

### ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 22 SUBPART H, PART 24 SUBPART E REQUIREMENT

 $\cap E$ 

	OF
Applicant:	Sharp Corporation, Mobile Communication B.U. 2-13-1, Hachihonmatsu-lida, Higashi-hiroshima-shi, Hiro- shima, 739-0192, Japan
Manufacturer:	Sharp Corporation 1 Takumi-cho, Sakai-ku, Sakai City,Osaka 590-8522,Japan
Product Name:	Cellular Phone
Report Number:	ER/2018/C0133
FCC ID:	APYHRO00271
FCC Rule Part:	2 , 22H & 24E
Issue Date:	Jan. 11, 2019
Date of Test:	Oct. 25, 2018 ~ Nov. 27, 2018
Date of EUT Received: We hereby certify that:	Oct. 25, 2018

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.26-2015 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Marcus

Tested By:

Marcus Tseng / Engineer

Approved By:

Jazz Huang / Asst. Supervisor





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# **Revision History**

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
ER/2018/C0133	Rev.00	Initial creation of document	All	Dec. 20, 2018	Stefanie Yu
ER/2018/C0133	Rev.01	Updated KDB 971168 D01 version	5	Jan. 11, 2019	Stefanie Yu

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## **1. GENERAL PRODUCT INFORMATION**

### **1.1. Product Description**

#### General:

Product Name:	Cellular Phone
Hardware Version:	DVT
Software Version:	N/A
Power Supply:	3.8V from Rechargeable Li-ion Battery
IMEI:	004401116602182 / 004401116602216

#### 1.2. GSM / WCDMA: Cellular Phone Standards Frequency Range

Operating Frequency (MHz)				
GSM/GPRS 850	824.2	-	848.8	
GSM/GPRS 1900	1850.2	-	1909.8	

Operating Frequency (MHz)			
WCDMA / HSPA+ Band V	826.4	-	846.6

#### 1.3. Type of Emission & Max ERP/EIRP Power Measurement Result:

	ERP / EIRP (dBm)		(W)	Type of Emission
GSM 850	29.72	ERP	0.938	246KGXW
GPRS 850	29.01	ERP	0.796	246KGXW
GSM 1900	31.49	EIRP	1.409	250KGXW
GPRS 1900	29.78	EIRP	0.951	246KGXW

	ERP / EIRP (dBm)		(W)	Type of Emission
WCDMA Band V	26.82	ERP	0.481	4M14F9W
HSDPA Band V	23.04	ERP	0.201	4M14F9W
HSUPA Band V	24.21	ERP	0.264	4M13F9W

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### 1.4. Test Methodology of Applied Standards

CC 47 CFR Part 2, 22, 24.

ANSI C63.26-2015

KDB971168 D01 Power Meas license Digital System v03r01

KDB941225 D01 SAR test for 3G devices v03r01 (SAR Measurement Procedures for 3G Devices, WCDMA / HSPA) was used for EUT and Base station setting.

TS 151 010-1 is used to set, and measure the output power.

Note: All test items have been performed and record as per the above standards.

#### 1.5. Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803 code 0513)

FCC Registration Numbers are: 509634 / TW0001

#### 1.6. Special Accessories

No special accessories were used during testing.

#### 1.7. Equipment Modifications

There were no modifications incorporated into the EUT.

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### 2. SYSTEM TEST CONFIGURATION

### 2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

#### 2.2. EUT Exercise

The EUT (Transmitter) was operated in the continuous transmission mode employed with the simulator of the Base Station that fixates at test default channels to fix the Tx frequency which was for the purpose of the measurements.

#### 2.3. Test Procedure

#### 2.3.1 Conducted Measurement at Antenna Port

According to measurement procured ANSI C63.26-2015, the EUT is placed on a turn table which is 0.8 m above ground plane. A low loss of RF cable was used to connect the antenna port of EUT to measurement equipment.

#### 2.3.2 Radiated Emissions (ERP/EIRP)

According to measurement procured ANSI C63.26-2015, The EUT is a placed on as turn table, for emission measurements below 1 GHz is 0.8 m above ground plane, for emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both Horizontal and Vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna according to the requirements in Section 8 and 13.

#### 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 attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

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#### Note:

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

Following shows an offset computation in physical test.

	RF cable loss (dB)	Attenuation factor(dB)	offset(dB)
Low Band (Below 1GHz)	4.5	10	14.5
High Band (Above 1 GHz)	5	10	15

#### 2.5. Final Amplifier Voltage and Current Information:

Test Mode	DC voltage (V)	DC current (mA)
GSM 850		135
GSM 1900	3.8	187
WCDMA B5		129

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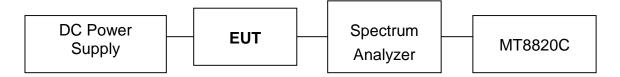
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### 2.6. Configuration of Tested System

### Fig. 2-1 Configuration of Tested System (Fixed Channel-Conducted)



### Fig. 2-2 Configuration of Tested System (Fixed Channel-Radiated)



#### **Remote Side**



#### Table 2-1 Equipment Used in

ltem	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1.	Radio Communication Analyer	Anritsu	MT8820C	6201465317	shielded	Un-shielded

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### 3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§2.1046(a)	RF Power Output	Compliant
§2.1046(a) §22.913(a)(5) §24.232(c)	ERP/ EIRP measurement	Compliant
§2.1049(h)	99% & 26dB Occuupied Bandwidth	Compliant
§2.1051 §22.917(a) §24.238(a)	Out of Band Emissions at Antenna Terminals and Band Edge / Emission mask requirements	Compliant
§2.1053 §22.917(a) §24.238(a)	Field Strength of Spurious Radiation	Compliant
§24.232(d) §22.913	Peak to Average Ratio	Compliant
§2.1055(a)(1) §22.355 §24.235	Frequency Stability	Compliant

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### 4. DESCRIPTION OF TEST MODES

### 4.1. The Worst Test Modes and Channel Details

- 1. The EUT has been tested under operating condition.
- 2. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, X(E1)Y(E2)Z(H) axis and antenna ports. The worst case was found as listed below. Following channel(s) was (were) selected for the final test as listed below:

BAND	ERP/EIRP	RADIATED EMISSION
GSM/GPRS 850	H-plan	E2-plan
GSM/GPRS 1900	H-plan	E2-plan
WCDMA/HSPA Band V	H-plan	E2-plan

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#### **GSM/GPRS MODE**

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	MODE
ERP	128 to 251	128, 190, 251	GSM/GPRS 850
EIRP	512 to 810	512, 661, 810	GSM/GPRS 1900
FREQUENCY STABILITY	128 to 251	190	GPRS 850
FREQUENCESTABILITE	512 to 810	661	GPRS 1900
OCCUPIED BANDWIDTH	128 to 251	190	GSM/GPRS 850
OCCOPIED BANDWIDTH	512 to 810	661	GSM/GPRS 1900
PEAK TO AVERAGE RATIO	128 to 251	128, 190, 251	GSM/GPRS 850
PEAK TO AVERAGE RATIO	512 to 810	512, 661, 810	GSM/GPRS 1900
BAND EDGE	128 to 251	128, 251	GSM/GPRS 850
BANDEDGE	512 to 810	512, 810	GSM/GPRS 1900
CONDCUDETED EMISSION	128 to 251	128, 190, 251	GSM/GPRS 850
	512 to 810	512, 661, 810	GSM/GPRS 1900
	128 to 251	128, 190, 251	GPRS 850
RADIATED EMISSION	512 to 810	512, 661, 810	GPRS 1900

#### WCDMA/HSPA MODE

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	MODE
ERP	4132 to 4233	4132, 4183, 4233	WCDMA/HSPA Band V
FREQUENCY STABILITY	4132 to 4233	4183	WCDMA Band V
OCCUPIED BANDWIDTH	4132 to 4233	4132, 4183, 4233	WCDMA/HSPA Band V
PEAK TO AVERAGE RATIO	4132 to 4233	4132, 4183, 4233	WCDMA/HSPA Band V
BAND EDGE	4132 to 4233	4132, 4233	WCDMA Band V
CONDCUDETED EMISSION	4132 to 4233	4132, 4183, 4233	WCDMA/HSPA Band V
RADIATED EMISSION	4132 to 4233	4132, 4183, 4233	WCDMA Band V

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### 5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
RF Power Output	+/- 1.10 dB
ERP/ EIRP measurement	Vertical Polarization = +/- 4.74dB Horizontal Polarization =+/- 4.62dB
99% Occupied Bandwidth	+/- 5.19 Hz
Out of Band Emissions at Antenna Terminals and Band Edge	+/- 0.70 dB
Peak to Average Ratio	+/- 0.70 dB
Frequency Stability vs. Temperature	+/- 5.19 Hz
Frequency Stability vs. Voltage	+/- 5.19 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC=+/- 0.2%

Radiated Spurious Emission:

	9kHz – 30MHz: +/- 2.87 dB				
	30MHz - 180MHz: +/- 3.37dB				
Measurement uncertainty (Polarization : <b>Vertical</b> )	180MHz -417MHz: +/- 3.19dB				
	0.417GHz-1GHz: +/- 3.19dB				
	1GHz - 18GHz: +/- 4.04dB				
	18GHz - 40GHz: +/- 4.04dB				

	9kHz – 30MHz: +/- 2.87 dB				
	30MHz - 167MHz: +/- 4.22dB				
Measurement uncertainty (Polarization : <b>Horizontal</b> )	167MHz -500MHz: +/- 3.44dB				
(Foldhzallon . <b>Honzonla</b> )	0.5GHz-1GHz: +/- 3.39dB				
	1GHz - 18GHz: +/- 4.08dB				
	18GHz - 40GHz: +/- 4.08dB				

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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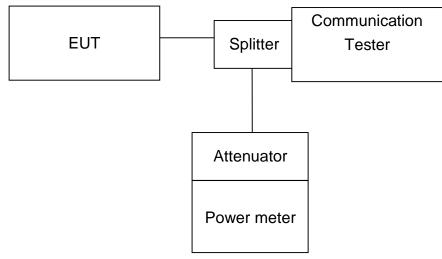


### 6. RF CONDUCTED OUTPUT POWER MEASUREMENT

### 6.1. Standard Applicable

A base station simulator was used to establish communication with the EUT. Its parameters were set to transmit the maximum power on the EUT. The measured power in the radio frequency on the transmitter output terminals.

#### 6.2. Test Set-up



Note: Measurement setup for testing on Antenna connector

#### 6.3. Measurement Procedure

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading. TS 151 010-1 is reference to conduct the test measurement of output power.

The Procedure of KDB941225 (SAR Measurement Procedures for 3G devices, (WCD-MA/HSPA) was used for EUT and Base station setting. RMC 12.2kps is used for this testing, and KDB 971168 D01 Power Meas License Digital System as the supplemental test methodology to adjust the proper setting obtaining the measurement results

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### 6.4. Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	NODEL NUMBER SERIAL NUMBER		CAL DUE.
Radio Communica- tion Analyer	Anritsu	MT8815B	6200711454	04/05/2018	04/04/2019
DC Power Supply	Agilent	E3640A	MY52410006	11/28/2017	11/27/2018
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2018	01/01/2019
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2018	01/01/2019

#### 6.5. Measurement Result

#### **RF Conducted Output Power**

#### GSM/GPRS/EDGE (GMSK; 8-PSK) Result:

			Average Burst Power	
EUT Mode	Frequency	СН	(1DN 1UP) Class 8 (dBm)	
	(MHz)		(dBm)	
0.014	824.2	128	31.72	
GSM 850	836.6	190	31.91	
000	848.8	251	32.05	
GSM 1900	1850.2	512	29.22	
	1880.0	661	29.33	
	1909.8	810	28.96	

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EUT			Average Burst Power	Power	Power	Average Burst Power
Mode			(1DN 1UP)	(1DN 2UP)	(1DN 3UP)	(1DN 4UP)
	(MHz)		Class 8 (dBm)	Class 10 (dBm)	Class 12 (dBm)	Class 12 (dBm)
	824.2	128	31.75	29.54	27.62	26.48
GPRS 850	836.6	190	31.97	29.58	27.59	26.38
000	848.8	251	32.08	29.44	27.52	26.31
0000	1850.2	512	29.28	26.72	24.92	23.65
GPRS 1900	1880.0	661	29.37	26.67	24.93	23.79
1000	1909.8	810	29.01	26.65	24.73	23.78

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#### WCDMA MODE:

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The EUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7). RMC 12.2kps is used for this testing.

#### **Results:**

EUT Mode	Freq. (MHz)	СН	Conducted Avg. Power (dBm)
	826.4	4132	23.05
WCDMA	836.6	4183	23.26
	846.6	4233	23.44
	826.4	4132	22.19
HSDPA	836.6	4183	22.23
	846.6	4233	22.24
	826.4	4132	21.82
HSUPA	836.6	4183	22.09
	846.6	4233	21.43

#### WCDMA/HSUPA/HSDPA Band V Result:

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#### **HSDPA Release 6 MODE:**

The following 4 Sub-Tests were completed according to the test requirements outlined in section 5.2A of the 3GPP TS34.121-1 specification. All TX RMS power requirements for Power Class 3 were met according to table 5.2AA.5 and 5.2B.5 All UE channels and power ratio's are set according to table C10.1.4 & C11.1.3 in the 3GPP TS34.121-1 RMC 12.2kps is used for this testing.

#### **HSDPA SUB-TEST Setting**

Table C.10.1.4:  $\beta$  values for transmitter characteristics tests with HS-DPCCH(FOR HSDPA)

Sub-test	βc	βa	β₀ ( <b>SF</b> )	β₀∕β⋴	βнs (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)	RMC (Kbps)
1	2/15	15/15	64	2/15	4/15	0.0	0.0	12.2
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0	12.2
3	15/15	8/15	64	15/8	30/15	1.5	0.5	12.2
4	15/15	4/15	64	15/4	30/15	1.5	0.5	12.2

Note: The recommended HSDPA MPRs are implemented as per following sub-tests.

#### **Results:**

Mode	Sub-test	-	vg. Power (dBm) Channel		Power Class 3 Limitation (dBm)	Comments	
		4132	4183	4233			
	1	22.19	22.23	22.24	20.3dBm – 25.7dBm	Pass	
HSDPA V	2	21.49	21.69	21.62	20.3dBm – 25.7dBm	Pass	
ISUFA V	3	21.45	21.66	21.82	19.8dBm – 25.7dBm	Pass	
	4	21.44	21.56	21.80	19.8dBm – 25.7dBm	Pass	

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### HSPA (HSDPA & HSUPA) Release 6 MODE

The following 5 Sub-Tests were completed according to the test requirements outlined in section 5.2A of the 3GPP TS34.121-1 specification. All TX RMS power requirements for Power Class 3 were met according to table 5.2AA.5 and 5.2B.5 All UE channels and power ratio's are set according to table C11.1.3 in the 3GPP TS34.121-1 RMC 12.2kps is used for this testing

#### **HSPA SUB-TEST Setting**

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH(FOR HSUPA)

Sub- test	βc	βa	β <sub>d</sub> (SF)	βс∕βа	βнs	β <sub>ec</sub>	βed	β <sub>ed</sub> (SF)	β <sub>ed</sub> (Code s)	CM (dB)	MPR (dB)	AG Index	E-TFCI	RMC (Kbps )
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/22 5	1309/225	4	1	1.0	0.0	20	75	12.2
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67	12.2
3	15/15	9/15	64	15/9	30/15	30/15	β <sub>ed</sub> 1: 47/15 β <sub>ed</sub> 2: 47/15	4 4	2	2.0	1.0	15	92	12.2
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71	12.2
5	15/15 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81	12.2

Note: The recommended HSUPA MPRs are implemented as per following sub-tests.

#### **Results:**

Mode	Sub test	Avg. Power (dBm) Channel			Power Class 3 Limitation (dBm)	Comments	
	ເຮຣເ	4132	4183	4233			
	1	21.82	22.09	21.43	17.3dBm – 25.7dBm	Pass	
	2	20.03	20.26	20.66	16.8dBm – 25.7dBm	Pass	
HSUPA V	3	19.88	20.05	20.09	17.8dBm – 25.7dBm	Pass	
	4	20.94	21.08	21.02	16.8dBm – 25.7dBm	Pass	
	5	21.90	22.00	22.10	20.3dBm – 25.7dBm	Pass	

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### **Minimum Communications Power Measurement**

#### PCS 1900 band

PCL	0	1	2	3	4	5	6	7	8
Output power (dBm)	28.47	26.54	25.11	23.17	21.09	19.31	17.17	15.14	13.22
								_	
PCL	9	10	11	12	13	14	15		
Output power (dBm)	11.08	9.12	7.07	5.24	3.11	1.03	-0.68		

Note: The EUT output power was controlled by simulator. Set Communication Tester MT8820C PCL as above, and get the mobile phone output power reading.

#### WCDMA/HSDPA/HSUPA band V

The EUT output power was controlled by simulator. Set Communication Tester MT8820C function key "UE Power Control" and enter max rated power 24dBm. The EUT is going to be set to max output power to 24dBm. Then record the read (see page 15 for measurement data). The min. power was measures by a function key "minimum power" then record the read. It is -52.3dBm. The power variation can be 0.1dB step by setting.

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## 7. EFFECTIVE RADIATED POWER AND EQUIVALENT ISOTROPIC RADIATED **POWER MEASUREMENT**

### 7.1. Standard Applicable

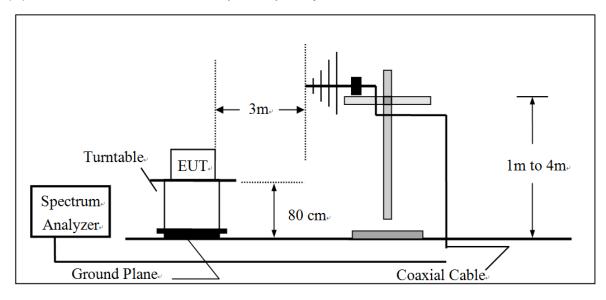
According to FCC §2.1046

FCC 22.913(a) Mobile station is limited to 7W ERP.

FCC 24.232(b) Mobile and portable stations are limited to 2W EIRP.

### 7.2. Test SET-UP

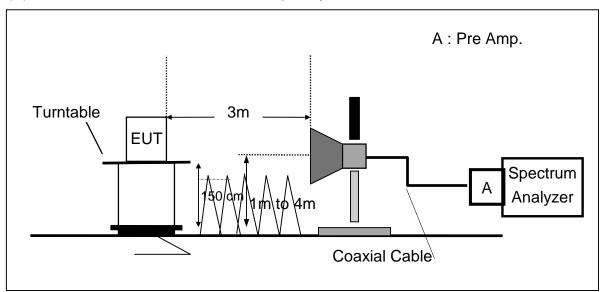
(A) Radiated Power Test Set-Up, Frequency Below1000MHz



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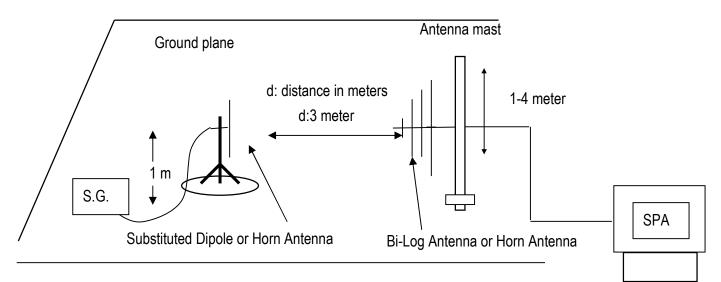
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### (B) Radiated Power Test Set-UP Frequency Over 1 GHz

(C) Substituted Method Test Set-UP



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### 7.3. Measurement Procedure

- 1. The testing follows the Measurement Procedure of FCC KDB 971168 D01
- 2. The EUT was placed on a non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer.
- 3. During the measurement, the EUT was communication with the station. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna from 4m to 1m. The reading was recorded and the field strength (E in dBuV/m) was calculated
- 4. The testing follows the Measurement Procedure of FCC KDB 971168 D01
- 5. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G.
- ERP = S.G. output (dBm) + Antenna Gain (dBd) Cable Loss (dB)
- 7. EIRP = S.G. output (dBm) + Antenna Gain (dBi) Cable Loss (dB)
- 8. Spectrum setting:

(1) Detector = Peak, marker the highest value of the detector by maximum hold, set RBW wide enough to capture the entire signal of emission, and VBW > =3xRBW.

(2) KDB 971168 D01 is adopted, and the procedure as lists under item 4, Measurement of the Average Power over the Fundamental Signal Bandwidth, is followed to set correspondingly for the acquisition of proper measurement data.

Set frequency = nominal signal center frequency;

Set span = 2 X occupied BW;

Set RBW ≈ 1~5% of the span, not to exceed 1 MHz

Set VBW =  $3 \times RBW$ ;

Select average power (RMS) detector

Set sweep time and number of measurement points to achieve a minimum of 1 millisecond/pt integration time (ex. Point = 601 points, then sweet time =  $601*10^{-3}$  = 6s.

Activate trace averaging routine over a minimum of 10 sweeps;

Activate marker/span pair and set span = signal or channel bandwidth;

Activate the band/interval power marker function;

Record the band power level;

Record adjusted value as the average signal power level. Then activate the occupied bandwidth measurement function.

The proper adjustment due to limitation of spectrum capability is given compensated to spectrum with conversion factor of 10\*log (TBW/RBW), where TBW is the transmission of UE exceeding the maximum BW UE can extends, and RBW is the resolution BW in UE.

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### 7.4. Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWAZBECK	VULB9168	378	2017/12/29	2018/12/28
Horn Antenna	Schwarzbeck	BBHA9120D	1441	2018/08/16	2019/08/15
Horn Antenna	Schwarzbeck	BBHA9170	184	2017/12/12	2018/12/11
Loop Antenna	ETS.LINDGREN	6502	148045	2018/10/08	2019/10/07
3m Site NSA	SGS	966 chamber	N/A	2018/01/02	2019/01/01
Spectrum Analyzer	Agilent	E4446A	MY51100003	2018/05/15	2019/05/14
Network Analyze	Anritsu	MS4644A	1216312	2018/06/19	2019/06/18
Pre-Amplifier	HP	8449B	3008A00578	2018/01/02	2019/01/01
Pre-Amplifier	HP	8447D	2944A07676	2018/01/02	2019/01/01
Pre-Amplifier	EMC Instru- ments	EMC184045B	980135	2018/10/02	2019/10/01
Attenuator	Mini-Circuit	BW-S10W2+	2	2018/01/02	2019/01/01
2GHz High Pass Filter	Micro-Tronics	HPM50110	36	2018/01/02	2019/01/01
Low Loss Cable	Huber Suhner	966_RX	9	2018/01/02	2019/01/01

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	EUT		Measurement							
Operation Band	Fundamental Frequency	СН	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	ERP	Limit		
	MHz		V/H	dBm	dBd	dB	dBm	dBm		
	924.2	100	V	15.19	3.45	-3.11	15.53	38.45		
	824.2	128	Н	28.28	3.45	-3.11	28.62	38.45		
GSM	836.6	190	V	23.5	3.45	-3.32	23.64	38.45		
850			Н	29.28	3.45	-3.32	29.42	38.45		
	848.8	251	V	25.4	3.46	-3.16	25.7	38.45		
	040.0		Н	29.42	3.46	-3.16	29.72	38.45		
	824.2	128	V	14.96	3.45	-3.11	15.3	38.45		
	024.2	120	Н	27.1	3.45	-3.12	27.43	38.45		
GPRS 850	836.6	100	V	22.22	3.45	-3.32	22.35	38.45		
	030.0	190	Н	28.8	3.45	-3.32	28.94	38.45		
	848.8	251	V	24.92	3.46	-3.16	25.22	38.45		
	040.0		Н	28.71	3.46	-3.16	29.01	38.45		

#### 7.5. Measurement Result: (Peak) –using option of peak measurement

Remark : (1) The RBW, VBW of SPA for frequency RBW=300 KHz, VBW=1MHz

	EUT				Measur	ement		
Operation Band	Fundamental Frequency	СН	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit
	MHz		V/H	dBm	dBi	dB	dBm	dBm
	1850.2	510	V	17.41	9.77	-4.66	22.52	33.00
	1000.2	512	Н	26.38	9.77	-4.66	31.49	33.00
GSM	1880.0	661	V	16.8	9.86	-4.7	21.96	33.00
1900			Н	25.51	9.86	-4.7	30.67	33.00
	1909.8	810	V	17.88	9.94	-4.72	23.1	33.00
			Н	24.96	9.94	-4.72	30.18	33.00
	1850.2	512	V	16.34	9.77	-4.66	21.44	33.00
	1000.2	512	Н	24.68	9.77	-4.66	29.78	33.00
GPRS	1880.0	661	V	16.08	9.86	-4.7	21.24	33.00
1900	1000.0	001	Н	23.74	9.86	-4.7	28.9	33.00
	1909.8	910	V	16.05	9.94	-4.72	21.27	33.00
	1909.0	810	Н	23.79	9.94	-4.72	29.01	33.00
Remark :	1909.0		H	23.79	9.94	-4.72	29.01	33.0

Remark	(1) The RBW, VBW of SPA for frequency RBW=300 KHz, VBW=1MHz
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	EUT				Measur	ement		
Operation Band	Fundamental Frequency	СН	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	ERP	Limit
	MHz		V/H	dBm	dBd	dB	dBm	dBm
	826.4	4400	V	21.42	3.45	-3.18	21.7	38.45
	020.4	4132	Н	26.53	3.45	-3.16	26.82	38.45
WCDMA	836.6	1102	V	19.89	3.45	-3.32	20.03	38.45
Band V	030.0	4183	Н	25.03	3.45	-3.32	25.17	38.45
	846.6	4233	V	22.14	3.46	-3.3	22.3	38.45
			Н	25.19	3.46	-3.31	25.34	38.45
	826.4	4132	V	19.67	3.45	-3.18	19.94	38.45
			Н	22.76	3.45	-3.17	23.04	38.45
HSDPA	836.6	4183	V	18.46	3.45	-3.31	18.61	38.45
Band V			Н	22.17	3.45	-3.31	22.32	38.45
	946.6	1000	V	19.32	3.46	-3.36	19.42	38.45
	846.6	4233	Н	22.63	3.46	-3.31	22.78	38.45
	906.4	4400	V	20.1	3.45	-3.17	20.38	38.45
	826.4	4132	Н	23.94	3.45	-3.18	24.21	38.45
HSUPA Band V	926.6	1100	V	19.73	3.45	-3.32	19.86	38.45
	836.6	4183	Н	23.36	3.45	-3.31	23.51	38.45
	0.40.0	4000	V	19.83	3.46	-3.38	19.91	38.45
Domorila	846.6	4233	Н	23.79	3.46	-3.35	23.91	38.45

Remark: (1)The RBW,VBW of SPA for frequency RBW=300 KHz, VBW=1MHz

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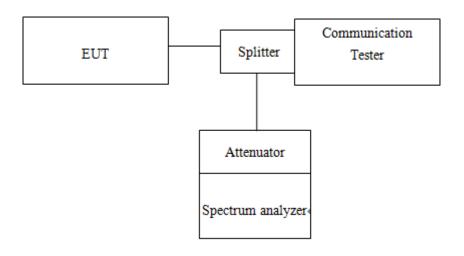


### 8. OCCUPIED BANDWIDTH MEASUREMENT

### 8.1. Standard Applicable

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power.

### 8.2. Test Set-up



#### 8.3. Measurement Procedure

### 99% &26dB Bandwidth with detector peak

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% of emission BW, VBW= 3 times RBW, -26dBc display line was placed on the screen (or 26dB bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace. Then set RBW to 99% bandwidth, RBW= 1%, VBW= 3 RBW, with span > 2 \* Signal BW, set % Power = 99%.

#### 99% Bandwidth with detector sample

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% ~ 5% of emission BW, VBW= 3 times RBW, -20dBc display line was placed on the screen (or 20dB bandwidth). Set RBW to 99% bandwidth, RBW= 1% ~ 5%, VBW= 3 RBW, with span > 2 \* Signal BW, set % Power = 99%.

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#### 8.4. Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUM- BER	SERIAL NUM- BER	LAST CAL.	CAL DUE.
EXA Spectrum Ana- lyzer	Agilent	N9010A	MY50420195	05/03/2018	05/02/2019
Radio Communication Analyer	Anritsu	MT8815B	6200711454	04/05/2018	04/04/2019
DC Power Supply	Agilent	E3640A	MY52410006	11/28/2017	11/27/2018
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2018	01/01/2019
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2018	01/01/2019
2WayDivider	Woken	DSU7AMK1A1	N/A	01/02/2018	01/01/2019
Coaxial Cable	Huber Su- hner	SUCOFLEX 102EPA	MY2616/2	01/02/2018	01/01/2019

#### 8.5. Measurement Result

Freq.		99% BV	V (MHz)	26 dB BW (MHz)		
(MHz)	СН	GSM 850	GPRS 850	GSM 850	GPRS 850	
824.2	128	0.24572	0.24394	0.318	0.319	
836.6	190	0.24576	0.24642	0.314	0.314	
848.8	251	0.24493	0.24208	0.311	0.322	

Freq.		99% BV	V (MHz)	26 dB BW (MHz)		
(MHz)	СН	GSM 1900	GPRS 1900	GSM 1900	GPRS 1900	
1850.2	512	0.24958	0.24241	0.316	0.321	
1880.0	661	0.24365	0.24606	0.311	0.320	
1909.8	810	0.24625	0.24186	0.319	0.315	

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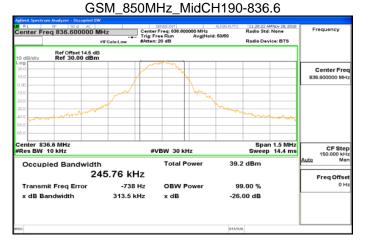
Бира	СН	99%	6 BW (M⊦	łz)	26 dB BW (MHz)			
Freq. (MHz)		WCDMA V	HSDPA V	HSUPA V	WCDMA V	HSDPA V	HSUPA V	
826.40	4132	4.11710	4.13260	4.13440	4.690	4.708	4.702	
836.60	4183	4.12450	4.12400	4.12900	4.703	4.716	4.701	
846.60	4233	4.13840	4.13960	4.13190	4.732	4.723	4.721	

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#### GSM 850MHz LowCH128-824.2





#### GSM\_850MHz\_HighCH251-848.8



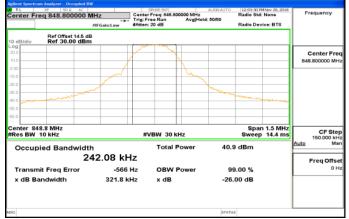
#### GPRS\_850MHz\_LowCH128-824.2







#### GPRS\_850MHz\_HighCH251-848.8



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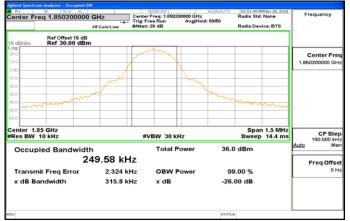
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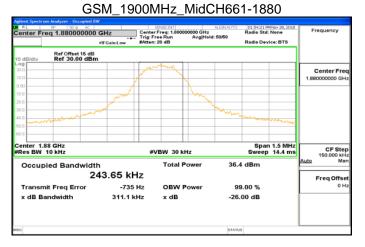
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#### GSM 1900MHz LowCH512-1850.2

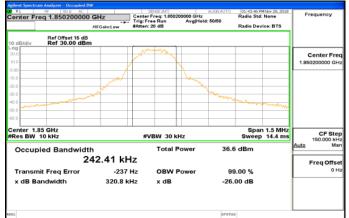


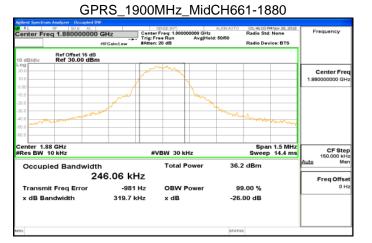


#### GSM\_1900MHz\_HighCH810-1909.8

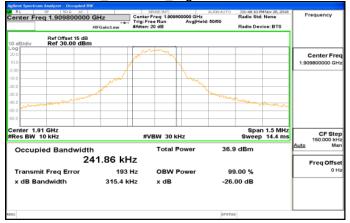


#### GPRS 1900MHz LowCH512-1850.2





#### GPRS\_1900MHz\_HighCH810-1909.8



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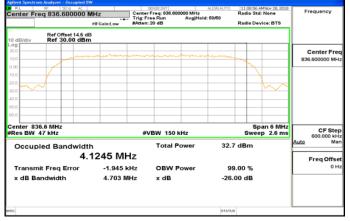
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#### WCDMA B5 LowCH4132-826.4

Center Freq 826.4	000000 MHz MIFGain:Low	Center Freq: 826.40 Trig: Free Run #Atten: 20 dB	ALIONAUTO 10000 MHz Avg Held: 50/50	11:01:37 AMNov 28, 2018 Radio Std: None Radio Device: BTS	Frequency
10 dB/div Ref 30	set 14.5 dB ).00 dBm				
200 100 000				~~~	Center Free 826.400000 MH
10.0					
enter 826,4 MHz				Span 6 MHz	
Res BW 47 kHz			kHz	Sweep 2.6 ms	CF Ste 600.000 kH
Occupied Bar	ndwidth 4.1171 M	Total F IHZ	ower 32.	5 dBm	Auto Ma Freq Offse
Transmit Freq E x dB Bandwidth				9.00 % 6.00 dB	он
a			STAT		



#### WCDMA\_B5\_MidCH4183-836.6

#### WCDMA B5 HighCH4233-846.6

enter Freq 846.600000	MHz Cente Trig:F	SENSE:INT r Freq: 846.600000 MHz ree Run Avg Hold :: 20 dB	: 50/50	11:14:16 AMNov 28, 2018 Radio Std: None	Frequency
Ref Offset 14.5 d dB/div Ref 30.00 dBr	B	:: 20 dB		Radio Device: BTS	
			·····		Center Fre 846.500000 MH
				han	
0					
enter 846.6 MHz tes BW 47 kHz	#	VBW 150 kHz		Span 6 MHz Sweep 2.6 ms	CF Ste 600.000 kH
Occupied Bandwidt 4.	<sub>h</sub> 1384 MHz	Total Power	32.6	dBm	Auto Ma
Transmit Freq Error x dB Bandwidth	-6.910 kHz 4.732 MHz	OBW Power x dB	99. -26.0	00 % 0 dB	он
			STATUS		

#### HSDPA B5 LowCH4132-826.4

Center Freq 826.400000 M	Trig:	SENSE:INT Freq: 826,400000 MHz Free Run Avg Hold h: 20 dB	Radio S	td: None	Frequency
Ref Offset 14.5 dE	a comicou	. 20 00	raio c	evice. Dio	
-og 20.0 10.0 0.00		-	m		Center Free 826.400000 MH
20.0				h.	
Center 826.4 MHz		VBW 150 kHz		apan 6 MHz 2.6 ms	CF Step
Occupied Bandwidt	h	Total Power	32.4 dBm	2.0 118	600.000 kH Auto Ma
4. Transmit Freg Error	1326 MHz -1.356 kHz	OBW Power	99.00 %		Freq Offse
x dB Bandwidth	4.708 MHz	x dB	-26.00 dB		
90 D			STATUS		

#### HSDPA\_B5\_MidCH4183-836.6



#### HSDPA\_B5\_HighCH4233-846.6

RL RL	m Analyzer - Occupied I RF 50.9 AC		SENSE:INT	4/1/2	AUTO 11:15:48	AMNov 28, 2018	
	eq 846.600000	MHz	Center Freq: 846.600000 MHz		Radio Ste		Frequency
		//IFGain:Low #Atten: 20 dB			Radio De	vice: BTS	
0 dB/div	Ref Offset 14.5 d Ref 30.00 dBi						
.og							Center Fre
0.0	- market			-hourses	m		846.600000 MH
1.00							
0.0							
···	1					han	
0.0							
0.0							
0.0							
0.0							
enter 84 Res BW			#VBW 150	kHz	Swee	oan 6 MHz ep 2.6 ms	CF Ste 600.000 ki
Occup	ied Bandwid	th	Total F	Power	32.6 dBm		Auto Ma
	4.	1396 MH	Iz				Freq Offs
Transm	it Freq Error	-10.881 k	Hz OBW I	Power	99.00 %		01
x dB Ba	ndwidth	4.722 M	Hz xdB		-26.00 dB		

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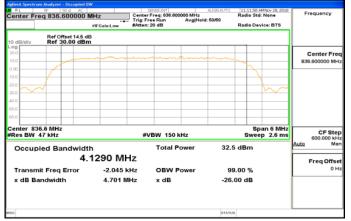
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#### HSUPA\_B5\_LowCH4132-826.4

enter Fre	eq 826.400000 N	Trig	SENSE:INT ter Freq: 826.400000 MHz : Free Run Avg Hold en: 20 dB	F 1: 50/50	11:05:01 AMNov 28, 2018 Radio Std: None Radio Device: BTS	Frequency
0 dB/div	Ref Offset 14.5 dB Ref 30.00 dBm	1		-		
						Center Frec 825.400000 MHz
enter 820 Res BW 4			#VBW 150 kHz		Span 6 MHz Sweep 2.6 ms	CF Step 600.000 kH
Occupi	ied Bandwidti 4.	י 1344 MHz	Total Power	32.5 c	IBm	Auto Mar
	it Freq Error andwidth	1.439 kHz 4.702 MHz	OBW Power x dB	99.0 -26.00		0 H
				STATUS		



#### HSUPA\_B5\_MidCH4183-836.6

#### HSUPA\_B5\_HighCH4233-846.6

RL RF 50.9 AG		SENSE:INT Freq: 846.600000 MHz	ALIGNAUTO	11:17:58 AM	Nov 28, 2018	Frequency
enter Freq 846.60000	Trig:1	Free Run Avg Hold	: 50/50	Radio Std:	None	
	#IFGain:Low #Atter	n: 20 dB		Radio Devi	ce: BTS	
Ref Offset 14.6 dB/div Ref 30.00 dl						
9						Center Fre
o			mm	_		846.600000 MH
0						
0				$\rightarrow$		
					man	
0						
0						
0						
enter 846.6 MHz Res BW 47 kHz	#	VBW 150 kHz		Sweer	an 6 MHz 2.6 ms	CF Ste
						600.000 kH Auto Ma
Occupied Bandwi	dth	Total Power	32.9	dBm		
4	1.1319 MHz					Freq Offse
Transmit Freq Error	-8.888 kHz	OBW Power	00	.00 %		01
-						
x dB Bandwidth	4.721 MHz	x dB	-26.0	00 dB		
			STATUS			

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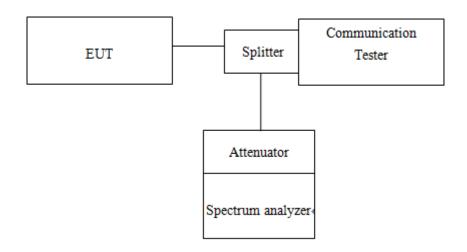


### 9. OUT OF BAND EMISSION AT ANTENNA TERMINALS

### 9.1. Standard Applicable

FCC §22.917(a), §24.238(a), Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

### 9.2. Test SET-UP



#### 9.3. Measurement Procedure

#### **Conducted Emission**

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

- 1. To connect Antenna Port of EUT to Spectrum.
- Set RBW = 1MHz & VBW = 1MHz on Spectrum.
- Allow trace to fully stabilize
- 4. Repeat above procedures until all default test channel measured were complete.

### **Band Edge**

- To connect Antenna Port of EUT to Spectrum.
- The band edge of low and high channels for the highest RF powers was measured. Setting RBW  $\geq$  1% EBW.
- Allow trace to fully stabilize
- Repeat above procedures until all default test channel measured were complete.

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#### 9.4. Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUM- BER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWAZBECK	VULB9168	378	2017/12/29	2018/12/28
Horn Antenna	Schwarzbeck	BBHA9120D	1441	2018/08/16	2019/08/15
Horn Antenna	Schwarzbeck	BBHA9170	184	2017/12/12	2018/12/11
Loop Antenna	ETS.LINDGREN	6502	148045	2018/10/08	2019/10/07
3m Site NSA	SGS	966 chamber	N/A	2018/01/02	2019/01/01
Spectrum Analyzer	Agilent	E4446A	MY51100003	2018/05/15	2019/05/14
Network Analyze	Anritsu	MS4644A	1216312	2018/06/19	2019/06/18
Pre-Amplifier	HP	8449B	3008A00578	2018/01/02	2019/01/01
Pre-Amplifier	HP	8447D	2944A07676	2018/01/02	2019/01/01
Pre-Amplifier	EMC Instru- ments	EMC184045B	980135	2018/10/02	2019/10/01
Attenuator	Mini-Circuit	BW-S10W2+	2	2018/01/02	2019/01/01
2GHz High Pass Filter	Micro-Tronics	HPM50110	36	2018/01/02	2019/01/01
Low Loss Cable	Huber Suhner	966_RX	9	2018/01/02	2019/01/01

#### 9.5. Measurement Result:

Refer to next pages.

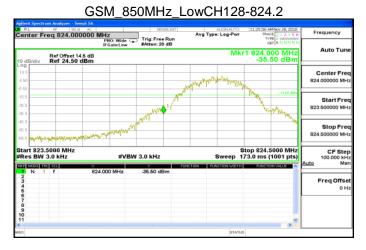
NOTE: The occurrence of the spike on the conducted emission is the signal of the fundamental emission.

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#### Band Edge







GPRS\_850MHz\_LowCH128-824.2



GPRS\_850MHz\_HighCH251-848.8



#### GSM 1900MHz LowCH512-1850.2



#### GSM\_1900MHz\_HighCH810-1909.8



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#### GPRS 1900MHz LowCH512-1850.2







#### WCDMA\_B5\_LowCH4132-826.4



#### WCDMA\_B5\_HighCH4233-846.6 nter Freq 849.000000 MHz PNO: Wide Trig: Free Run #Atten: 20 dB ALIGNAUTO Avg Type: Log-Pwi



#### HSDPA\_B5\_LowCH4132-826.4



#### HSDPA\_B5\_HighCH4233-846.6

ilent Spectrum Analyzer - Swept SA					
enter Freq 849.000000 I	MHz	SENSE:INT	ALIONAUTO Avg Type: Log-Pwr	11:16:25 AMNov 28, 2018 TRACE 1 2 3 4 5 6 TYPE 4 0404040	Frequency
Ref Offset 14.5 dB	PNO: Wide 😱 IFGain:Low	Trig: Free Run #Atten: 20 dB	Mkr	1 849.000 MHz -24.08 dBm	Auto Tun
4.5 .50					Center Fre 849.000000 MH
5.5		1		-13.00 dBn	Start Fre
5.5					848.500000 MH
5.5					Stop Fre
5.5 tart 848.5000 MHz			s	top 849.5000 MHz	CF Ste
Res BW 47 kHz	#VBW	150 kHz	Sweep 1	.000 ms (1001 pts)	100.000 kF Auto Ma
2 11 1 1 1 1 84 3 4 6 6	8.000 MPZ	-24.00 0.5m			Freq Offs
7 8 9 0					
a			STATUS	>	

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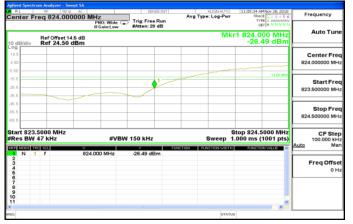
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#### HSUPA\_B5\_LowCH4132-826.4



#### HSUPA\_B5\_HighCH4233-846.6

RL	RF 50.9 AC		SENSE:INT	ALIGNAUTO	11:18:22 AMNov 28, 2018	
enter Fr	eq 849.000000	MHz		Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6	Frequency
		PNO: Wide G	Trig: Free Run #Atten: 20 dB		DET A N N N N N	Auto Tun
) dB/div	Ref Offset 14.5 dB Ref 24.50 dBm			Mk	r1 849.000 MHz -23.72 dBm	Auto Tun
4.5						Center Fre
.50						849.000000 MH
50					-13.00 dDn	
.5						Start Fre
5.5						848.500000 MH
.5						
5.5						Stop Fre 849.500000 MH
5.5						040.00000 mm
art 848. Res BW	5000 MHz 47 kHz	#VBW	150 kHz	Sweep 1	Stop 849.5000 MHz .000 ms (1001 pts)	CF Ste 100.000 kH
NODE TH		9.000 MHz	-23.72 dBm	FUNCTION WIDTH	FUNCTION VALUE	Auto Ma
2 3 4						Freq Offse
5						
3						
0						
					2	
5				STATUS	5	

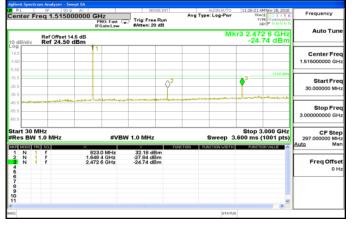
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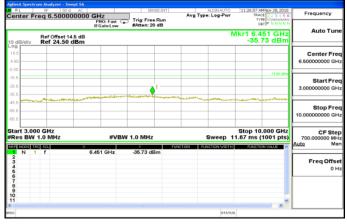


### **Out of Band Emission**

#### 30MHz~3GHz\_GSM\_850MHz\_LowCH128-824.2



### 3GHz~10GHz\_GSM\_850MHz\_LowCH128-824.2



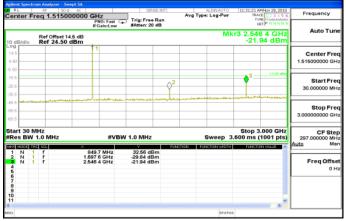
### 30MHz~3GHz\_GSM\_850MHz\_MidCH190-836.6

gilent Spectrum Analyzer - Swep					
Center Freq 1.51500		SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	11:28:45 AMNov 28, 2018 TRACE 1 2 3 4 5 6	Frequency
teriter rieg 1.51500	PNO: Fast G	#Atten: 20 dB		DET P N N N N N	
Ref Offset 14.0 0 dB/div Ref 24.50 d			Mk	r3 2.509 8 GHz -23.53 dBm	Auto Tun
0g 14,5 4.50 5.50	1				Center Free 1.515000000 GH
15.5 25.5 36.5				-13.00 dbn	Start Fre 30.000000 MH
45.5 56.5 55.5	ىرىلىن دۆلۈكەتلەرلەر شىن مىل استۇرىپىيەرىل	-Jertillussen in die en 249 de san	an a		Stop Free 3.000000000 GH
tart 30 MHz Res BW 1.0 MHz	#VBW	1.0 MHz	Sweep 3	Stop 3.000 GHz .600 ms (1001 pts)	CF Ste 297.000000 MH
NU NODE THE SEL	837.8 MHz	32.54 dBm	CTION FUNCTION WIDTH	FUNCTION VALUE	Auto Ma
2 N 1 F 3 N 1 F 4 5 5 7	1.673 2 GHz 2.509 8 GHz	-28.34 dBm -23.53 dBm			Freq Offse 0 H
9 9 10					
20			STATUS	2	

#### 3GHz~10GHz\_GSM\_850MHz\_MidCH190-836.6



### 30MHz~3GHz\_GSM\_850MHz\_HighCH251-848.8



### 3GHz~10GHz\_GSM\_850MHz\_HighCH251-848.8

		<u> </u>				
					am Analyzer - Swept SA	
Frequency	11:31:41 AMNov 28, 2018	ALIGN AUTO	SENSE:INT		RF 50.9 AC	RL
Frequency	TRACE 1 2 3 4 5 6	vg Type: Log-Pwr			eq 6.500000000	enter Fi
	DET P N N N N N		g:Free Run ten:20 dB			
Auto Tur			iten. 20 ub	IFGain:Low #Ad		
Autoru	lkr1 5.674 GHz	N			Ref Offset 14.5 dB	
	-36.20 dBm				Ref 24.50 dBm	0 dB/div
					Ref 24.50 dbm	Pg Pg
Center Fr						4.5
						50
6.500000000 G						50
						50
	-13.00 dBm					5.5
Start Fr						
3.000000000 G				i		5.5
				<b>•</b>		5.5
	and a second sec	and the second	terror and a start of the	the stand of the second stand and state		
0100 Ex						5.5
Stop Fr						5.5
10.00000000 G						5.5
L						0.0
-	Stop 10.000 GHz				0.04-	art 3.00
CF St	1.67 ms (1001 pts)	<b>6</b>		#VBW 1.0		Res BW
700.000000 M Auto M	1.07 ms (1001 pts)	aweep 1	WIN2	#40441.01	1.0 Minz	CES DW
Auto M	FUNCTION VALUE	FUNCTION WIDTH		Y		JI NODE TI
			20 dBm	.674 GHz -36.	f f	1 N 1
Freq Offs						2
						3
0						5
L						5
						7
						9
						0
	~					1
	>		-1			
		STATUS				3
		STATOS				

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### 30MHz~3GHz\_GPRS\_850MHz\_LowCH128-824.2



### 3GHz~10GHz GPRS 850MHz LowCH128-824.2



### 30MHz~3GHz\_GPRS\_850MHz\_MidCH190-836.6

Agilent Spectrum Analyzer - Swept SA					
Center Freq 1.51500000	0 GHz	SENSE:INT	ALIONAUTO Avg Type: Log-Pwr	11:42:36 AMNov 28, 2018 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast G	Trig: Free Run #Atten: 20 dB		DET P NNNN	Auto Tune
10 dB/div Ref Offset 14.5 dB			M	r3 2.509 8 GHz -23.50 dBm	Auto Tuni
Log 14.5 4.50	1				Center Freq 1.51500000 GHz
-15.5		<sup>2</sup>	and an a second rule and second	-13.00 dBn	Start Freq 30.000000 MHz
45.5 mm2/2000 at 10 mm2/20000 at	leave have a second	fortung Landen getab and transfel frame			Stop Fred 3.000000000 GH2
Start 30 MHz #Res BW 1.0 MHz	#VBV	/ 1.0 MHz	Sweep 3	Stop 3.000 GHz 1.600 ms (1001 pts)	CF Step 297.000000 MH Auto Mar
1 N 1 F 2 N 1 F 3 N 1 F	837.8 MHz 1.673 2 GHz 2.509 8 GHz	32.35 dBm -28.08 dBm -23.50 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Freq Offset 0 Hz
4 6 6 7 8 9 10 10					
ABG			STATU	5	t

#### 3GHz~10GHz\_GPRS\_850MHz\_MidCH190-836.6



### 30MHz~3GHz GPRS 850MHz HighCH251-848.8



#### 3GHz~10GHz\_GPRS\_850MHz\_HighCH251-848.8

	rum Analyzer - Swe							
Center F	req 6.50000		SENSE	A	ALIGNAUTO	TRAC	Nov 28, 2018 E 1 2 3 4 5 6	Frequency
10 dB/div	If Galant.ow #Atten: 20 dB Mkr1 5.695 GHz   10 dB/div Ref 0.0fmet 14.5 dB -35.67 dBm							
14.5 4.50								Center Freq 6.50000000 GHz
-15.5			↓				-13.00 dBn	Start Freq 3.000000000 GHz
-45.5 -55.5 -65.5	and a second second				·····		an a	Stop Freq 10.000000000 GHz
Start 3.00 #Res BW	1.0 MHz	#V	BW 1.0 MHz	FUNCTION		11.67 ms (		CF Step 700.000000 MHz Auto Man
1 N 1 23 4 5 6 7		5.695 GHz	-36.67 dBm					Freq Offset 0 Hz
8 9 10 11							*	
MBG					STAT	rus		

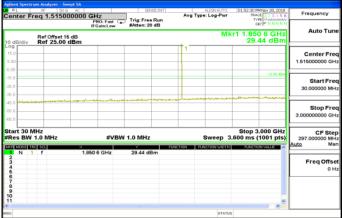
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### 30MHz~3GHz\_GSM\_1900MHz\_LowCH512-1850.2



#### 3GHz~10GHz\_GSM\_1900MHz\_LowCH512-1850.2



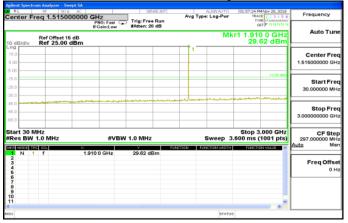
### 30MHz~3GHz GSM 1900MHz MidCH661-1880

nter Freg 1.51500		SENSE:INT	ALIONAUTO Avg Type: Log-Pwr	01:54:45 PM Nov 28, 2018 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast G IFGain:Low	Trig: Free Run #Atten: 20 dB		DET P N N N N N	Auto Tu
Ref Offset 15 B/div Ref 25.00 c			м	kr1 1.880 3 GHz 29.54 dBm	
0			1		Center Fr
					1.515000000
				-13.00.091	
					Start F 30.000000 M
	ملدب ومناحب أسمامه الصدوريس			and a second second	
Contraction of the second seco					Stop F
					3.000000000
rt 30 MHz				Stop 3.000 GHz	CFS
es BW 1.0 MHz		V 1.0 MHz		3.600 ms (1001 pts)	297.000000 M
NODE THE SEL	× 1.880 3 GHz	29.54 dBm	NETION FUNCTION WADTH	PUNCTION VALUE	
					Freq Off
			STAT	18	

#### 3GHz~10GHz\_GSM\_1900MHz\_MidCH661-1880



#### 30MHz~3GHz\_GSM\_1900MHz\_HighCH810-1909.8



### 3GHz~10GHz\_GSM\_1900MHz\_HighCH810-1909.8

	um Analyzer - Swept S					
Center F	req 11.500000	000 GHz	SENSE:INT	Log-Pwr	01:57:44 PM Nov 28, 2018 TRACE 1 2 3 4 5 6 TYPE 1/1000444	
10 dB/div	Ref Offset 16 dB Ref 25.00 dBn	PNO: Fast G IFGain:Low	#Atten: 20 dB	м	cr1 19.830 GHz -28.77 dBm	Auto Tune
16.0 5.00						Center Freq 11.50000000 GHz
-15.0		Martin da nu da n	a stan a star	 	-13.00 diss	Start Freq 3.000000000 GHz
-45.0 -55.0 -65.0						Stop Freq 20.000000000 GHz
Start 3.00 #Res BW	1.0 MHz	#VB\	W 1.0 MHz	Sweep 4	Stop 20.000 GHz 2.53 ms (1001 pts)	CF Step 1.700000000 GHz Auto Man
	f	19.830 GHz	-29.77 dBm			Freq Offset 0 Hz
ABG				STATUS		

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台灣檢驗科技股份有限公司



#### 30MHz~3GHz\_GPRS\_1900MHz\_LowCH512-1850.2



#### 3GHz~10GHz\_GPRS\_1900MHz\_LowCH512-1850.2



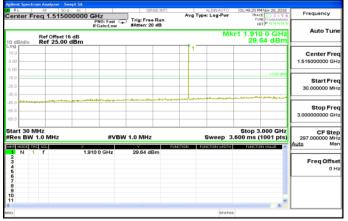
### 30MHz~3GHz GPRS 1900MHz MidCH661-1880

ent Spectrum Analy									
nter Freq 1.	50 9 AC	GH7	SENSE:INT	Ave Tvp	ALIGNAUTO e: Log-Pwr	D1:46:23 PM Nov 2 TRACE 1 2	3456	Frequency	
tor rieq i.	51500000	PN0: Fast	Trig: Free Run #Atten: 20 dB		DET P N N P		NNNN	Ň	
	ffset 15 dB 25.00 dBm				Mkr1 1.880 3 0 29.57 d			Z	
				1					
								Center Fr	
								1.515000000	
							1.00 d <b>e</b> m		
								Start Fr	
								30.000000 N	
	-	monum	-	سسابيه		we have we	أبيعين		
							_	Stop F	
							_	3.000000000 0	
							_		
rt 30 MHz				_	-	Stop 3.000	GHz	CF SI	
s BW 1.0 M	Hz	#VBW	1.0 MHz		Sweep 3	.600 ms (100	1 pts)	297.000000 N	
MODE THE SOL	×			UNCTION TO	INCTION WIDTH	FUNCTION VAL	- <b>1</b>	Auto N	
N 1 F	12	880 3 GHz	29.57 dBm						
								Freq Off	
								•	
							-		
							×		
					STATU				
					STATU	1			

#### 3GHz~10GHz\_GPRS\_1900MHz\_MidCH661-1880



#### 30MHz~3GHz\_GPRS\_1900MHz\_HighCH810-1909.8



### 3GHz~10GHz\_GPRS\_1900MHz\_HighCH810-1909.8

	m Analyzer - Swept SA							
Center Fr	eq 11.50000000		SENSE:INT		LIGNAUTO	TRAC	4Nov 28, 2018 E 1 2 3 4 5 6	Frequency
10 dB/div	Ref Offset 15 dB Ref 25.00 dBm	PN0: Fast 😱 IFGain:Low	#Atten: 20 dB		м	kr1 19.8	13 GHz 08 dBm	Auto Tune
16.0 5.00								Center Fred 11.500000000 GH:
-15.0		A	and a second	and some series	, menne		-13.00 dBn	Start Free 3.000000000 GH
-45.0								Stop Free 20.000000000 GH
Start 3.000 #Res BW 1		#VBW	1.0 MHz		Sweep 4	2.53 ms (		CF Step 1.700000000 GH Auto Ma
2000 2000 100 2 3 4 5 6 7 8 9 10 11 ≤	50. X f 1	9.813 GHz	-29.08 dBm	PUNCTION PUR	ACTION WIDTH	FUNCTIO		Freq Offse 0 H
a					STATUS	в		

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ム滞品	<b>卧斜</b> 井	股份有	龍公司	
百八饭	微石口口	AX 177 19	NK 25 PJ	



#### 30MHz~3GHz\_WCDMA\_B5\_LowCH4132-826.4





### 30MHz~3GHz WCDMA B5 MidCH4183-836.6

	um Analyzer - Swept					
RL	reg 1.5150000		SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	11:09:22 AMNov 28, 2018 TRACE 1 2 3 4 5 6	Frequency
Jenter F	req 1.5150000	PN0: Fast G IFGain:Low	Trig: Free Run #Atten: 20 dB	Ang Type: Log-t wi	DET P N NN N N	
0 dB/div	Ref Offset 14.5 ( Ref 24.50 dB			Mk	r3 2.509 8 GHz -38.50 dBm	Auto Tun
14.5		1				Center Free
4.50						1.515000000 GH
5.50					-13.00 dDn	
25.5						Start Fre 30.000000 MH
35.5			a	and the second statements and	3	30.000000 MPI
	101.00.00.00 <sup>-0</sup> 00 <sup>1</sup> /2000-00-0	and here a house				Stop Fre
65.5						3.00000000 GH
itart 30 M					Stop 3.000 GHz	CF Ste
	1.0 MHz		1.0 MHz		.600 ms (1001 pts)	297.000000 MH Auto Ma
1 N 1	f	837.8 MHz 1.673 2 GHz	23.55 dBm -39.49 dBm	NCTION FUNCTION WIDTH	FUNCTION WALLER	
2 N 1 3 N 1 4 5	1	2.509 8 GHz	-39.49 dBm -38.50 dBm			Freq Offse 0 H
4 6 7 8 9						
9						
93				STATUS	>	
				UTATO:		

#### 3GHz~10GHz\_WCDMA\_B5\_MidCH4183-836.6



#### 30MHz~3GHz\_WCDMA\_B5\_HighCH4233-846.6



### 3GHz~10GHz\_WCDMA\_B5\_HighCH4233-846.6

	rum Analyzer - Swept SA							
Center F	NF 50 9 AC		Trig: Free Run	Avg Type:	Lignauto	TRAC	MNov 28, 2018 E 1 2 3 4 5 6	Frequency
10 dB/div	Ref Offset 14.5 dE Ref 24.50 dBm	IFGain:Low	#Atten: 20 dB		N	1kr1 6.3	53 GHz 21 dBm	Auto Tune
14.5 4.50								Center Freq 6.500000000 GHz
-15.5		مەر بىر بىر بىر بىر بىر بىر بىر بىر بىر بى	<b>•</b> 1			الريوري	-13.00 dBn	Start Fred 3.000000000 GHz
-45.5								Stop Free 10.000000000 GH
	1.0 MHz	#VBV	V 1.0 MHz			1.67 ms (		CF Step 700.000000 MH Auto Mar
10000 №000 № 2 3 4 6 6 7 8 9 9 10 11 4	fic 501 >	6.353 GHz	√ -36.21 dBm	FUNCTION	TION WIDTH	FUNCTIO		Freq Offset 0 Hz
190					STATUS			

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台灣檢驗科技	肌心右	瓜八司
宣传惊厥打仪	AX 177 19	1K 25 9



### 30MHz~3GHz\_HSDPA\_B5\_LowCH4132-826.4





### 30MHz~3GHz HSDPA B5 MidCH4183-836.6

								er - Swept SA		
Frequency	MNov 28, 2018	TRA	ALIGNAUTO pe: Log-Pwr	Ave Ty	SE:INT		Hz	50 Q AC		ter F
Auto Tun		TY D			Run dB	Trig: Free #Atten: 20	PNO: Fast 😱 Gain:Low		oq 1.51	NOT T
Auto Tun	98 GHz 10 dBm		Mk					set 14.5 dB 1.50 dBm		B/div
Center Fre								1		
1.515000000 GH										
	-13.00 dBn									
Start Fre 30.000000 MH										
30.000000 MH		<b>∮</b> <sup>3</sup>			<sup>2</sup>				_	
Stop Fre					and the second	hand a the state of the second se		نا المتحمد في المحمد مكانيات		1
3.000000000 GH										
	000 CH	Step 2							L a	rt 30 M
CF Ste 297.000000 MH	.000 GHz 1001 pts)		Sweep 3			1.0 MHz	#VBW	z	HZ 1.0 MHZ	
<u>Auto</u> Ma	IN VALLE	FUNCTI	UNCTION WIDTH	TION P	FUNC	23.60 dE	.9 MHz	×	501	N 1
Freq Offse					3m	-39.49 dE -39.10 dE	2 GHz 8 GHz	1.67	1	N
0 H					2111	-00.10 42	o on a	2.00		
			STATUS							

### 3GHz~10GHz\_HSDPA\_B5\_MidCH4183-836.6



### 30MHz~3GHz\_HSDPA\_B5\_HighCH4233-846.6



### 3GHz~10GHz\_HSDPA\_B5\_HighCH4233-846.6

	um Analyzer - Swe					
Center F	req 6.50000	0000 GHz	SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	11:17:07 AMNov 28, 2018 TRACE 1 2 3 4 5 6 Type 1 2 3 4 5 6	Frequency
10 dB/div	Ref Offset 14 Ref 24.50 d		#Atten: 20 dB	r	Mkr1 6.486 GHz -35.64 dBm	Auto Tune
14.5 4.50						Center Freq 6.50000000 GHz
-15.5		ىنى بىرى بىرى بىرى بىرى بىرى بىرى بىرى ب	1	where a method	-13.00 dBm	Start Freq 3.00000000 GHz
-45.5 -65.5 -65.5	And the second sector for				247-13-50-1128-1-1-200-1243-0-0-200-0-	Stop Fred 10.000000000 GHz
Start 3.00 #Res BW		#VB	W 1.0 MHz	Sweep 1	Stop 10.000 GHz 1.67 ms (1001 pts)	CF Step 700.000000 MH
10000 0000 00 1 N 1 2 3 4 5 6 7 8 9 9 10 11 €		× 6.406 GHz	-35.64 dBm	TUNCTION TUNCTION WOTH		Freq Offset
19G				STATU	5	

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### 30MHz~3GHz\_HSUPA\_B5\_LowCH4132-826.4





### 30MHz~3GHz HSUPA B5 MidCH4183-836.6

	um Analyzer - Swep					
Center Fi	reg 1.515000	AC DOOD GHz	SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	11:12:18 AMNov 28, 2018 TRACE 1 2 3 4 5 6	Frequency
	Ref Offset 14.5	PNO: Fast G IFGain:Low	Trig: Free Run #Atten: 20 dB	M	r3 2.509 8 GHz -38.53 dBm	Auto Tune
0 dB/div 0 g 14.5 4.50	Ref 24.50 dl	3m 1			-38.53 dBm	Center Free 1.515000000 GH:
15.5 25.5 35.5					-13.00 dBn	Start Free 30.000000 MH
45.5 ****** 65.5	and a second second second		al an			Stop Free 3.000000000 GH
Start 30 M Res BW	1.0 MHz	#VBW	/ 1.0 MHz	Sweep 3	Stop 3.000 GHz .600 ms (1001 pts)	CF Step 297.000000 MH: Auto Mar
1 N 1 2 N 1 3 N 1 4 5 6 7 8 9 10	•	837.8 MHz 1.673 2 GHz 2.509 8 GHz	23.64 dBm -40.07 dBm -38.53 dBm			Freq Offse 0 H
8 9 10 11			J.	STATU	s	

### 3GHz~10GHz\_HSUPA\_B5\_MidCH4183-836.6



### 30MHz~3GHz\_HSUPA\_B5\_HighCH4233-846.6



### 3GHz~10GHz\_HSUPA\_B5\_HighCH4233-846.6

	rum Analyzer - Swept SA						
Center F	req 6.50000000	0 GHz	SENSE:INT	Avg Typ	e: Log-Pwr	11:19:01 AMNov 28, 20 TRACE 1 2 3 4 5 TYPE MULLIAN	6 Frequency
10 dB/div	Ref Offset 14.5 dB Ref 24.50 dBm	PNO: Fast G IFGain:Low	#Atten: 20 dB		N	1kr1 6.479 GH -36.02 dBr	Z Auto Tune
14.5 4.50							Center Freq 6.50000000 GHz
-15.5		الارتقاد معارمهم المقاسمات	1-	معنسيوريوصالخطيور		-13.00 dt	Start Freq 3.00000000 GHz
-45.5 -65.5 -65.5	And an and a second				10-10-10-10-10-10-10-10-10-10-10-10-10-1		Stop Fred 10.000000000 GHz
Start 3.00 #Res BW		#VBV	W 1.0 MHz		Sweep 1	Stop 10.000 GH 1.67 ms (1001 pt	
2000 20000 00 1 N 1 2 3 4 6 6 7 8 9 9 10 11 ≪	nc so. >>	6.479 GHz	-36.02 dBm	FUNCTION FU	NCTION WIDTH	PLNICTION VALLE	Freq Offset 0 Hz
190					STATUS		

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# 10. FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

### 10.1. Standard Applicable

According to FCC §2.1053,

FCC §22.917(a), §24.238(a), the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the instruction manual and/ or alignment procedure, shall not be less than 43 + 10 log (mean output power in watts) dBc below the mean power output outside a license's frequency block (-13dBm).

### Table 2 — Unwanted Emissions for Mobile, Portable and Low-Power Fixed Subscriber Equipment

Frequency (MHz)	Attenuation (dB)
<2200	$43 + 10 \log_{10}(p)$
2200 - 2288	$70 + 10 \log_{10}(p)$
2288 - 2292	$67 + 10 \log_{10}(p)$
2292 - 2296	$61 + 10 \log_{10}(p)$
2296 - 2300	$55 + 10 \log_{10}(p)$
2300 - 2305	$43 + 10 \log_{10}(p)$
2305 - 2320	$43 + 10 \log_{10}(p)^{Note}$
2320 - 2324	$55 + 10 \log_{10}(p)$
2324 - 2328	$61 + 10 \log_{10}(p)$
2328 - 2337	$67 + 10 \log_{10}(p)$
2337 - 2341	$61 + 10 \log_{10}(p)$
2341 - 2345	$55 + 10 \log_{10}(p)$
2345 - 2360	$43 + 10 \log_{10}(p)^{Note}$
2360 - 2365	$43 + 10 \log_{10}(p)$
2365 - 2395	$70 + 10 \log_{10}(p)$
>2395	$43 + 10 \log_{10}(p)$

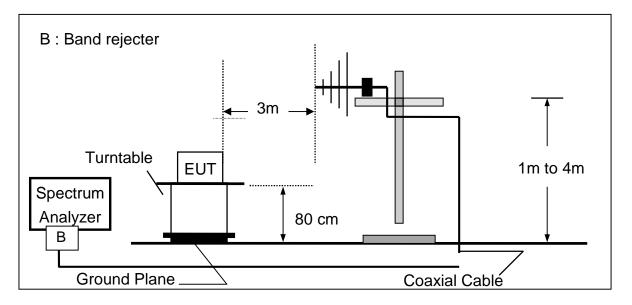
Note: Measured at the edges of the highest and lowest frequency range(s) in which the equipment is designed to operate. See Section 1.2 for the permitted frequency ranges for various equipment types.

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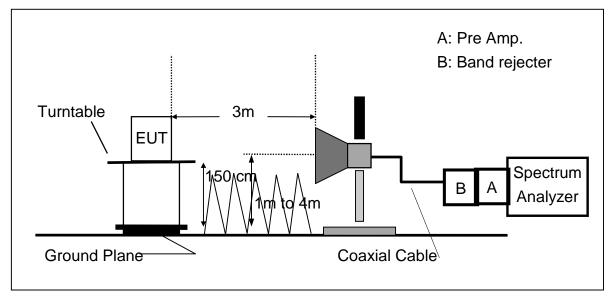


### 10.2. EUT Setup

Radiated Emission Test Set-Up, Frequency Below 1000MHz



### Radiated Emission Test Set-UP Frequency Over 1 GHz



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### **10.3. Measurement Procedure:**

The EUT was placed on a non-conductive; the measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

ERP (dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

EIRP (dBm) = SG Level(dBm) + Antenna Gain(dBi) + Cable Loss(dB)

"F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. Note :

"E" : denotes Band Edge Frequency.; "S" : denotes Spurious Frequency.

"---": denotes Noise Floor.

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### **10.4. Measurement Equipment Used:**

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWAZBECK	VULB9168	378	2017/12/29	2018/12/28
Horn Antenna	Schwarzbeck	BBHA9120D	1441	2018/08/16	2019/08/15
Horn Antenna	Schwarzbeck	BBHA9170	184	2017/12/12	2018/12/11
Loop Antenna	ETS.LINDGREN	6502	148045	2018/10/08	2019/10/07
3m Site NSA	SGS	966 chamber	N/A	2018/01/02	2019/01/01
Spectrum Ana- lyzer	Agilent	E4446A	MY51100003	2018/05/15	2019/05/14
Network Analyze	Anritsu	MS4644A	1216312	2018/06/19	2019/06/18
Pre-Amplifier	HP	8449B	3008A00578	2018/01/02	2019/01/01
Pre-Amplifier	HP	8447D	2944A07676	2018/01/02	2019/01/01
Pre-Amplifier	EMC Instru- ments	EMC184045B	980135	2018/10/02	2019/10/01
Attenuator	Mini-Circuit	BW-S10W2+	2	2018/01/02	2019/01/01
2GHz High Pass Filter	Micro-Tronics	HPM50110	36	2018/01/02	2019/01/01
Low Loss Cable	Huber Suhner	966_RX	9	2018/01/02	2019/01/01

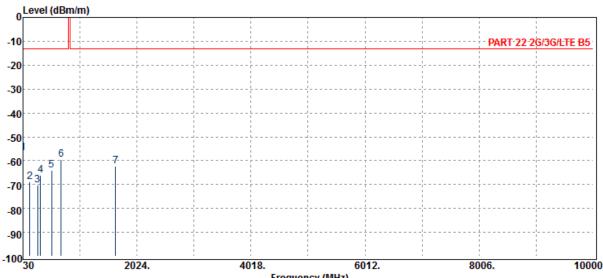
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



### **10.5. Measurement Result:**

### Radiated Spurious Emission Measurement Result: GSM 850 Mode

Operation Band	:GSM 850	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequen	- :824.2 MHz	Engineer	:Tin
Operation Mode	:Tx CH LOW		
EUT Pol.	:E2 Plane	Measurement Ante Pol.	<sup>nna</sup> :VERTICAL



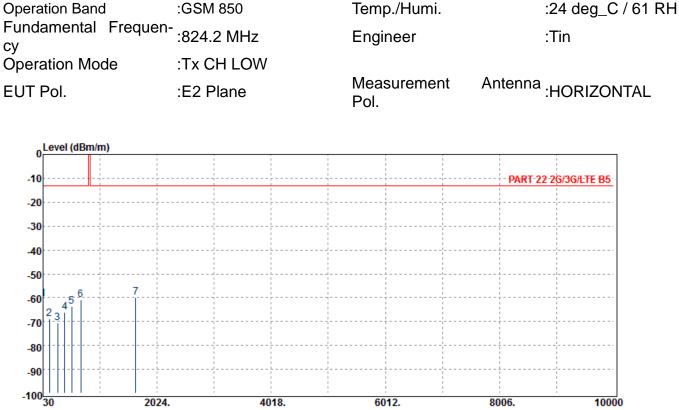
Frequency (MHz)

Freq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
30.00	-56.58	-41.42	-14.58	-0.58	-13.00	-43.58
148.34	-68.93	-65.75	-1.89	-1.29	-13.00	-55.93
288.99	-70.17	-71.82	3.42	-1.78	-13.00	-57.17
337.49	-65.97	-67.81	3.80	-1.96	-13.00	-52.97
534.40	-63.93	-65.74	4.00	-2.19	-13.00	-50.93
696.39	-59.69	-60.92	3.69	-2.46	-13.00	-46.69
1648.40	-62.37	-65.00	6.97	-4.35	-13.00	-49.37

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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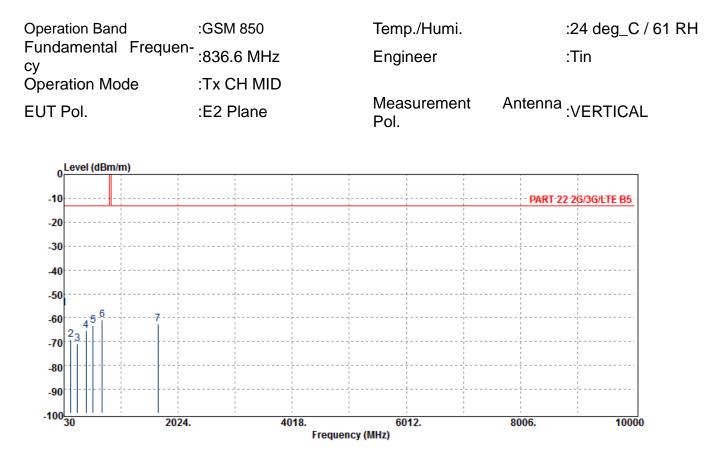
Frequency (MHz)

Freq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
30.00	-60.42	-45.26	-14.58	-0.58	-13.00	-47.42
143.49	-68.77	-65.36	-2.13	-1.28	-13.00	-55.77
288.99	-70.73	-72.37	3.42	-1.78	-13.00	-57.73
405.39	-66.17	-67.71	3.69	-2.15	-13.00	-53.17
534.40	-63.67	-65.49	4.00	-2.19	-13.00	-50.67
692.51	-60.86	-61.80	3.70	-2.76	-13.00	-47.86
1648.40	-59.94	-62.57	6.97	-4.35	-13.00	-46.94

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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Freq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
30.00	-56.02	-40.86	-14.58	-0.58	-13.00	-43.02
149.31	-69.34	-66.21	-1.84	-1.29	-13.00	-56.34
262.80	-70.90	-72.81	3.62	-1.71	-13.00	-57.90
418.00	-65.45	-66.98	3.65	-2.11	-13.00	-52.45
541.19	-63.43	-65.52	3.99	-1.91	-13.00	-50.43
694.45	-60.92	-62.00	3.69	-2.61	-13.00	-47.92
1673.20	-62.61	-65.28	7.06	-4.39	-13.00	-49.61

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

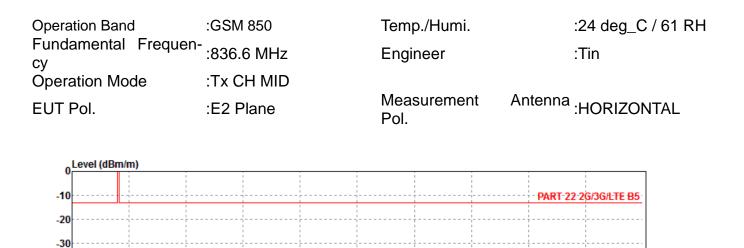


40 -50 -60

E 4 2 -70 -80 -90 -100<mark>\_\_\_\_\_\_30</mark>

2024.

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4018. 6012. Frequency (MHz)

8006.

10000

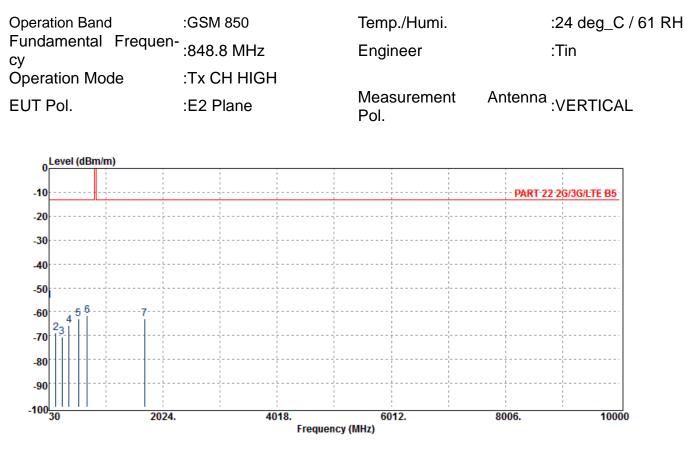
Freq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
31.94	-59.50	-44.82	-14.08	-0.59	-13.00	-46.50
172.59	-69.54	-68.00	-0.20	-1.34	-13.00	-56.54
288.99	-70.58	-72.23	3.42	-1.78	-13.00	-57.58
381.14	-66.04	-67.78	3.77	-2.02	-13.00	-53.04
547.01	-63.92	-66.04	3.98	-1.86	-13.00	-50.92
691.54	-60.72	-61.59	3.70	-2.83	-13.00	-47.72
1673.20	-63.54	-66.20	7.06	-4.39	-13.00	-50.54

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

SGS Taiwan Ltd.



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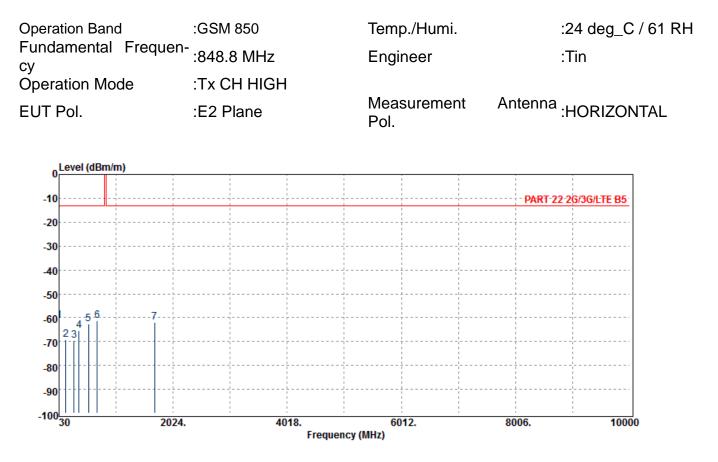


Freq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
 MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
30.00	-55.43	-40.27	-14.58	-0.58	-13.00	-42.43
148.34	-68.89	-65.72	-1.89	-1.29	-13.00	-55.89
259.89	-70.46	-72.43	3.67	-1.70	-13.00	-57.46
382.11	-65.91	-67.65	3.76	-2.02	-13.00	-52.91
548.95	-62.89	-64.90	3.98	-1.97	-13.00	-49.89
694.45	-61.47	-62.55	3.69	-2.61	-13.00	-48.47
1697.60	-63.12	-65.82	7.14	-4.43	-13.00	-50.12

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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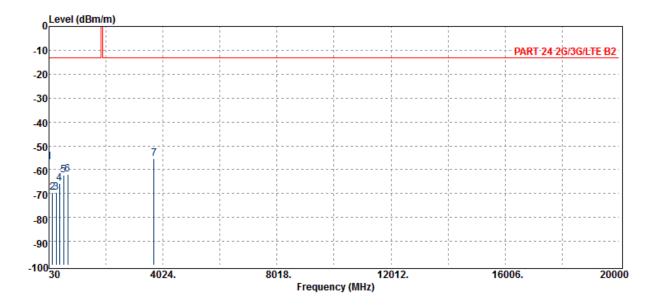
Fr	eq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
Μ	Hz	dBm	dBm	dBd/dBi	dB	dBm	dB
30	.00	-61.18	-46.03	-14.58	-0.58	-13.00	-48.18
146	5.40	-69.12	-65.85	-1.98	-1.29	-13.00	-56.12
291	1.90	-69.43	-71.10	3.46	-1.79	-13.00	-56.43
376	5.29	-65.52	-67.26	3.78	-2.03	-13.00	-52.52
544	4.10	-62.75	-64.95	3.99	-1.79	-13.00	-49.75
694	4.45	-61.31	-62.39	3.69	-2.61	-13.00	-48.31
169	7.60	-61.99	-64.69	7.14	-4.43	-13.00	-48.99

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



### **Radiated Spurious Emission Measurement Result: GSM 1900 Mode**

Operation Band	:GSM 1900	Temp./Humi.	:22 deg_C / 62 RH
Fundamental Frequen	:1850.2 MHz	Engineer	:Tin
Operation Mode	:Tx CH LOW		
EUT Pol.	:E2 Plane	Measurement Antenn Pol.	<sup>a</sup> :VERTICAL



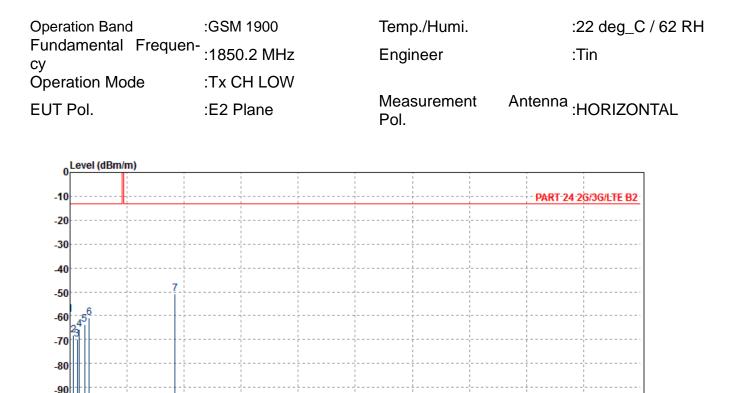
Freq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
 MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
30.00	-56.58	-41.42	-14.58	-0.58	-13.00	-43.58
148.34	-69.39	-66.21	-1.89	-1.29	-13.00	-56.39
282.20	-69.72	-71.39	3.42	-1.75	-13.00	-56.72
393.75	-65.61	-67.27	3.73	-2.07	-13.00	-52.61
546.04	-62.40	-64.57	3.99	-1.81	-13.00	-49.40
694.45	-61.84	-62.92	3.69	-2.61	-13.00	-48.84
3700.40	-55.47	-61.12	12.57	-6.91	-13.00	-42.47

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



4024.

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12012. Frequency (MHz)

16006.

20000

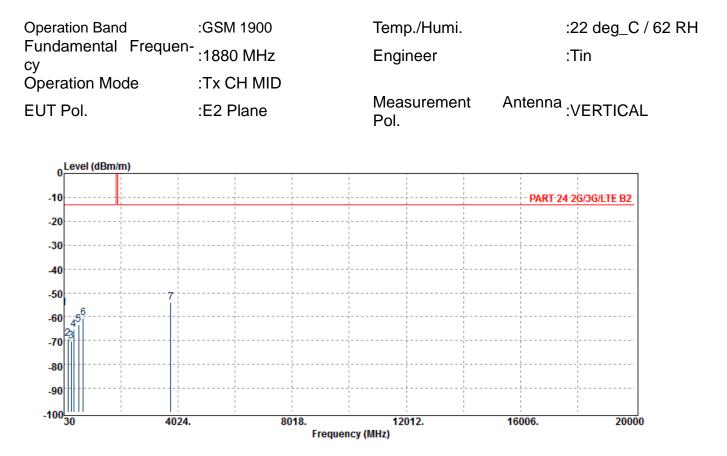
8018.

Freq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
30.00	-59.36	-44.20	-14.58	-0.58	-13.00	-46.36
148.34	-67.99	-64.82	-1.89	-1.29	-13.00	-54.99
284.14	-70.04	-71.70	3.42	-1.76	-13.00	-57.04
359.80	-65.61	-67.38	3.83	-2.06	-13.00	-52.61
536.34	-63.77	-65.66	4.00	-2.11	-13.00	-50.77
699.30	-60.73	-62.17	3.68	-2.24	-13.00	-47.73
3700.40	-50.86	-56.52	12.57	-6.91	-13.00	-37.86

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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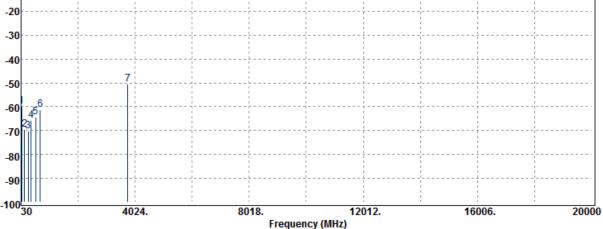
Freq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
30.00	-56.47	-41.31	-14.58	-0.58	-13.00	-43.47
168.71	-69.17	-67.14	-0.70	-1.33	-13.00	-56.17
289.96	-70.27	-71.91	3.42	-1.78	-13.00	-57.27
362.71	-65.39	-67.15	3.82	-2.07	-13.00	-52.39
544.10	-63.18	-65.38	3.99	-1.79	-13.00	-50.18
699.30	-60.50	-61.94	3.68	-2.24	-13.00	-47.50
3760.00	-54.06	-59.79	12.61	-6.89	-13.00	-41.06

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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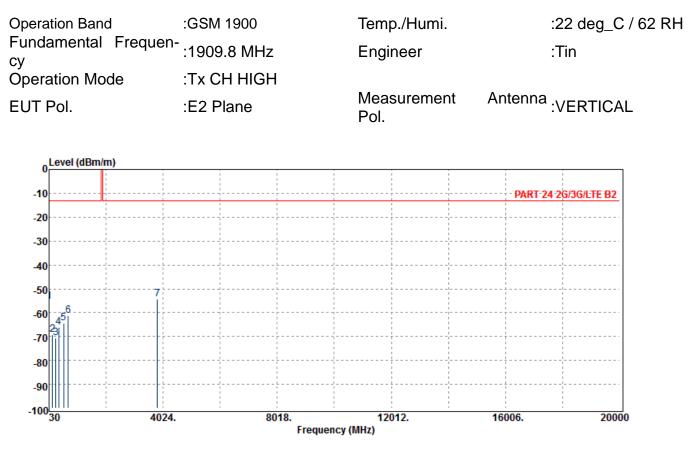
Operation Band Fundamental Frequen- cy	:GSM 1900 :1880 MHz	Temp./Humi. Engineer	:22 deg_C / 62 RH :Tin	
Operation Mode	:Tx CH MID			
EUT Pol.	:E2 Plane	Measurement Anter Pol.	Antenna :HORIZONTAL	
0_Level (dBm/m)				
-10		P/	RT-24-26/36/LTE-B2	



Fi	req.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
N	1Hz	dBm	dBm	dBd/dBi	dB	dBm	dB
46	5.49	-59.99	-47.47	-11.81	-0.71	-13.00	-46.99
14	6.40	-69.60	-66.33	-1.98	-1.29	-13.00	-56.60
28	9.96	-70.39	-72.03	3.42	-1.78	-13.00	-57.39
38	1.14	-65.67	-67.41	3.77	-2.02	-13.00	-52.67
53	7.31	-64.49	-66.42	4.00	-2.07	-13.00	-51.49
69	9.30	-61.39	-62.83	3.68	-2.24	-13.00	-48.39
376	60.00	-50.48	-56.21	12.61	-6.89	-13.00	-37.48

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



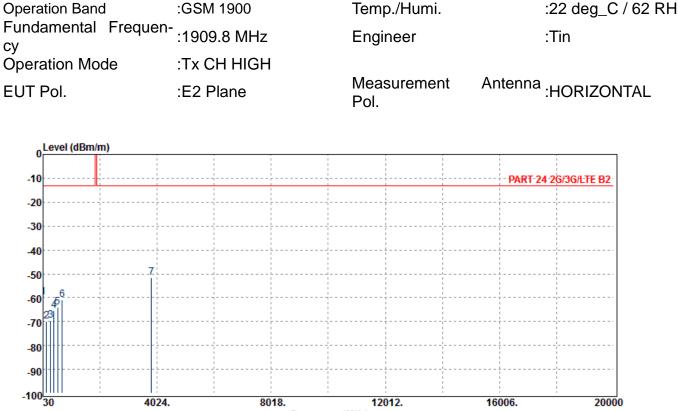


Freq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
 MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
30.00	-55.42	-40.26	-14.58	-0.58	-13.00	-42.42
154.16	-69.26	-66.39	-1.57	-1.30	-13.00	-56.26
272.50	-70.57	-72.32	3.48	-1.73	-13.00	-57.57
371.44	-66.01	-67.75	3.79	-2.05	-13.00	-53.01
542.16	-64.39	-66.52	3.99	-1.87	-13.00	-51.39
699.30	-61.30	-62.74	3.68	-2.24	-13.00	-48.30
3819.60	-54.50	-60.14	12.66	-7.02	-13.00	-41.50

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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Frequency (MHz)

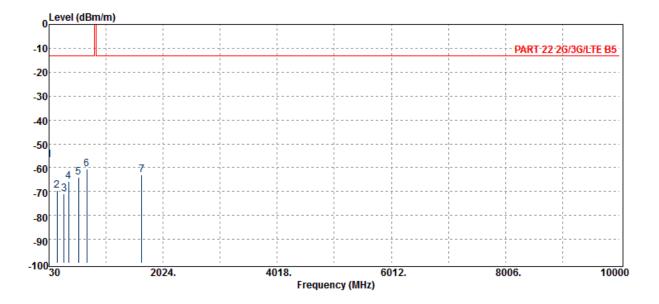
Freq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
30.00	-60.03	-44.87	-14.58	-0.58	-13.00	-47.03
146.40	-69.75	-66.48	-1.98	-1.29	-13.00	-56.75
291.90	-69.70	-71.37	3.46	-1.79	-13.00	-56.70
408.30	-65.45	-66.99	3.68	-2.14	-13.00	-52.45
548.95	-63.98	-65.99	3.98	-1.97	-13.00	-50.98
696.39	-60.89	-62.12	3.69	-2.46	-13.00	-47.89
3819.60	-51.61	-57.25	12.66	-7.02	-13.00	-38.61

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



### **Radiated Spurious Emission Measurement Result: WCDMA Band V Mode**

Operation Band	:WCDMA B5	Temp./Humi.	:24 deg_C / 61 RH
Fundamental Frequen	:826.4 MHz	Engineer	:Tin
Operation Mode	:Tx CH LOW		
EUT Pol.	:E2 Plane	Measurement Antenr Pol.	<sup>ia</sup> :VERTICAL

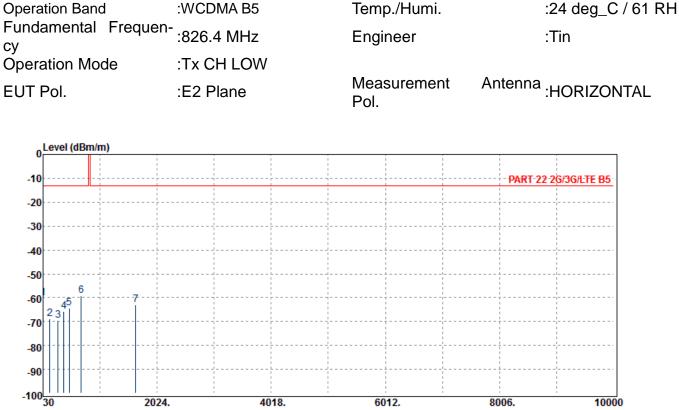


Freq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
 MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
30.00	-56.62	-41.46	-14.58	-0.58	-13.00	-43.62
173.56	-69.40	-68.02	-0.04	-1.35	-13.00	-56.40
293.84	-70.90	-72.60	3.50	-1.80	-13.00	-57.90
371.44	-65.73	-67.47	3.79	-2.05	-13.00	-52.73
547.01	-64.08	-66.20	3.98	-1.86	-13.00	-51.08
692.51	-60.63	-61.57	3.70	-2.76	-13.00	-47.63
1652.80	-63.07	-65.70	6.99	-4.36	-13.00	-50.07

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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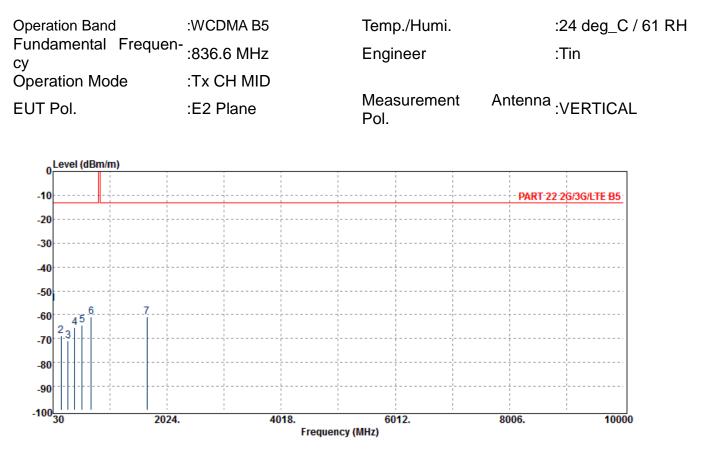


Frequency (MHz)

Freq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
30.00	-60.36	-45.20	-14.58	-0.58	-13.00	-47.36
151.25	-68.93	-65.90	-1.73	-1.29	-13.00	-55.93
294.81	-69.60	-71.31	3.52	-1.80	-13.00	-56.60
395.69	-65.90	-67.54	3.73	-2.08	-13.00	-52.90
485.90	-64.48	-66.56	3.91	-1.84	-13.00	-51.48
699.30	-59.00	-60.44	3.68	-2.24	-13.00	-46.00
1652.80	-62.96	-65.59	6.99	-4.36	-13.00	-49.96

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.





	Freq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
	MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
	30.00	-55.48	-40.32	-14.58	-0.58	-13.00	-42.48
	167.74	-69.02	-66.95	-0.76	-1.32	-13.00	-56.02
	293.84	-70.77	-72.47	3.50	-1.80	-13.00	-57.77
	405.39	-65.51	-67.06	3.69	-2.15	-13.00	-52.51
	542.16	-64.39	-66.51	3.99	-1.87	-13.00	-51.39
	694.45	-61.01	-62.09	3.69	-2.61	-13.00	-48.01
1	673.20	-60.80	-63.47	7.06	-4.39	-13.00	-47.80

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



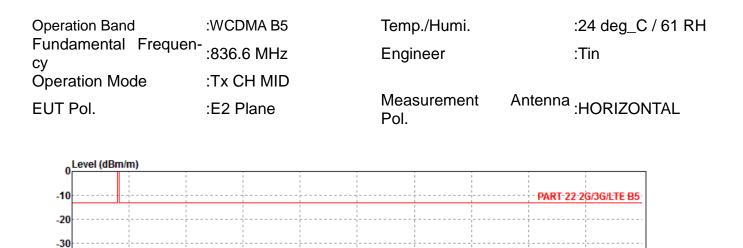
40 -50 -60

-100<mark>1</mark>30

4 5 2 -70 -80 -90

2024.

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Frequency (MHz)

6012.

8006.

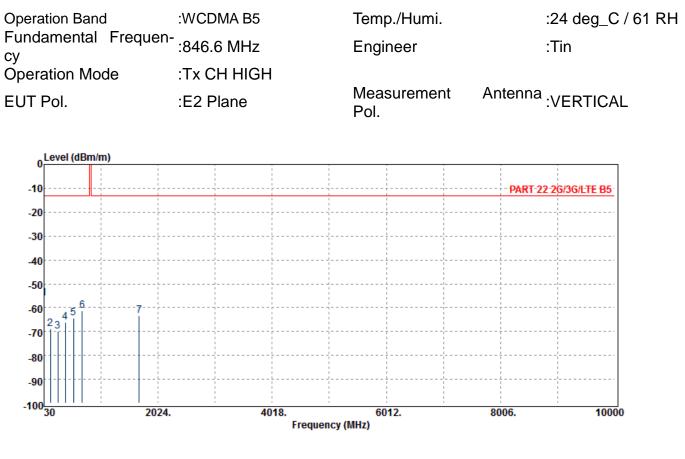
10000

4018.

Freq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
31.94	-60.24	-45.56	-14.08	-0.59	-13.00	-47.24
148.34	-69.02	-65.84	-1.89	-1.29	-13.00	-56.02
288.99	-70.25	-71.89	3.42	-1.78	-13.00	-57.25
362.71	-65.71	-67.46	3.82	-2.07	-13.00	-52.71
534.40	-64.71	-66.52	4.00	-2.19	-13.00	-51.71
697.36	-61.47	-62.77	3.68	-2.38	-13.00	-48.47
1673.20	-61.42	-64.08	7.06	-4.39	-13.00	-48.42

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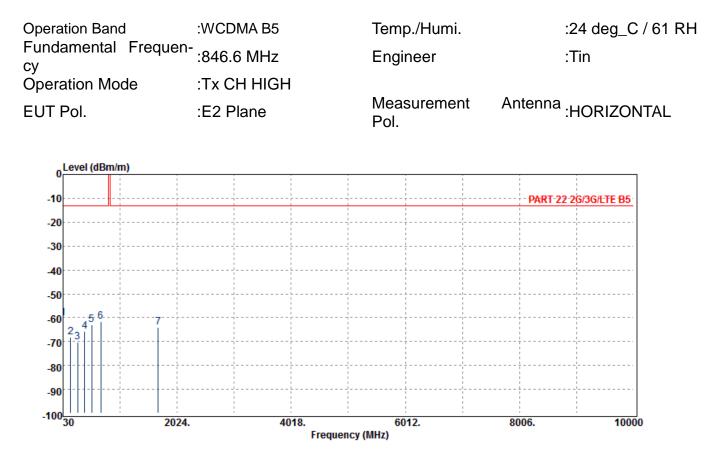


Freq.	ERP/EIRP	SG	Antenna	Cable	Limit	Margin
		Output Level	Gain	Loss		
MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
31.94	-55.99	-41.32	-14.08	-0.59	-13.00	-42.99
144.46	-69.00	-65.64	-2.08	-1.28	-13.00	-56.00
274.44	-69.95	-71.68	3.46	-1.73	-13.00	-56.95
401.51	-66.05	-67.64	3.71	-2.13	-13.00	-53.05
544.10	-64.28	-66.48	3.99	-1.79	-13.00	-51.28
699.30	-61.38	-62.82	3.68	-2.24	-13.00	-48.38
1693.20	-63.27	-65.97	7.12	-4.43	-13.00	-50.27

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F	Freq.	ERP/EIRP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
	MHz	dBm	dBm	dBd/dBi	dB	dBm	dB
3	31.94	-60.12	-45.45	-14.08	-0.59	-13.00	-47.12
1	65.80	-68.30	-66.11	-0.88	-1.31	-13.00	-55.30
2	84.14	-70.30	-71.96	3.42	-1.76	-13.00	-57.30
4	10.24	-65.71	-67.25	3.68	-2.13	-13.00	-52.71
5	31.49	-63.00	-64.69	4.01	-2.31	-13.00	-50.00
6	91.54	-61.56	-62.42	3.70	-2.83	-13.00	-48.56
16	693.20	-63.89	-66.59	7.12	-4.43	-13.00	-50.89

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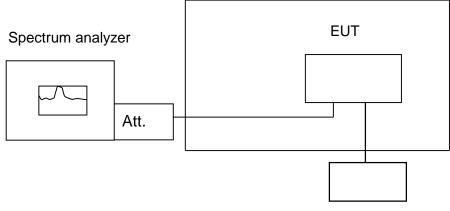
#### FREQUENCY STABILITY MEASUREMENT 11.

## 11.1. Standard Applicable

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

## 11.2. Test Set-up

**Temperature Chamber** 



Variable DC Power Supply

Note: Measurement setup for testing on Antenna connector

## **11.3. Measurement Procedure**

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

Set chamber temperature to 25°C. Use a variable AC power supply / DC power source to

power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (+/- 15%) and endpoint as declared by the manufacturer, record the maximum frequency change.

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### 11.4. Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUM- BER	SERIAL NUM- BER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	05/03/2018	05/02/2019
Radio Commu- nication Analyer	Anritsu	MT8815B	6200711454	04/05/2018	04/04/2019
DC Power Supply	Agilent	E3640A	MY52410006	11/28/2017	11/27/2018
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2018	01/01/2019
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2018	01/01/2019
2WayDivider	Woken	DSU7AMK1A1	N/A	01/02/2018	01/01/2019
Coaxial Cable	Huber Su- hner	SUCOFLEX 102EPA	MY2616/2	01/02/2018	01/01/2019

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### **11.5. Measurement Result**

### FREQUENCY ERROR vs. VOLTAGE

	GPRS 850	Mid Channel	836.6	MHz				
	Limi	t: +/- 2.5 ppm						
Vdc	Temp. (°C)	Freq. (MHz)	Delta (Hz)	Limit (Hz)				
FR	FREQUENCY ERROR vs. VOLTAGE							
4.37	20	836.60036	360	2091				
3.8	20	836.5986	-1400	2091				
3.23	20	836.60161	1610	2091				
3 (End point)	20	836.59866	-1340	2091				

### FREQUENCY ERROR vs. TEMPERATURE

FREQUENCY ERROR vs. Temp.								
3.8	50	836.5988	-1200	2091				
3.8	40	836.60033	330	2091				
3.8	30	836.59894	-1060	2091				
3.8	20	836.5986	-1400	2091				
3.8	10	836.59951	-490	2091				
3.8	0	836.59951	-490	2091				
3.8	-10	836.60127	1270	2091				
3.8	-20	836.59891	-1090	2091				
3.8	-30	836.60186	1860	2091				

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### FREQUENCY ERROR vs. VOLTAGE

(	1880	MHz		
	Limi	t: +/- 2.5 ppm		
Vdc	Temp. (°C)	Freq. (MHz)	Delta (Hz)	Limit (Hz)
FR	EQUENCY	ERROR vs.	VOLTAGE	
4.37	20	1879.99871	-1290	4700
3.8	20	1880.001	1000	4700
3.23	20	1880.00268	2680	4700
3 (End point)	20	1879.99724	-2760	4700

### FREQUENCY ERROR vs. TEMPERATURE

FREQUENCY ERROR vs. Temp.								
3.8	50	1879.99826	-1740	4700				
3.8	40	1880.00145	1450	4700				
3.8	30	1879.99814	-1860	4700				
3.8	20	1880.001	1000	4700				
3.8	10	1880.00203	2030	4700				
3.8	0	1880.00019	190	4700				
3.8	-10	1879.99798	-2020	4700				
3.8	-20	1879.99788	-2120	4700				
3.8	-30	1880.00237	2370	4700				

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### FREQUENCY ERROR vs. VOLTAGE

	WCDMA V	Mid Channel	836.6	MHz
	Limi	t: +/- 2.5 ppm	l	
Vdc	Temp. (°C)	Freq. (MHz)	Delta (Hz)	Limit (Hz)
FR	EQUENCY	ERROR vs.	VOLTAGE	
4.37	20	836.59871	-1290	2091
3.8	20	836.59838	-1620	2091
3.23	20	836.59968	-320	2091
3 (End point)	20	836.60122	1220	2091

### FREQUENCY ERROR vs. TEMPERATURE

FREQUENCY ERROR vs. Temp.								
3.8	50	836.6006	600	2091				
3.8	40	836.59816	-1840	2091				
3.8	30	836.59906	-940	2091				
3.8	20	836.59838	-1620	2091				
3.8	10	836.59845	-1550	2091				
3.8	0	836.60078	780	2091				
3.8	-10	836.59896	-1040	2091				
3.8	-20	836.5982	-1800	2091				
3.8	-30	836.59867	-1330	2091				

Note: The battery is rated 3.8V dc.

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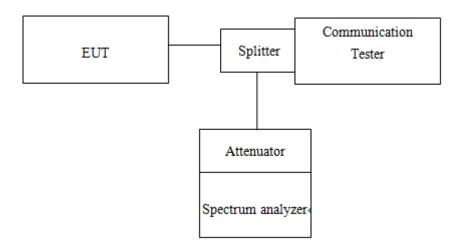


#### 12. PEAK TO AVERAGE RATIO

## 12.1. Standard Applicable

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

### 12.2. Test SET-UP



### **12.3. Measurement Procedure**

- 1. KDB 971168 D01 is employed as the following procedure is proper adjusted accordingly:
- 2. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth; & internal =1ms
- 3. Set the number of counts to a value that stabilizes the measured CCDF curve.

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### 12.4. Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer			MY50420195	05/03/2018	05/02/2019
Radio Commu- nication Analyer Anritsu		MT8815B	6200711454	04/05/2018	04/04/2019
DC Power Sup- ply	Agilent	E3640A	MY52410006	11/28/2017	11/27/2018
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2018	01/01/2019
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2018	01/01/2019
2WayDivider	Woken	DSU7AMK1A1	N/A	01/02/2018	01/01/2019
Coaxial Cable	Huber Su- hner	SUCOFLEX 102EPA	MY2616/2	01/02/2018	01/01/2019

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### 12.5. Measurement Result

### **Tabular Results:**

Freq.		Peak-to-Average Ratio (dB)		
(MHz)	СН	GSM 1900	GPRS 1900	
1850.2	512	9.68	9.2	
1880	661	9.65	9.32	
1909.8	810	9.64	8.89	

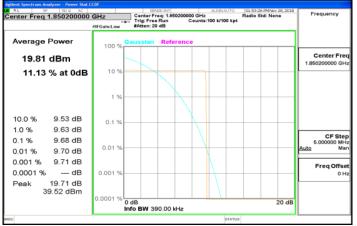
### **Measurement Results:**

Please refer to next page.

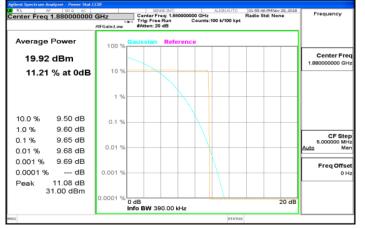
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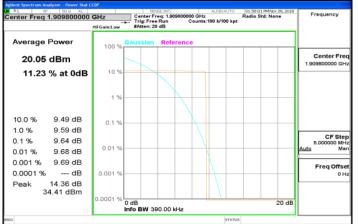
### GSM 1900MHz LowCH512-1850.2



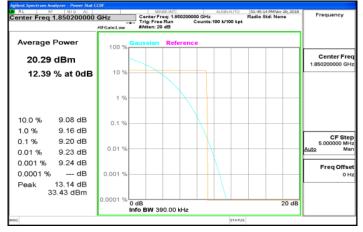
#### GSM 1900MHz MidCH661-1880



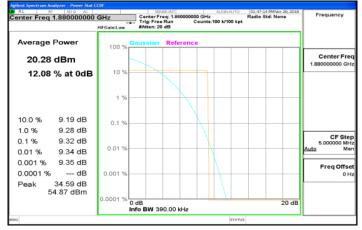
#### GSM\_1900MHz\_HighCH810-1909.8



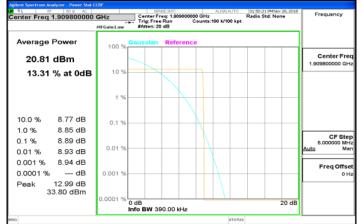
#### GPRS 1900MHz LowCH512-1850.2



#### GPRS 1900MHz MidCH661-1880



### GPRS\_1900MHz\_HighCH810-1909.8



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