

## 7.2 EQUIVALENT ISOTROPIC RADIATED POWER (GSM/ WCDMA)

### (GSM1900 Mode)

Ch./ Freq.		Measured Level(dBm)	Substitute LEVEL (dBm)	Ant. Gain (dBi)	C.L	Pol.	EIRP	
channel	Freq.(MHz)						W	dBm
512	1,850.20	-12.50	19.53	10.02	1.41	H	0.652	28.14
661	1,880.00	-13.08	19.23	10.04	1.45	H	0.605	27.82
810	1,909.80	-13.40	18.85	10.05	1.44	H	0.557	27.46

### (WCDMA1900 Mode)

Ch./ Freq.		Measured Level(dBm)	Substitute LEVEL (dBm)	Ant. Gain (dBi)	C.L	Pol.	EIRP	
channel	Freq.(MHz)						W	dBm
9262	1,852.40	-17.32	14.83	10.02	1.40	H	0.221	23.45
9400	1,880.00	-18.29	14.02	10.04	1.45	H	0.182	22.61
9538	1,907.60	-18.59	13.97	10.05	1.48	H	0.179	22.54

Note: Standard batteries are the only options for this phone. And a peak detector is used.

#### NOTES:

Equivalent Isotropic Radiated Power Measurements by Substitution Method  
according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a non-conductive styrofoam resin table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For WCDMA signals, a peak detector is used, with RBW = VBW = 5MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the Horn antenna is measured. The difference between the gain of the horn and an isotropic antenna is taken into consideration and the EIRP is recorded.

This device was tested under all configurations and the highest power is reported in GSM mode and using a Power Control Level of "0" in the PCS Band and "5" in the Cellular Band. This unit was tested with its standard battery. Also, we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna. The worst case of the EUT is in x plane in GSM1900 mode. Also worst case of detecting Antenna is in horizontal polarization in GSM1900 mode.

FCC CERTIFICATION REPORT			<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1307FR22-1	Date of Issue: July 22, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WFI802.11 b/g/n	FCC ID: ZNFE410J

## 7.3 RADIATED SPURIOUS EMISSIONS

### 7.3.1 RADIATED SPURIOUS EMISSIONS (GSM850)

- ▣ MEASURED OUTPUT POWER: 26.11 dBm = 0.408 W
- ▣ MODULATION SIGNAL: GSM850
- ▣ DISTANCE: 3 meters
- ▣ LIMIT:  $43 + 10 \log_{10}(W) =$  39.11 dBc

Ch.	Freq.(MHz)	<u>Measured Level</u> [dBm]	Ant. Gain (dBd)	<u>Substitute</u> <u>Level</u> [dBm]	C.L	Pol.	ERP (dBm)	dBc
128 (824.2)	1,648.40	-27.75	7.05	-34.59	1.18	V	-28.72	54.83
	2,472.60	-48.05	7.90	-51.80	1.57	V	-45.47	71.58
	3,296.80	-45.77	9.91	-49.65	1.99	V	-41.73	67.84
190 (836.6)	1,673.20	-31.49	7.22	-38.49	1.20	V	-32.47	58.58
	2,509.80	-51.48	8.51	-55.27	1.65	H	-48.41	74.52
	3,346.40	-46.18	10.09	-50.57	2.00	H	-42.48	68.59
251 (848.8)	1,697.60	-36.61	7.34	-43.63	1.20	V	-37.49	63.60
	2,546.40	-49.44	8.61	-52.98	1.65	V	-46.02	72.13
	3,395.20	-43.95	10.22	-48.48	1.99	H	-40.25	66.36

- NOTES:**
1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:
  2. The magnitude of spurious emissions attenuated more than 20dB below the limit above 5<sup>th</sup> Harmonic for all channel.
  3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

### 7.3.2 RADIATED SPURIOUS EMISSIONS (GSM1900)

- MEASURED OUTPUT POWER: 28.14 dBm = 0.652 W
- MODULATION SIGNAL: GSM1900
- DISTANCE: 3 meters
- LIMIT:  $43 + 10 \log_{10}(W) =$  41.14 dBc

Ch.	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	EIRP (dBm)	dBc
512 (1850.2)	3,700.40	-54.53	12.27	-59.27	2.19	V	-49.19	77.33
	5,550.60	-51.63	13.40	-51.30	2.88	H	-40.78	68.92
	7,400.80	-54.60	11.37	-44.31	3.29	V	-36.23	64.37
661 (1880.0)	3,760.00	-52.02	12.31	-56.57	2.11	V	-46.37	74.51
	5,640.00	-51.99	13.41	-51.32	2.92	V	-40.83	68.97
	7,520.00	-52.26	11.55	-42.74	3.34	V	-34.53	62.67
810 (1909.8)	3,819.60	-47.86	12.37	-52.34	2.14	H	-42.11	70.25
	5,729.40	-50.17	13.42	-48.73	3.02	V	-38.33	66.47
	7,639.20	-50.56	11.70	-40.80	3.13	H	-32.23	60.37

- NOTES:**
1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:
  2. The magnitude of spurious emissions attenuated more than 20dB below the limit above 5<sup>th</sup> Harmonic for all channel.
  3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

### 7.3.3 RADIATED SPURIOUS EMISSIONS (WCDMA1900)

- MEASURED OUTPUT POWER: 23.45 dBm = 0.221 W
- MODULATION SIGNAL: WCDMA1900
- DISTANCE: 3 meters
- LIMIT:  $43 + 10 \log_{10}(W) =$  36.45 dBc

Ch.	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBi)	Substitute Level [dBm]	C.L	Pol.	EIRP (dBm)	dBc
9262	3,704.80	-45.79	12.27	-50.53	2.19	H	-40.45	63.90
	5,557.20	-51.87	13.40	-51.54	2.88	H	-41.02	64.47
	7,409.60	-48.80	11.37	-38.51	3.29	V	-30.43	53.88
9400	3,760.00	-51.83	12.31	-56.38	2.11	V	-46.18	69.63
	5,640.00	-53.07	13.41	-52.40	2.92	H	-41.91	65.36
	7,520.00	-52.76	11.55	-43.24	3.34	H	-35.03	58.48
9538	3,815.20	-53.15	12.37	-57.63	2.14	V	-47.40	70.85
	5,722.80	-51.74	13.42	-50.30	3.02	V	-39.90	63.35
	7,630.40	-52.42	11.70	-42.66	3.13	H	-34.09	57.54

- NOTES:**
1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:
  2. The magnitude of spurious emissions attenuated more than 20dB below the limit above 5<sup>th</sup> Harmonic for all channel.
  3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

## 7.4 PEAK-TO-AVERAGE RATIO

Band	Ch.	Measured P <sub>Pk</sub> (dBm)	Measured P <sub>Avg</sub> (dBm)	P <sub>Avg</sub> (Duty Cycle)			P.A.R. = P <sub>Pk</sub> - P <sub>Avg</sub> (dB)	Limit (dB)	Pass / Fail
				Tx <sub>Total</sub> (ms)	Tx <sub>On</sub> (ms)	Factor (dB)			
GSM1900	661	30.17	20.71	4.6232	0.5507	9.24	0.22	13	Pass
WCDMA1900	9400	CCDF Procedure					3.48		

- Plots of the EUT's Peak- to- Average Ratio are shown Page 29 ~ 30, 32.

### NOTES:

Peak to Average Power Ratio was tested in accordance with KDB971168 D01 Power Meas License Digital Systems v02r01, June 7, 2013, Section 5.7.

Only GSM(include EDGE) Mode was tested by Section 5.7.2 Alternate Procedure

$P.A.R.(dB) = P_{Pk}(dBm) - P_{Avg}(dBm)$  (P<sub>Avg</sub> = Average Power + Duty cycle Factor)

Duty cycle Factor =  $10 \log(1/x)$ ,  $x = Tx_{On} / Tx_{Total}$

## 7.5 OCCUPIED BANDWIDTH

Band	Channel	Frequency(MHz)	Data (MHz) (GSM: kHz)
GSM850	128	824.20	245.6694
	190	836.60	245.3426
	251	848.80	247.4383
GSM1900	512	1850.20	245.7743
	661	1880.00	245.3137
	810	1909.80	247.7873
WCDMA1900	9262	1852.40	4.1761
	9400	1880.00	4.1691
	9538	1907.60	4.1663

- Plots of the EUT's Occupied Bandwidth are shown Page 26 ~ 28, 30 ~ 31.

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## 7.6 CONDUCTED SPURIOUS EMISSIONS

Band	Channel	Frequency of Maximum Harmonic (GHz)	Maximum Data (dBm)
GSM850	128	4.808900	-28.48
	190	4.816360	-28.90
	251	4.691110	-29.39
GSM1900	512	10.303130	-24.56
	661	5.555310	-25.39
	810	6.930400	-25.30
WCDMA1900	9262	6.952920	-25.78
	9400	6.971860	-24.99
	9538	6.950920	-25.31

- Plots of the EUT's Conducted Spurious Emissions are shown Page 38 ~ 47.

### 7.6.1 BAND EDGE

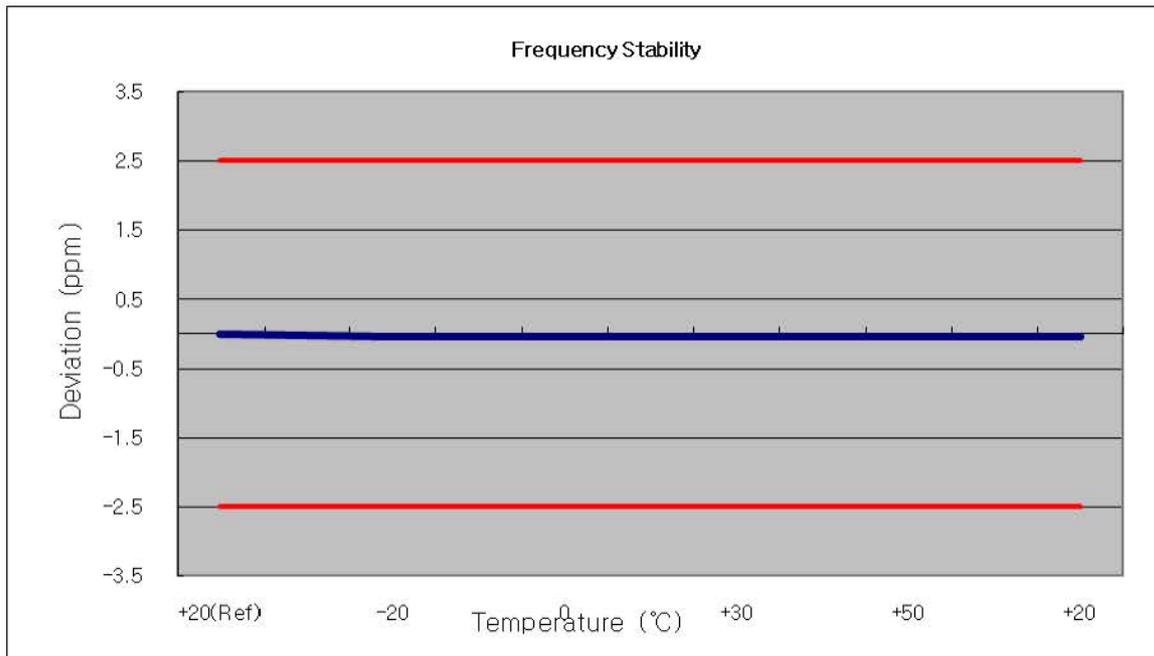
- Plots of the EUT's Band Edge are shown Page 32 ~ 38.

## 7.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

### 7.7.1 FREQUENCY STABILITY (GSM850)

- ▣ OPERATING FREQUENCY: 836,600,000 Hz
- ▣ CHANNEL: 190
- ▣ REFERENCE VOLTAGE: 3.7 VDC
- ▣ DEVIATION LIM IT: ± 0.000 25 % or 2.5 ppm

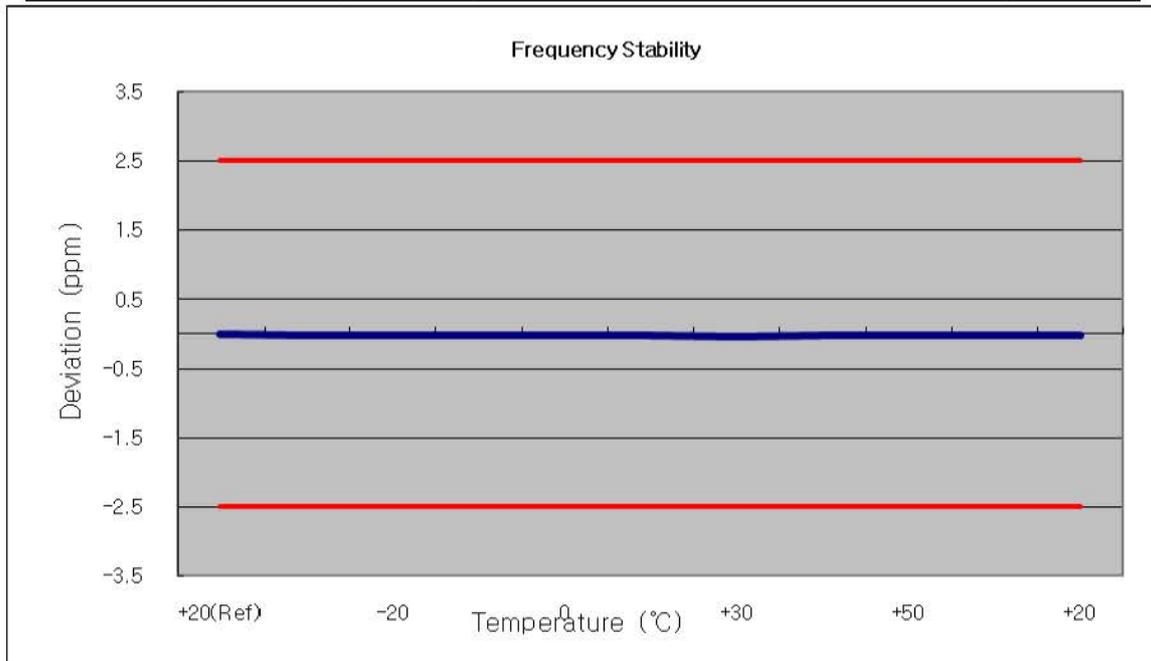
Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.700	+20(Ref)	836 600 029	0	0.000 000	0.000
100%		-30	836 600 006	-22.82	-0.000 003	-0.027
100%		-20	836 599 999	-29.70	-0.000 004	-0.036
100%		-10	836 599 998	-30.81	-0.000 004	-0.037
100%		0	836 599 997	-32.09	-0.000 004	-0.038
100%		+10	836 599 994	-35.07	-0.000 004	-0.042
100%		+30	836 599 993	-36.00	-0.000 004	-0.043
100%		+40	836 599 994	-35.20	-0.000 004	-0.042
100%		+50	836 599 994	-34.84	-0.000 004	-0.042
115%		4.255	+20	836 599 993	-36.38	-0.000 004
Batt. Endpoint	3.400	+20	836 599 992	-37.24	-0.000 004	-0.045



### 7.7.2 FREQUENCY STABILITY (GSM1900)

- ▣ OPERATING FREQUENCY: 1880,000,000 Hz
- ▣ CHANNEL: 661
- ▣ REFERENCE VOLTAGE: 3.7 VDC
- ▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

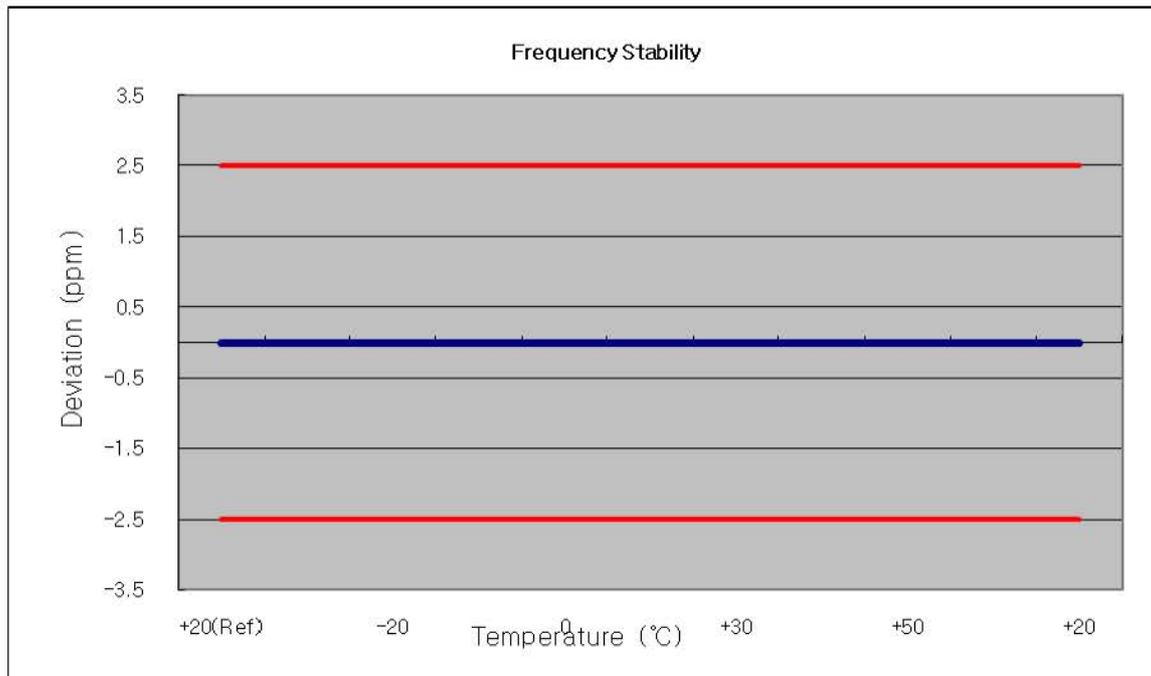
Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.700	+20(Ref)	1880 000 058	0	0.000 000	0.000
100%		-30	1880 000 000	-57.78	-0.000 003	-0.031
100%		-20	1880 000 004	-53.59	-0.000 003	-0.029
100%		-10	1880 000 002	-55.70	-0.000 003	-0.030
100%		0	1880 000 001	-56.37	-0.000 003	-0.030
100%		+10	1880 000 002	-55.61	-0.000 003	-0.030
100%		+30	1879 999 997	-60.33	-0.000 003	-0.032
100%		+40	1880 000 001	-56.44	-0.000 003	-0.030
100%		+50	1880 000 002	-55.91	-0.000 003	-0.030
115%		4.255	+20	1880 000 001	-56.07	-0.000 003
Batt. Endpoint	3.400	+20	1880 000 004	-53.97	-0.000 003	-0.029



### 7.7.3 FREQUENCY STABILITY (WCDMA1900)

- ▣ OPERATING FREQUENCY: 1,880,000,000 Hz
- ▣ CHANNEL: 9400
- ▣ REFERENCE VOLTAGE: 3.7VDC
- ▣ DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.700	+20(Ref)	1880 000 015	0	0.000 000	0.000
100%		-30	1879 999 984	-15.73	-0.000 001	-0.008
100%		-20	1879 999 986	-14.17	-0.000 001	-0.008
100%		-10	1879 999 982	-18.47	-0.000 001	-0.010
100%		0	1879 999 980	-20.46	-0.000 001	-0.011
100%		+10	1879 999 984	-15.74	-0.000 001	-0.008
100%		+30	1879 999 975	-24.57	-0.000 001	-0.013
100%		+40	1879 999 983	-16.78	-0.000 001	-0.009
100%		+50	1879 999 980	-19.91	-0.000 001	-0.011
115%	4.255	+20	1879 999 980	-20.46	-0.000 001	-0.011
Batt. Endpoint	3.400	+20	1879 999 981	-18.84	-0.000 001	-0.010





## 8. TEST PLOTS

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■ GSM850 MODE (128 CH.) Occupied Bandwidth



■ GSM850 MODE (190 CH.) Occupied Bandwidth



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■ GSM850 MODE (251 CH.) Occupied Bandwidth



■ GSM1900 MODE (512 CH.) Occupied Bandwidth



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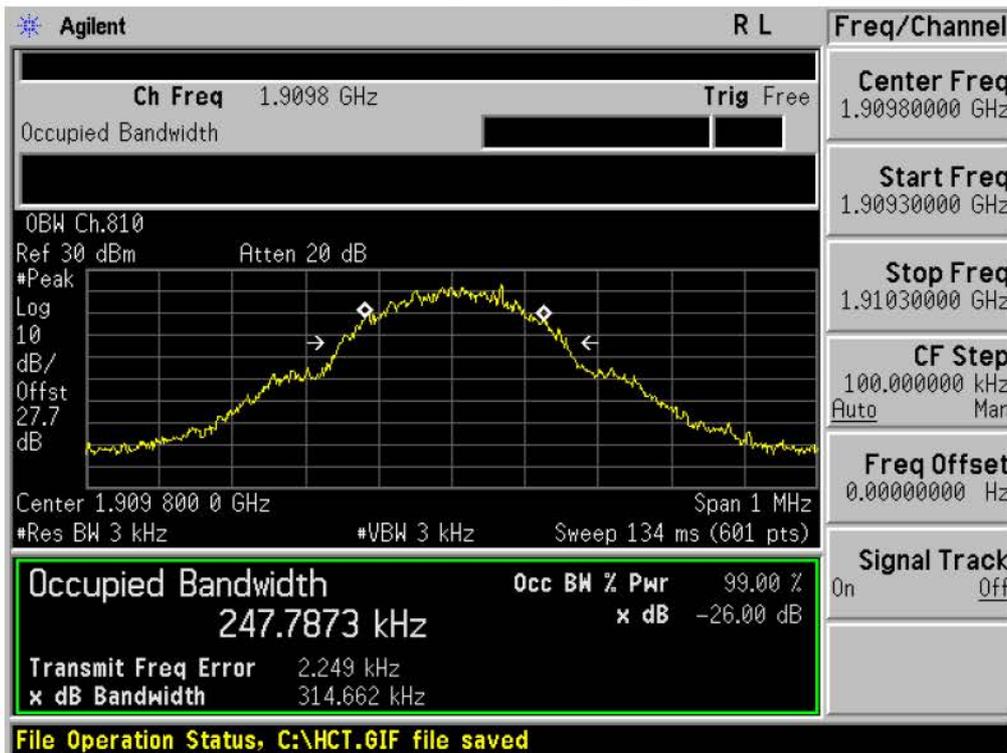
EUT Type:  
GSM/WCDMA Phone with Bluetooth3.0, WMF1802.11 b/g/n

FCC ID:  
ZNFE410J

■ GSM1900 MODE (661 CH.) Occupied Bandwidth



■ GSM1900 MODE (810 CH.) Occupied Bandwidth



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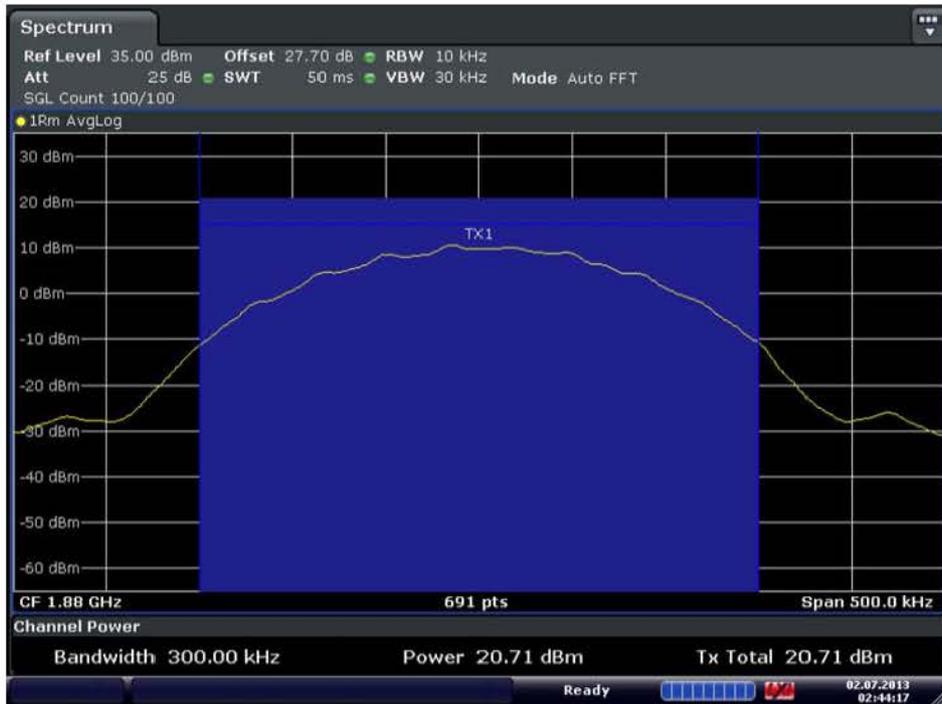
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■ GSM1900 MODE (661 CH.) Peak-to-Average Ratio  $P_{PK}$



Date: 2.JUL.2013 02:45:03

■ GSM1900 MODE (661 CH.) Peak-to-Average Ratio  $P_{Avg}$



Date: 2.JUL.2013 02:44:17

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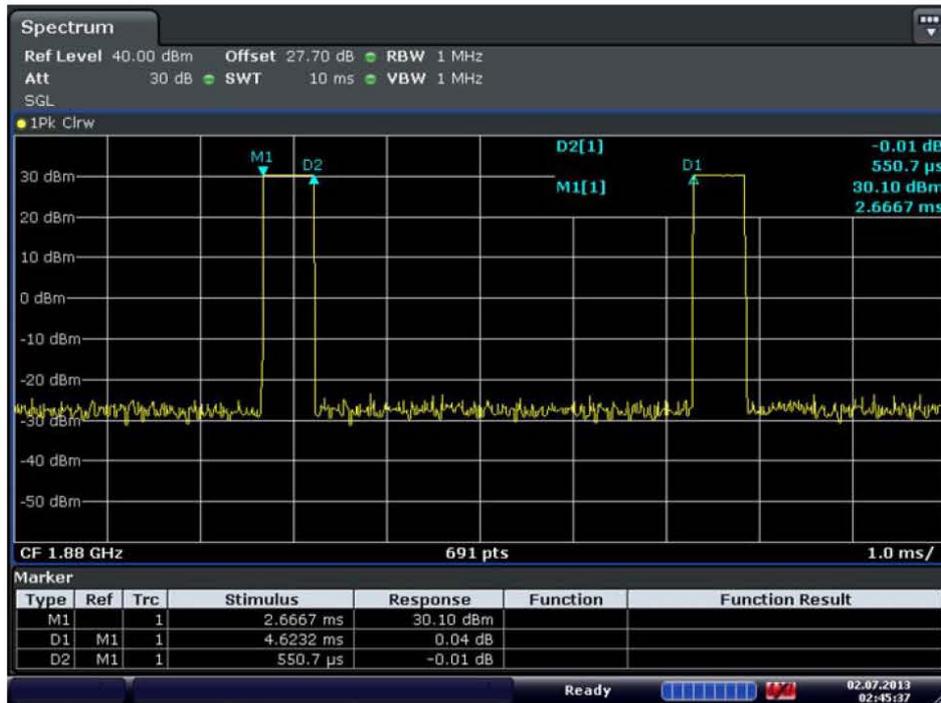
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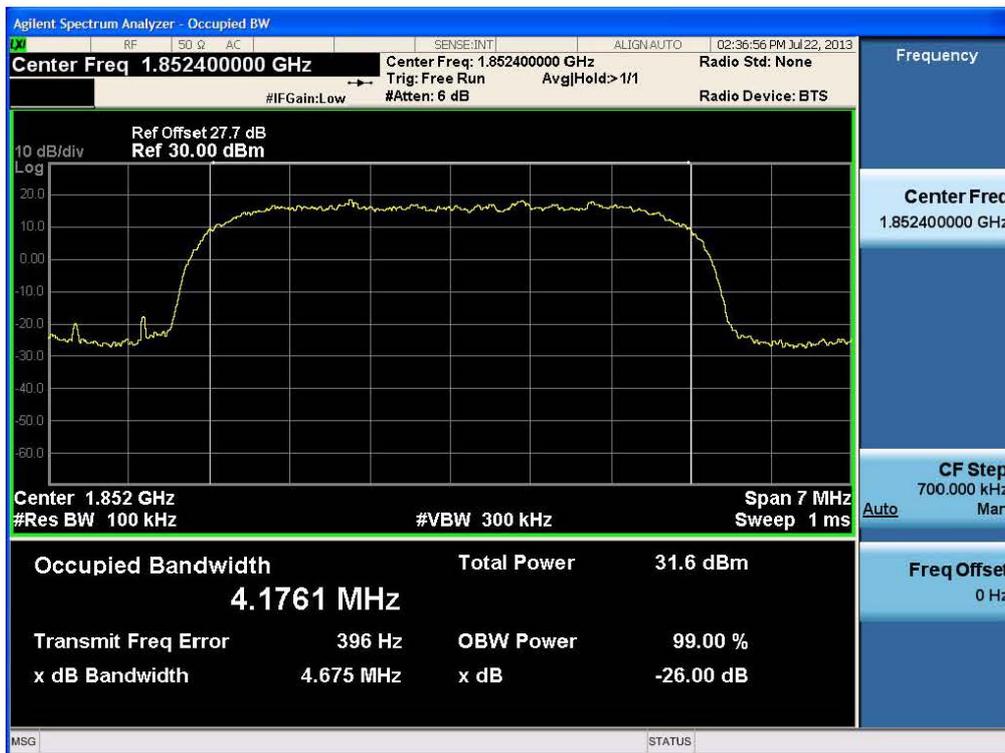
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■ GSM1900 MODE (661 CH.) Peak-to-Average Ratio  $P_{Avg}$



Date: 2.JUL.2013 02:45:38

■ WCDMA1900 MODE (9262 CH.) Occupied Bandwidth



■ WCDMA1900 MODE (9400 CH.) Occupied Bandwidth



■ WCDMA1900 MODE (9538 CH.) Occupied Bandwidth



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