

Doc Sec.	Test Data – VOIP841XY/ZZ Handset RF	Revision	1.2
		Page(s)	1 of 20

# TEST REPORT

**FCC ID:** Base: **PBWB187R26**  
**IC:** Handset: **PBWB187R26H**

**Equipment Under Test:  
(EUT)** **VOIP841 XY/ZZ**  
S/N MS000639010015 (Conducted measurement)  
S/N MS000639010016 (Radiated measurement)  
S/N MS000639010017 (SAR measurement)  
S/N MS000639010018 (SAR measurement)

**In Accordance With:** **FCC Part 15, Subparts B, C & D**  
**IC RSS-213, RSS-Gen, & ICES-003**  
UPCS / LE-PCS Isochronous Device  
Base & Handset: **1921.536 – 1928.448 MHz**

ANSI C63.17 – 1998 (or 2005 Draft where applicable)

**Tested By:** **Frank / Jeffrey**

**Reviewed By:** **Kevin Yau**

Date: **September 28, 2006**

Doc Sec. <b>Test Data – VOIP841XY/ZZ Handset RF</b>	Revision    1.2
	Page(s)    2 of 20

## TABLE OF CONTENTS

1	CHANNEL FREQUENCIES .....	3
2	ANTENNA REQUIREMENT.....	4
3	MONITORING THRESHOLD .....	7
4	FREQUENCY STABILITY AND JITTER.....	7
5	EMISSION BANDWIDTH .....	8
5.1	Handset.....	8
6	CONDUCTED PEAK TRANSMIT POWER.....	9
6.1	Handset.....	9
7	RADIATED PEAK POWER .....	10
7.1	Handset.....	11
8	RF EXPOSURE .....	12
8.1	Handset SAR .....	12
9	DUTY CYCLE CORRECTION FACTOR.....	13
9.1	Handset.....	13
10	POWER SPECTRAL DENSITY .....	14
11	EMISSIONS AT BAND EDGE AND BEYOND .....	14
12	RADIATED SPURIOUS EMISSIONS.....	15
12.1	Handset without earset plugged in.....	15
12.2	Handset with earset plugged in.....	17
APPENDIX	TEST SETUP.....	18
	Radiation Test Set-up & Procedure.....	18

Doc Sec. <b>Test Data – VOIP841XY/ZZ Handset RF</b>	Revision    1.2
	Page(s) <b>3 of 20</b>

## 1      CHANNEL FREQUENCIES

**Clause:**      **15.303 (d) & (g) / 1**

**Requirement:** Within 1920 – 1930 MHz band for isochronous devices

U-/LE-PCS CHANNEL	FREQUENCY (MHz)
Band Edge	1930.000
<b>1 (High)</b>	1928.448
2	1926.720
<b>3 (Mid)</b>	1924.992
4	1923.264
<b>5 (Low)</b>	1921.536
Band Edge	1920.000

**Test Condition:** Refer to RF Communication Protocol or Test Mode Procedure for the selection of channel in normal and test modes of operation.

## 2 ANTENNA REQUIREMENT

**Clause:** 15.317 (15.203) / 4.1 (e), RSS-Gen 7.1.4

**Requirement:** No antenna other than that furnished by the responsible party shall be used with the device

**Observation:** Base and Handset have each a pre-formed wire antenna permanently attached on the PCB; it is not user replaceable. Base has an additional internal antenna for diversity configuration. There is no external antenna or connector provided on the base or handset for the user to use antenna other than that furnished originally.

**Spec of Antenna:** As follows across the band:

Base antenna tx gain = 1.12 dBi (1.294 numeric) max.

Handset antenna tx gain = 0.21 dBi (1.05 numeric) max.

**Result:** As antenna gain < 3 dBi, no correction factor necessary to be applied to subsequent radiation measurement readings.

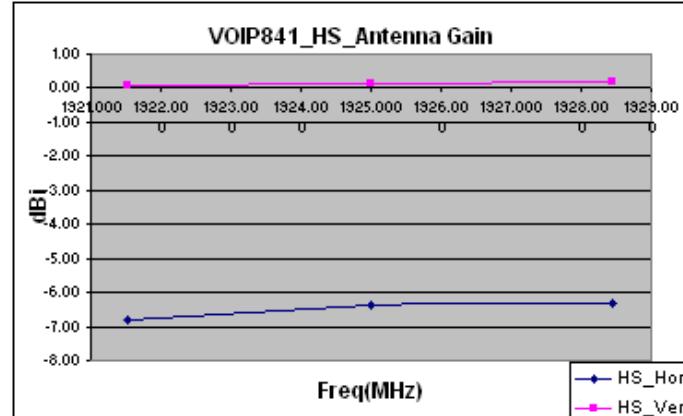
### GAIN

#### VOIP841 Antenna Gain for FCC Approval Sample

Ascalade Technologies Inc.

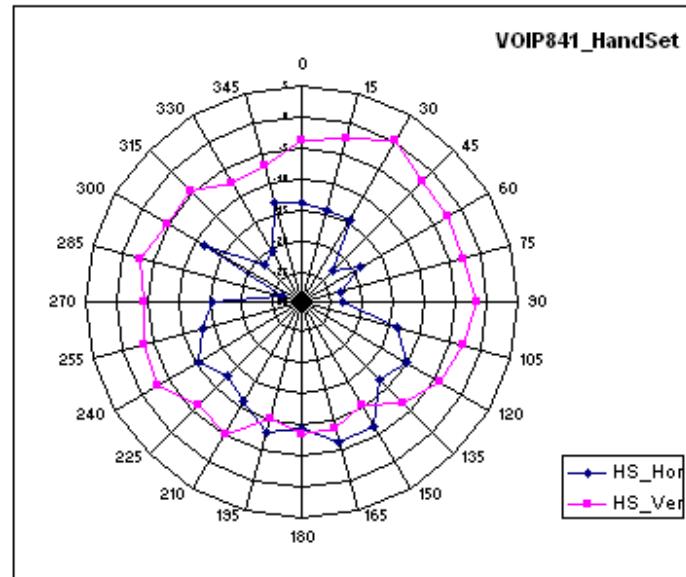
Date: Sept 18, 2006

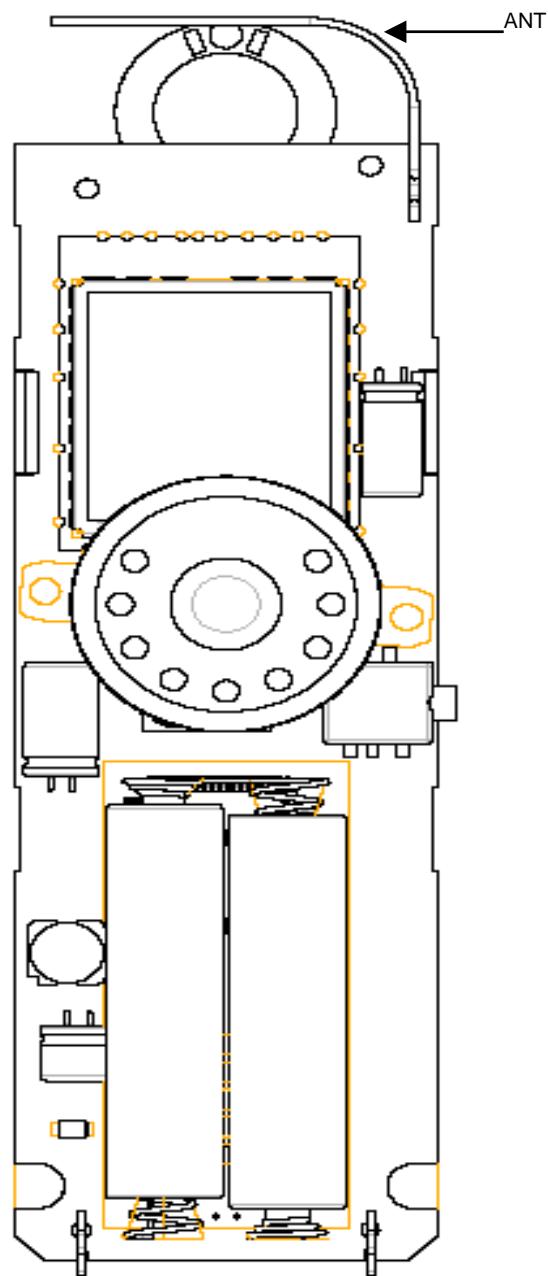
	Channel	Ch 1	Ch 3	Ch 5
	Freq(MHz)	1928.448	1924.992	1921.536
HS	Hor	-6.34	-6.40	-6.82
HS	Ver	0.21	0.12	0.08



## POLARIZATION PATTERN

Degree	HS_Hor (dBi)	HS_Ver (dBi)
0	-13.88	-3.82
15	-14.5	-2.41
30	-14.65	0.21
45	-22.62	-2.47
60	-18.87	-2.45
75	-23.44	-2.82
90	-23.42	-1.7
105	-13.84	-3.03
120	-10.43	-3.99
135	-12.33	-6.61
150	-6.65	-10.91
165	-6.4	-9.02
180	-9.55	-8.41
195	-8.23	-10.59
210	-11.24	-5.38
225	-13.02	-6.29
240	-10.83	-2.86
255	-13.41	-3.42
270	-15.65	-4.46
285	-26.94	-2.82
300	-11.64	-4.65
315	-21.5	-4.62
330	-20.54	-7.48
345	-13.3	-7.32
360	-13.51	-3.99
Max(dBi)	-6.40	0.21
Min(dBi)	-26.94	-10.91
Diff(dB)	20.54	11.12



**HANDSET ANTENNA ASSEMBLY**

**3 MONITORING THRESHOLD****4 FREQUENCY STABILITY AND JITTER**

Test results of original equipment under TIMCO reference 920AUT5 continue to be representative and applicable.

Doc Sec. <b>Test Data – VOIP841XY/ZZ Handset RF</b>	Revision <b>1.2</b>
	<b>Page(s) 8 of 20</b>

## 5 EMISSION BANDWIDTH

**Clause:** **15.323 (a) / 6.4**

**Requirement:**  $50 \text{ kHz} < B < 2.5 \text{ MHz}$

**SA Setting:**  $\text{RBW} \approx 1\% \text{ of Emission BW}$  (or  $0.5\% < \text{RBW} < 2\%$  for fixed setting)

**ANSI 6.1.3**  $\text{VBW} \geq 3 \times \text{RBW}$

Span  $\geq 2 \times B$

Sweep: Sufficient to stabilize trace

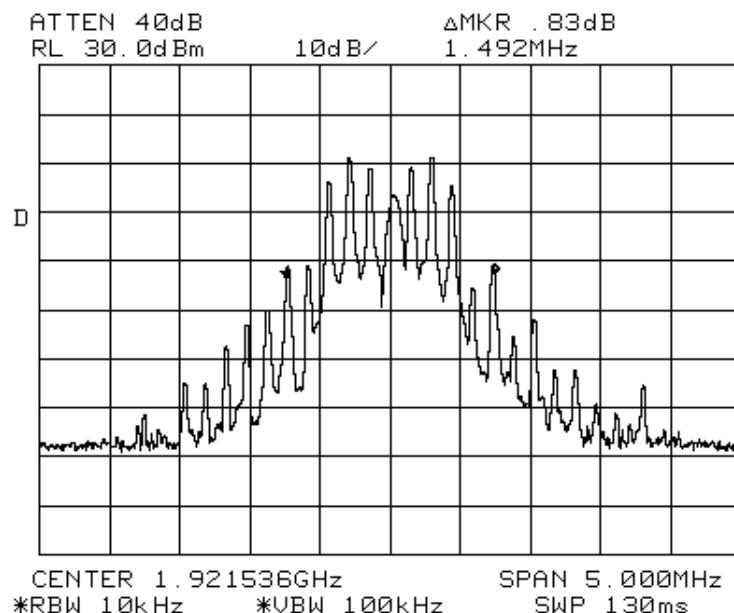
Detection: Peak hold

**Test Result:** Handset:  $1.492 \text{ MHz} < \text{Limit } 2.5 \text{ MHz}$

### 5.1 Handset

Channel No.	Frequency (MHz)	26 dB Bandwidth (kHz)
5	1921.536	1492
3	1924.992	1483
1	1928.448	1483

Worst-case plot follows:



Handset emission BW at Low-freq Channel

Doc Sec. <b>Test Data – VOIP841XY/ZZ Handset RF</b>	Revision <b>1.2</b>
	<b>Page(s) 9 of 20</b>

## 6 CONDUCTED PEAK TRANSMIT POWER

**Clause:** **15.319 (c) / 6.5**

**Requirement:**  $\leq 100 \mu\text{W} \times \sqrt{B} = 5 \log B - 10 \text{ dBm} = 20.8 \text{ dBm}$ , where B rated 1.5 MHz maximum

**SA Setting:**  $\text{RBW} \geq \text{Emission BW}$  (or increased until no more than 0.5 dB change in power)

**ANSI 6.1.2**  $\text{VBW} \geq 3 \times \text{RBW}$

Span = zero, centered on channel center

Sweep: fast enough to resolve transmit pulse

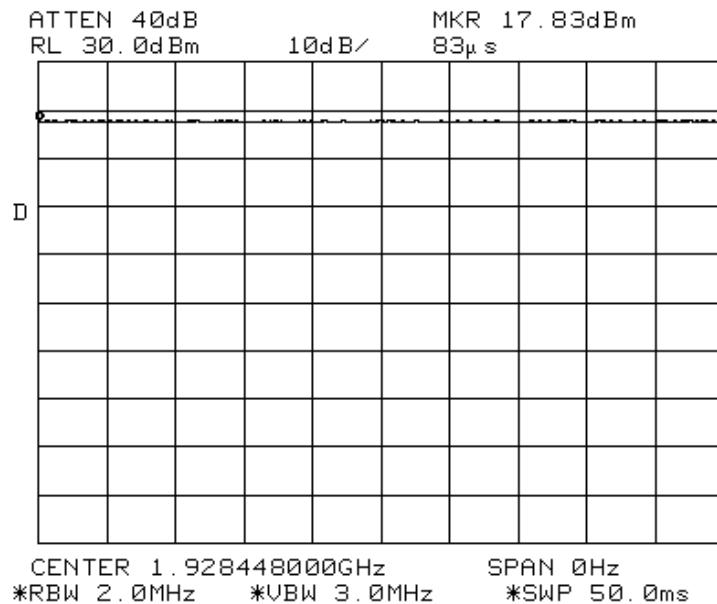
Detection: Peak

**Test Result:** Handset: 18.63 dBm (73 mW)

### 6.1 Handset

Chan. No.	Freq. (MHz)	Reading (dBm)	Cable (dB)	Pk Power (dBm)	Orig. (dBm)	Diff. (dB)	Margin (dBm)
5	1921.536	17.67	0.8	18.47			2.33
3	1924.992	17.83	0.8	18.63	(79 mW)		2.17
1	1928.448	<b>17.83</b>	0.8	18.63	18.97	<b>-0.34</b>	<b>2.17</b>

Worst-case plot follows:



Handset peak power at High-freq Channel

Doc Sec. <b>Test Data – VOIP841XY/ZZ Handset RF</b>	Revision    1.2
	Page(s) <b>10 of 20</b>

## 7      RADIATED PEAK POWER

**Clause:**      **15.319 (c) / 6.5**

**Requirement:**  $\leq 100 \mu\text{W} \times \sqrt{B} = 5 \log B - 10 \text{ dBm} = 20.8 \text{ dBm}$  for  $B = 1.5 \text{ MHz}$  max.

$\leq 116 \text{ dB}\mu\text{V/m}$  at 3m for handset /  $117 \text{ dB}\mu\text{V/m}$  for base  
by radiated measurement derived from Friis formula as follows

$$\text{Field Strength } E = \frac{\sqrt{30PG}}{d} = \frac{\sqrt{30 * 0.122 * 1.05}}{3} \text{ V/m} = 95.5 + P \text{ dBm} = 116.3 \text{ dB}\mu\text{V/m}$$

where  $P = 0.122 \text{ W}$  (20.8 dBm)  
 $G = \text{Numeric gain of TX antenna} = 1.05$  (0.21 dBi highest for handset)  
 $d = 3 \text{ m}$

**SA Setting:**       $\text{RBW} \geq \text{Emission BW}$  (or increased until no more than 0.5 dB change in power)  
**ANSI 6.1.2**       $\text{VBW} \geq 3 \times \text{RBW}$

Span = zero, centered on channel center  
Sweep: fast enough to resolve transmit pulse  
Detection: Peak

**Test Result:**      Handset      17.34 dBm (54.2 mW)

## 7.1 Handset

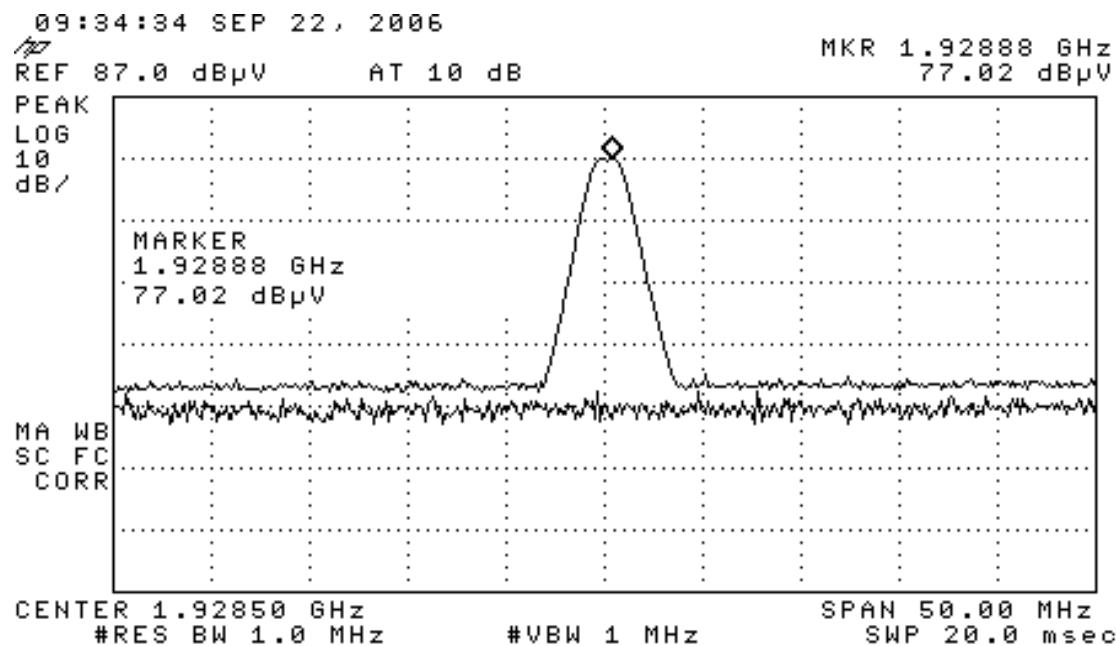
Chan. No.	Freq. (MHz)	Meter Peak Reading (dB $\mu$ V)	Coax Loss (dB)	Antenna Factor (Note 2) (dB)	Pre-amp Gain (dB)	Field Strength at 3m (dB $\mu$ V/m)	Radiated Power (Note 3) (dBm)	EIRP (mW)	
5	1922.00	76.74	7.52	28.3	V	0	112.56	17.06	50.8
3	1925.50	76.18	7.52	28.3	V	0	112.00	16.50	44.7
1	1928.88	<b>77.02</b>	7.52	28.3	V	0	112.84	<b>17.34</b>	<b>54.2</b>

Note 2: Horn antenna in Horizontal (H) or Vertical (V) polarization

Note 3: 95.5 dB taken as factor to convert Field Strength to Radiated Power in numerical value

Note 5: EUT raised up by at least 5 cm to minimize reflection of RF emissions by test table

Worst-case plot follows.



Handset Radiated Field Strength at High-freq Channel

Doc Sec. <b>Test Data – VOIP841XY/ZZ Handset RF</b>	Revision <b>1.2</b>
	<b>Page(s) 12 of 20</b>

## 8 RF EXPOSURE

**Clause:** **15.319 / RSS-Gen 5.5**

**Requirement:** **1.1307(b), 2.1091 and 2.1093 / RSS-102**

MPE  $\leq 1 \text{ mW/cm}^2$  at 20 cm

given by Power density  $S = \text{EIRP} / 4\pi R^2$ , where R is distance 20 cm.

For  $S = 1 \text{ mW/cm}^2$

Maximum permissible  $P = 4\pi R^2 = 4\pi(20)^2 = 5026 \text{ mW} = 37 \text{ dBm}$

SAR  $\leq 1.6 \text{ W/kg}$  over any 1 g of tissue

**Reference:** OET Bulletin 65 for General Population / Uncontrolled Exposure

**Test Result:** Handset: Compliant

### 8.1 Handset SAR

Refer to separate SAR testing report No. 021306PBW-T721- S15T on Model VOIP321XY/ZZ by Celltech.

Highest level measured: Head: 0.0416 mW/g  
Body: 0.0208 mW/g

Measurement of radiated power for SAR EUT

**Result:** Sample 1: 18.10 dBm (64.6 mW)  
Sample 2: 17.78 dBm (60.0 mW)

Chan. No.	Freq. (MHz)	Meter Peak Reading (dB $\mu$ V)	Coax Loss (dB)	Antenna Factor (Note 2) (dB)	Pre-amp Gain (dB)	Field Strength at 3m (dB $\mu$ V/m)	Radiated Power (Note 3) (dBm)	EIRP (mW)
<b>Sample 1</b>								
5	1921.97	77.66	7.52	28.3 V	0	113.48	17.98	62.8
3	1925.50	77.54	7.52	28.3 V	0	113.36	17.86	61.1
1	1929.00	<b>77.78</b>	7.52	28.3 V	0	113.60	<b>18.10</b>	<b>64.6</b>
<b>Sample 2</b>								
5	1921.97	77.24	7.52	28.3 V	0	113.06	17.56	57.0
3	1925.50	77.25	7.52	28.3 V	0	113.07	17.57	57.1
1	1929.00	<b>77.46</b>	7.52	28.3 V	0	113.28	<b>17.78</b>	<b>60.0</b>

Note 2: Horn antenna in Horizontal (H) or Vertical (V) polarization

Note 3: 95.5 dB taken as factor to convert Field Strength to Radiated Power in numerical value

Note 5: EUT raised up by at least 5 cm to minimize reflection of RF emissions by test table

Doc Sec. <b>Test Data – VOIP841XY/ZZ Handset RF</b>	Revision <b>1.2</b>
	<b>Page(s) 13 of 20</b>

## 9 DUTY CYCLE CORRECTION FACTOR

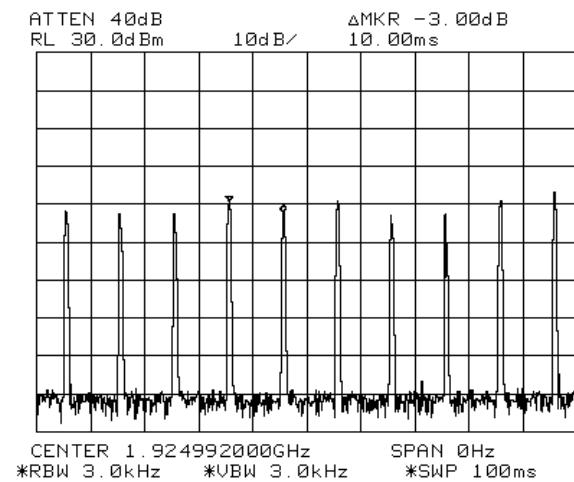
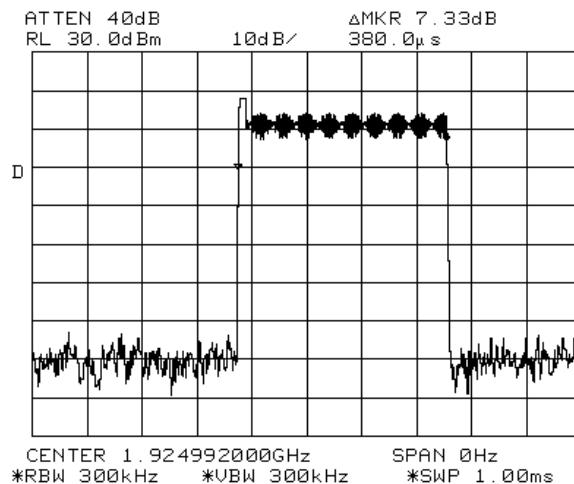
**Clause:** RSS-Gen 4.3, RSS-213 6.6

**Max. Allowed:** 6 dB

**SA Setting:** RBW = 3 kHz  
 VBW = RBW  
 Sweep = 100 ms (or less for better resolution)  
 Span = zero, centered on channel center  
 Detection: Peak

### 9.1 Handset

DCF\_HS =  $10 \log (\text{TX-on Time}/100 \text{ ms})$  for power in dBm  
 =  $10 \log (380 \mu\text{s} \times 10 / 100 \text{ ms})$  from timing plots below  
 = -14.2 dB (3.8%)



**10 POWER SPECTRAL DENSITY****11 EMISSIONS AT BAND EDGE AND BEYOND**

Test results of original equipment under TIMCO reference 330UT6 / 1591UT5 continue to be representative and applicable.

Doc Sec. <b>Test Data – VOIP841XY/ZZ Handset RF</b>	Revision <b>1.2</b>
	<b>Page(s) 15 of 20</b>

## 12 RADIATED SPURIOUS EMISSIONS

**Clause:** **15.205 (a), 15.205 (c), 15.209 (a) / RSS-Gen 6**

**Limits:**

Emission Frequency (MHz)	Field Strength		At Distance (m)	Detector Type
	( $\mu$ V/m)	(dB $\mu$ V/m)		
0.009 – 0.490	2400/f (kHz)	67.6 / kHz	300	AV (9-90 kHz, 110-490 kHz) QP (others)
0.490 – 1.705	24000/f (kHz)	87.6 / kHz	30	QP
1.705 – 30.0	30	29.5	30	QP
30 – 88	100	40	3	QP
88 – 216	150	43.5	3	QP
216 – 960	200	46	3	QP
> 960	500	54	3	AV (> 1 GHz)

**SA Setting:** RBW  $\geq$  100 kHz for  $f < 1$  GHz, 1 MHz for  $f \geq 1$  GHz

**DA 00-705** VBW  $\geq$  RBW

Span = to fully capture emission being measured

Sweep = auto

**Test Result:** Worst-case in each band complies (See separate section for band edge emissions)

### 12.1 Handset without earset plugged in

12.1.1 Band 9 kHz – 30 MHz

12.1.2 Band 30 – 88 MHz

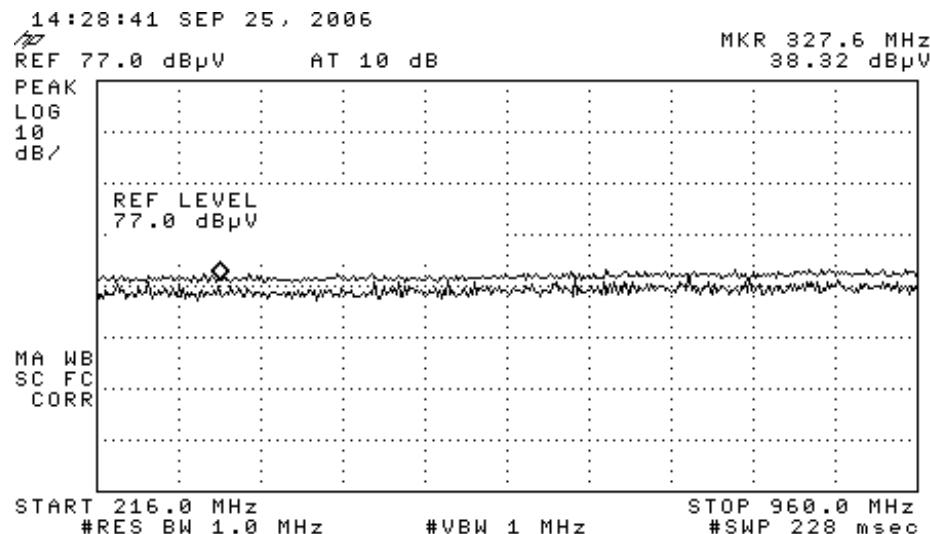
12.1.3 Band 88 – 216 MHz

12.1.4 Band 216 – 960 MHz

Band (MHz)	Freq. (MHz)	Meter Peak Reading (dB $\mu$ V)	Coax Loss (dB)	Antenna Factor (Note 1) (dB)	Pre- amp Gain (dB)	Field Strength at 3m (dB $\mu$ V/m)	Rule Limit (dB $\mu$ V/m)	Margin from Limit (dB)
0.009–30		N/A						N/A
30 – 88	52.48	39.21	2.0	10.0 BH	-23.5	27.71	40	12.29
88 – 216	190.1	39.07	2.5	14.3 BV	-23.5	32.37	43.5	11.13
216–960	327.6	<b>38.92</b>	4.0	22.5 LV	-23.5	41.92	46	<b>4.08</b>

Note 1: Biconical (B) or Log-periodic (L) antenna in Horizontal (H) or Vertical (V) polarization

Worst-case plot follows:



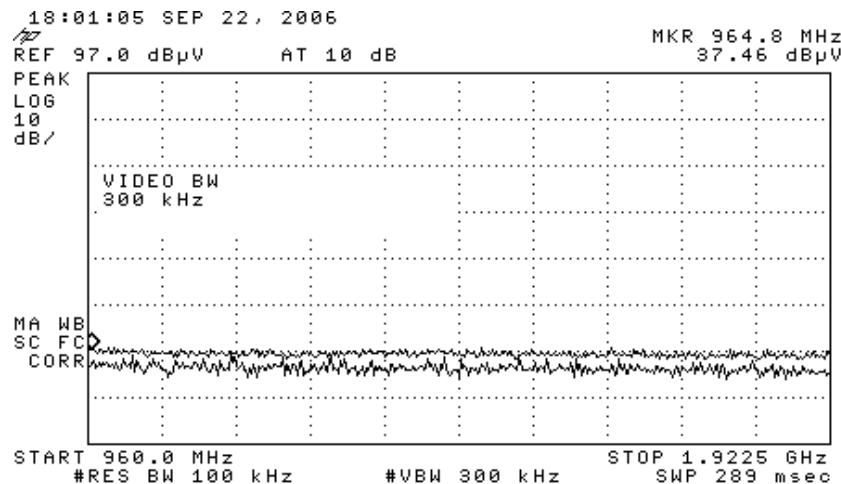
Handset spurious emission  $\leq$  960 MHz

#### 12.1.5 Band above 960 MHz

Band (MHz)	Freq. (MHz)	Meter Peak Reading (dB $\mu$ V)	Coax Loss (dB)	Antenna Factor (Note 1) (dB)	Pre-amp Gain (dB)	Field Strength at 3m (dB $\mu$ V/m)	Rule Limit (dB $\mu$ V/m)	Margin from Limit (dB)
> 960	964.8	37.46	6.0	24.3 LH	-35.0	32.76	54	21.24

Note 1: Biconical (B) or Log-periodic (L) antenna in Horizontal (H) or Vertical (V) polarization

Emission unnoticeable below noise floor as shown below.



Handset spurious emission  $>$  960 MHz

Doc Sec. <b>Test Data – VOIP841XY/ZZ Handset RF</b>	Revision <b>1.2</b>
	Page(s) <b>17 of 20</b>

## 12.2 Handset with earset plugged in

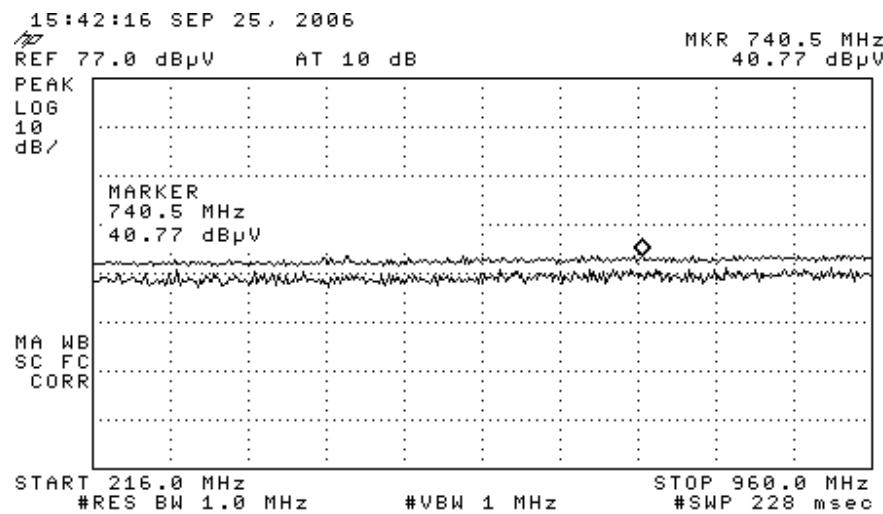
Earset Model: WDCP045 with 32 ohm speaker

- 12.2.1 Band 9 kHz – 30 MHz
- 12.2.2 Band 30 – 88 MHz
- 12.2.3 Band 88 – 216 MHz
- 12.2.4 Band 216 – 960 MHz

Band (MHz)	Freq. (MHz)	Meter Peak Reading (dB $\mu$ V)	Coax Loss (dB)	Antenna Factor (Note 1)	Pre-amp Gain (dB)	Field Strength at 3m (dB $\mu$ V/m)	Rule Limit (dB $\mu$ V/m)	Margin from Limit (dB)
0.009–30		N/A						N/A
30 – 88	32.61	38.47	2.0	10.0 BH	-23.5	26.97	40	13.03
88 – 216	202.2	39.90	2.5	15.1 BV	-23.5	34.00	43.5	9.50
216–960	740.5	<b>40.77</b>	4.5	20.5 LV	-23.5	42.27	46	<b>3.73</b>

Note 1: Biconical (B) or Log-periodic (L) antenna in Horizontal (H) or Vertical (V) polarization

Worst-case plot follows:



Handset spurious emission  $\leq$  960 MHz

## 12.2.5 Band above 960 MHz

Band (MHz)	Freq. (MHz)	Meter Peak Reading (dB $\mu$ V)	Coax Loss (dB)	Antenna Factor (Note 1)	Pre-amp Gain (dB)	Field Strength at 3m (dB $\mu$ V/m)	Rule Limit (dB $\mu$ V/m)	Margin from Limit (dB)
> 960	964.8	39.32	5.3	25.4 LV	-35.0	35.02	54	18.98

Note 1: Biconical (B) or Log-periodic (L) antenna in Horizontal (H) or Vertical (V) polarization

Emission unnoticeable below noise floor.

Doc Sec. <b>Test Data – VOIP841XY/ZZ Handset RF</b>	Revision <b>1.2</b>
	<b>Page(s) 18 of 20</b>

**APPENDIX TEST SETUP****Radiation Test Set-up & Procedure**

<b>Reference</b>	<ul style="list-style-type: none"><li>ANSI Standard C63.4- 2000: Section 8.1, 8.2.3 and 8.3</li></ul>
<b>Set-up</b>	<ul style="list-style-type: none"><li>Take the Base or Handset as separate EUT.</li><li>For AC operated device (e.g. base unit), the EUT is operated from a 120 Vac mains supply via an AC adapter unless power source stated otherwise in owner's manual.</li><li>For battery operated device (e.g. handset), the EUT is powered by the battery type stated in the owner's manual.</li><li>Terminal equipment, if applicable, is terminated with loop simulator (or telephone analyzer) such as TELTONE TLS-5.</li><li>Arrange the EUT and its peripherals to minimize crossing of connecting wires.</li></ul>
<b>Procedures</b>	<ul style="list-style-type: none"><li>Setup and connect the EUT as shown in Figures 1 and 2.</li><li>Put EUT into Test Mode.</li><li>Monitor the frequency spectrum for different modes of operation with variations in antenna height (1 m through 4 m), antenna polarization (horizontal and vertical), EUT azimuth and cable or wire placement.</li></ul>

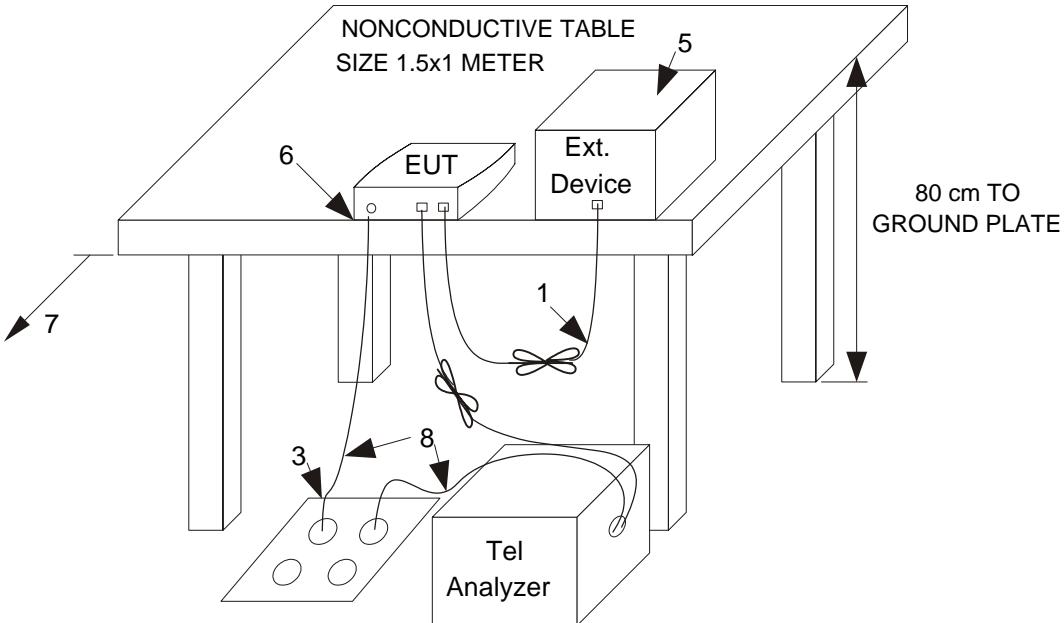
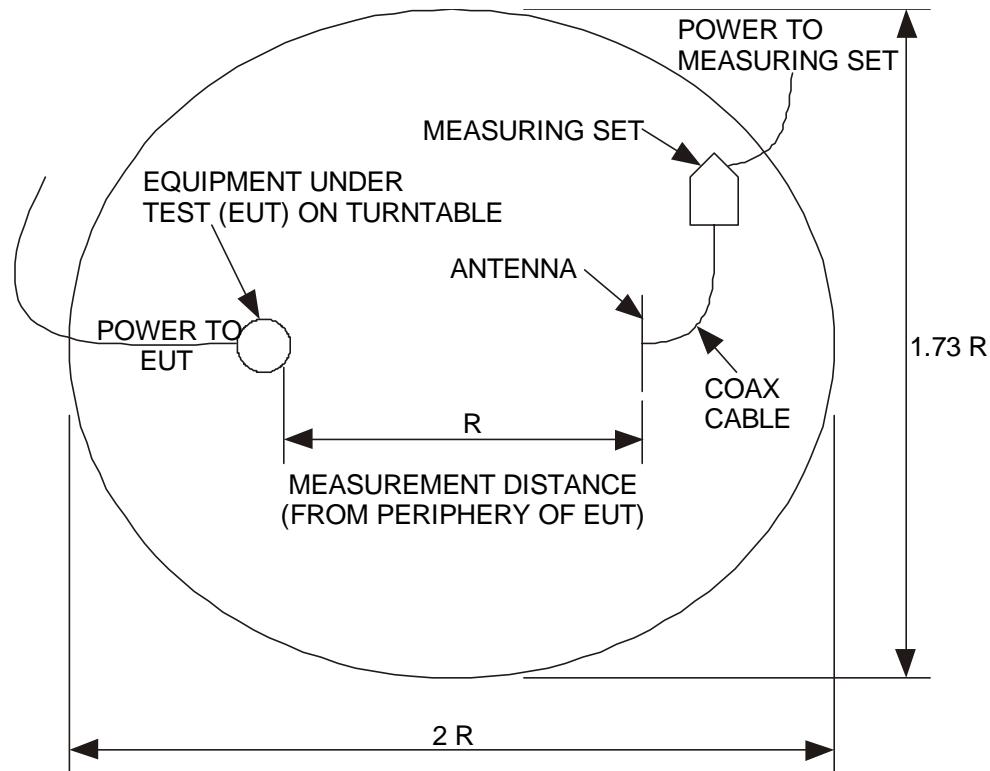


Figure 1. Test Configuration – Radiated Emissions Test

LEGEND:

1. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth forming a bundle 30 to 40 cm long, hanging approximately in the middle between ground plane and table.
2. I/O cables that are connected to a peripheral shall be bundle in center. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 1 m.
3. If Line Impedance Stabilization Networks (LISN) are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground plane with the receptacle flush with the ground plane.
4. Cables of hand-operated devices, such as keyboards, mouses, etc., have to be placed as close as possible to the host.
5. Non-EUT components being tested.
6. Rear of EUT, including peripherals, shall be all aligned and flush with rear of tabletop.
7. No vertical conducting wall is used.
8. Power cords drape to the floor and are routed over to receptacle.



**Figure 2. Radiated Emissions Measurement – Free Area for Site with a Turntable**  
**Area dimensions with  $R = 3\text{m}$  is  $6\text{m} \times 5.2\text{m}$ , with  $R = 10\text{m}$  is  $20\text{m} \times 17.3\text{m}$**