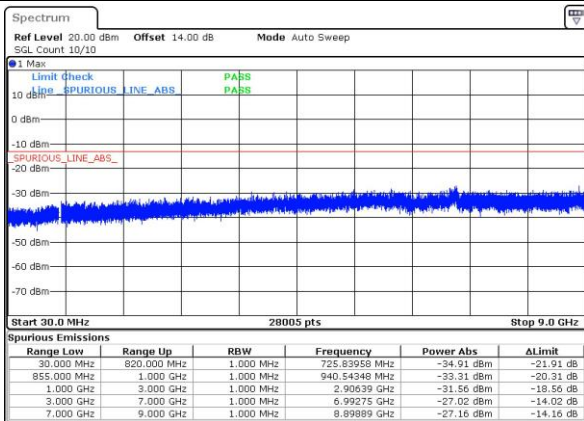
Date: 2.SEP.2020 03:40:00

Middle Channel



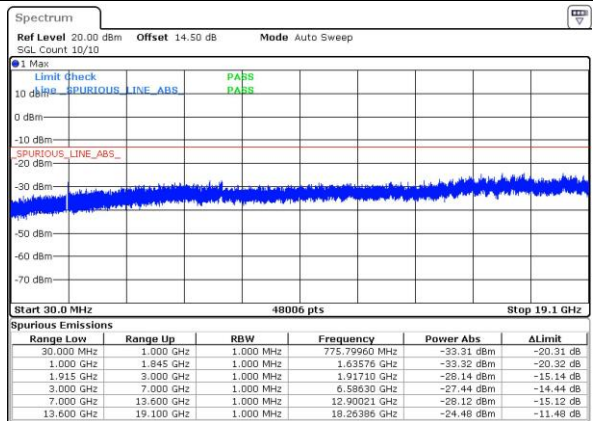
Date: 2.SEP.2020 02:48:24

Highest Channel



Date: 2.SEP.2020 03:42:46

Highest Channel



Date: 2.SEP.2020 02:51:16

**Frequency Stability**

Test Conditions	Middle Channel	GSM850 (GSM)	Limit 2.5ppm
Temperature (°C)	Voltage (Volt)	Deviation (ppm)	Result
50	Normal Voltage	0.0016	PASS
40	Normal Voltage	0.0037	
30	Normal Voltage	0.0039	
20(Ref.)	Normal Voltage	0.0000	
10	Normal Voltage	0.0063	
0	Normal Voltage	0.0039	
-10	Normal Voltage	0.0027	
-20	Normal Voltage	0.0016	
-30	Normal Voltage	0.0048	
20	Maximum Voltage	0.0063	
20	Normal Voltage	0.0000	
20	Battery End Point	0.0032	

Note: Normal Voltage/ Maximum Voltage = 4.0V. ; Battery End Point (BEP) = 3.7 V.

Test Conditions	Middle Channel	GSM1900 (GSM)	Limit Note 2.
Temperature (°C)	Voltage (Volt)	Deviation (ppm)	Result
50	Normal Voltage	0.0027	PASS
40	Normal Voltage	0.0009	
30	Normal Voltage	0.0007	
20(Ref.)	Normal Voltage	0.0000	
10	Normal Voltage	0.0035	
0	Normal Voltage	0.0024	
-10	Normal Voltage	0.0012	
-20	Normal Voltage	0.0013	
-30	Normal Voltage	0.0034	
20	Maximum Voltage	0.0025	
20	Normal Voltage	0.0000	
20	Battery End Point	0.0005	

Note:

1. Normal Voltage/ Maximum Voltage = 4.0V. ; Battery End Point (BEP) = 3.7 V
2. The frequency fundamental emissions stay within the authorized frequency block based on the frequency deviation measured is small.



Test Conditions	Middle Channel	WCDMA Band V (RMC 12.2Kbps)	Limit 2.5ppm
Temperature (°C)	Voltage (Volt)	Deviation (ppm)	Result
50	Normal Voltage	0.0005	PASS
40	Normal Voltage	0.0001	
30	Normal Voltage	0.0008	
20(Ref.)	Normal Voltage	0.0000	
10	Normal Voltage	0.0011	
0	Normal Voltage	0.0002	
-10	Normal Voltage	0.0001	
-20	Normal Voltage	0.0013	
-30	Normal Voltage	0.0010	
20	Maximum Voltage	0.0007	
20	Normal Voltage	0.0000	
20	Battery End Point	0.0016	

Note: Normal Voltage/ Maximum Voltage = 4.0V. ; Battery End Point (BEP) = 3.7 V

Test Conditions	Middle Channel	WCDMA Band II (RMC 12.2Kbps)	Limit Note 2.
Temperature (°C)	Voltage (Volt)	Deviation (ppm)	Result
50	Normal Voltage	0.0006	PASS
40	Normal Voltage	0.0005	
30	Normal Voltage	0.0011	
20(Ref.)	Normal Voltage	0.0000	
10	Normal Voltage	0.0027	
0	Normal Voltage	0.0010	
-10	Normal Voltage	0.0015	
-20	Normal Voltage	0.0013	
-30	Normal Voltage	0.0019	
20	Maximum Voltage	0.0015	
20	Normal Voltage	0.0000	
20	Battery End Point	0.0010	

Note:

1. Normal Voltage/ Maximum Voltage = 4.0V. ; Battery End Point (BEP) = 3.7 V
2. The frequency fundamental emissions stay within the authorized frequency block based on the frequency deviation measured is small.



Appendix B. Test Results of Radiated Test

Radiated Spurious Emission

GSM850 (GSM)									
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	1672.8	-59.41	-13	-46.41	-67.01	-62.66	4.00	9.40	H
	2509.2	-52.82	-13	-39.82	-64.89	-56.39	4.88	10.60	H
	3345.6	-63.02	-13	-50.02	-77.77	-67.95	5.52	12.60	H
	1672.8	-58.61	-13	-45.61	-66.40	-61.86	4.00	9.40	V
	2509.2	-45.57	-13	-32.57	-57.76	-49.14	4.88	10.60	V
	3345.6	-63.09	-13	-50.09	-77.86	-68.02	5.52	12.60	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

GSM1900 (GSM)									
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	3760	-62.21	-13	-49.21	-78.44	-68.96	5.85	12.60	H
	5640	-42.85	-13	-29.85	-63.16	-48.65	7.30	13.10	H
	7520	-54.95	-13	-41.95	-79.49	-58.10	8.35	11.50	H
	3760	-60.44	-13	-47.44	-76.23	-67.19	5.85	12.60	V
	5640	-44.67	-13	-31.67	-63.77	-50.47	7.30	13.10	V
	7520	-54.58	-13	-41.58	-79.54	-57.73	8.35	11.50	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

WCDMA Band II(RMC 12.2Kbps)									
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	3760	-61.43	-13	-48.43	-77.66	-68.18	5.85	12.60	H
	5640	-59.88	-13	-46.88	-80.19	-65.68	7.30	13.10	H
	7520	-54.87	-13	-41.87	-79.41	-58.02	8.35	11.50	H
	3760	-62.63	-13	-49.63	-78.42	-69.38	5.85	12.60	V
	5640	-61.00	-13	-48.00	-80.1	-66.80	7.30	13.10	V
	7520	-54.56	-13	-41.56	-79.52	-57.71	8.35	11.50	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.



Top Antenna

WCDMA Band V(RMC 12.2Kbps)									
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	1672.8	-64.29	-13	-51.29	-71.89	-67.54	4.00	9.40	H
	2509.2	-64.85	-13	-51.85	-76.92	-68.42	4.88	10.60	H
	3345.6	-63.19	-13	-50.19	-77.94	-68.12	5.52	12.60	H
	1672.8	-65.61	-13	-52.61	-73.40	-68.86	4.00	9.40	V
	2509.2	-64.40	-13	-51.40	-76.59	-67.97	4.88	10.60	V
	3345.6	-63.21	-13	-50.21	-77.98	-68.14	5.52	12.60	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

Bottom Antenna

WCDMA Band V(RMC 12.2Kbps)									
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	1672.8	-65.45	-13	-52.45	-73.05	-68.70	4.00	9.40	H
	2509.2	-62.26	-13	-49.26	-74.33	-65.83	4.88	10.60	H
	3345.6	-61.73	-13	-48.73	-76.48	-66.66	5.52	12.60	H
	1672.8	-65.52	-13	-52.52	-73.31	-68.77	4.00	9.40	V
	2509.2	-62.69	-13	-49.69	-74.88	-66.26	4.88	10.60	V
	3345.6	-61.59	-13	-48.59	-76.36	-66.52	5.52	12.60	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.