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TEST REPORT

FCC ID: **PBWB187R26** (for Base)
PBWB187R26H (for Handset)
IC: **3842A-B187** (Base & Handset)

Equipment Under Test: **VoIP321XY/ZZ** (Base & Handset)
(EUT) **VoIP321C** (Handset Charger)

S/N: MS000608010010 (TS05036610) (Conducted measurement)
S/N: MS000608010008 (TS05036602) (Radiated measurement)
S/N: MS000608010009 (TS05036615) (Radiated measurement)
S/N: MS000608010008 (TS05036602) (Charger)
S/N: MS000608010009 (TS05036615) (Charger)
S/N: MS000608010011 (B187060210001) (SAR)
S/N: MS000608010012 (B187060210002) (SAR)

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

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

Tested By: **Frank Ma / Jeffrey Yang**

Date: **Feb15, 2006**

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1 CHANNEL FREQUENCIES

Clause: 15.303 (d) & (g) / 8.0

Requirement: Within 1920 – 1930 MHz band for isochronous devices

UPCS CHANNEL	FREQUENCY (MHz)
Band Edge	1930.000
1 (High)	1928.448
4	1926.720
3 (Mid)	1924.992
2	1923.264
5 (Low)	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) / 5.5

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
Antenna transmit gain = 1.6 – 2.0 dBi (1.446 – 1.585 numeric) across the band

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

GAIN

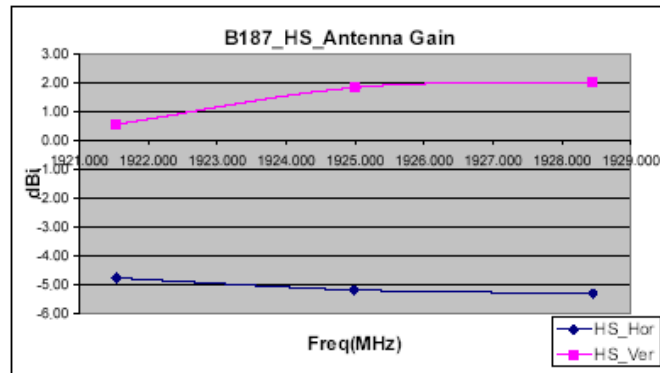
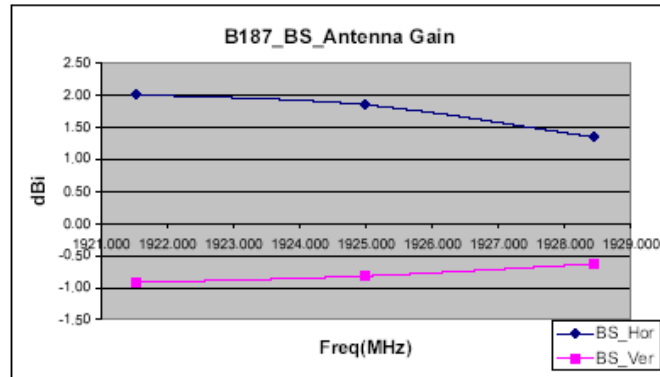
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B187 Antenna Gain for FCC Approval Sample

Ascalade Technologies Inc.
Date: Jan 31, 2006

	Channel	Ch 0	Ch 2	Ch 4
	Freq(MHz)	1928.448	1924.992	1921.536
BS	Hor	1.34	1.84	2.00
	Ver	-0.63	-0.82	-0.92
HS	Hor	-5.28	-5.16	-4.74
	Ver	2.00	1.82	0.55



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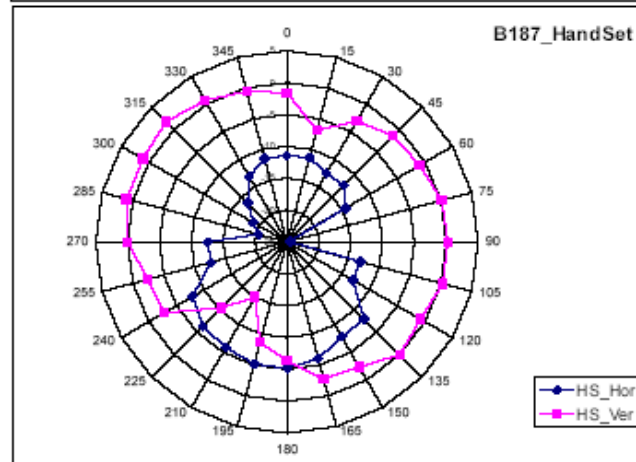
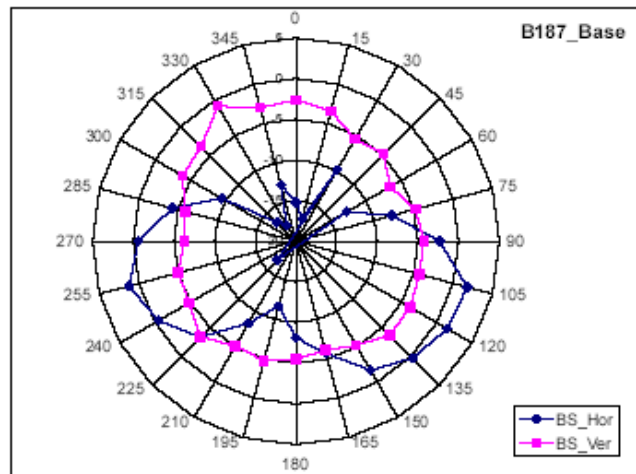
B187 Antenna Pattern for FCC Approval Sample

Ascalade Technologies Inc.

Date: Jan 31, 2006

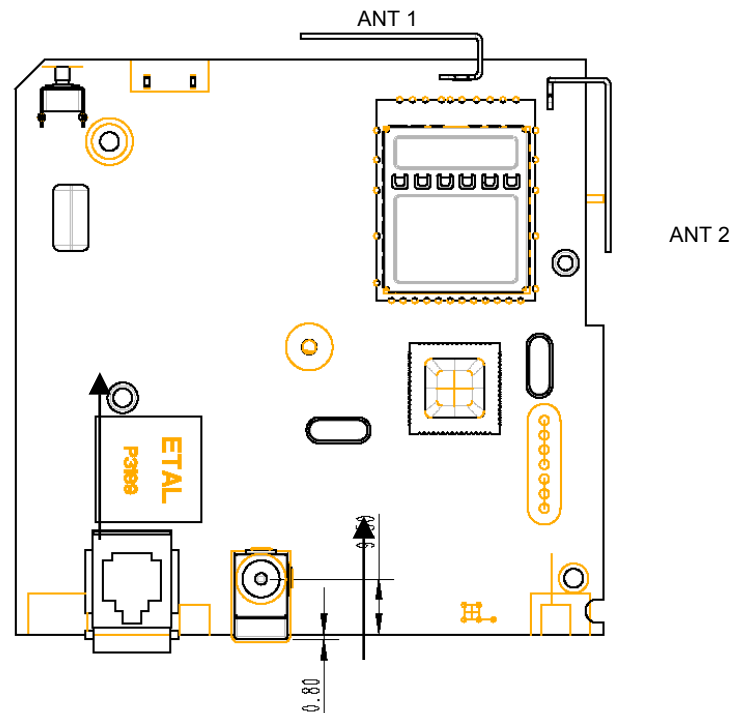
Degree	BS_Hor (dBi)	BS_Ver (dBi)	HS_Hor (dBi)	HS_Ver (dBi)
0	-15.2	-2.61	-11.45	-1.61
15	-17.14	-3.43	-11.34	-6.91
30	-9.84	-5.46	-12.62	-3.1
45	-23.27	-4.8	-12.46	-1.46
60	-12.77	-6.64	-14.38	-0.95
75	-7.79	-4.8	-24.47	0.17
90	-2.33	-4.28	-24.46	0.21
105	1.81	-4.28	-13.03	0.27
120	1.49	-3.78	-13.06	-0.79
135	0.31	-3.71	-7.86	-0.02
150	-1.7	-5.2	-7.82	-2.34
165	-5.7	-6.13	-6.05	-2.78
180	-8.14	-5.46	-5.16	-6.35
195	-11.73	-4.78	-5.19	-8.73
210	-8.31	-5.13	-5.86	-15
225	-3.35	-3.36	-6.35	-10.34
240	-0.49	-4.83	-7.92	-2.79
255	1.26	-5.01	-12.66	-2.36
270	-0.63	-6.29	-12.55	-0.07
285	-4.25	-5.89	-20.36	1.03
300	-9.47	-3.89	-18.9	1.07
315	-16.7	-3.5	-16.3	1.72
330	-17.77	-0.82	-13.15	0.61
345	-12.82	-3.03	-11.45	-0.54
360	-15.58	-2.65	-12.26	-1.45

Max(dBi)	1.81	-0.82	-5.16	1.72
Min(dBi)	-23.27	-6.64	-24.47	-15.00
Diff(dB)	25.08	5.82	19.31	16.72

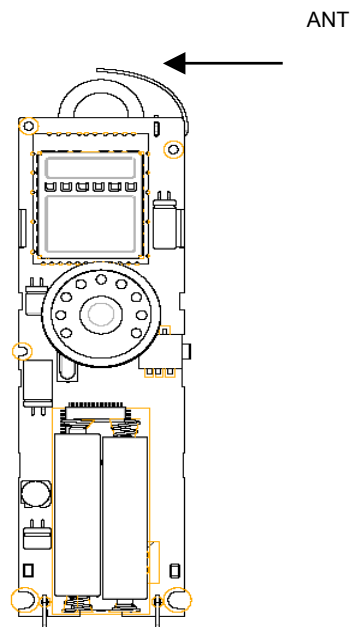


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BASE ANTENNA ASSEMBLY



HANDSET ANTENNA ASSEMBLY



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EMISSION BANDWIDTH

Clause: 15.323 (a) / 8.2**Requirement:** 50 kHz < B < 2.5 MHz**SA Setting:** RBW $\approx$ 1 % of Emission BW (or 0.5 % < RBW < 2 % for fixed setting)**ANSI 6.1.3** VBW $\geq$ 3 x RBWSpan $\geq$ 2 x B

Sweep: Sufficient to stabilize trace

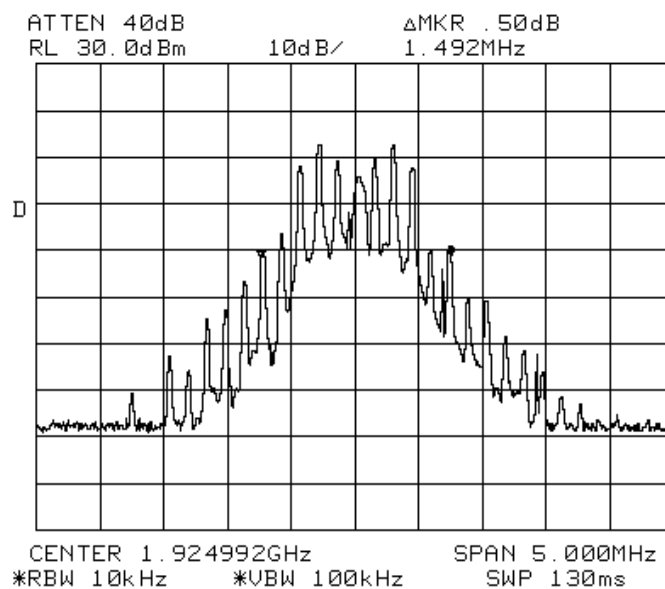
Detection: Peak hold

Test Result: Base: 1.492 MHz < Limit 2.5 MHz
Handset: 1.492 MHz < Limit 2.5 MHz

3.1 Base

Test Mode	Channel No.	Frequency (MHz)	26 dB Bandwidth (kHz)
4	1	1928.448	1483
5	3	1924.992	1492
6	5	1921.536	1467

Worst-case plot follows:



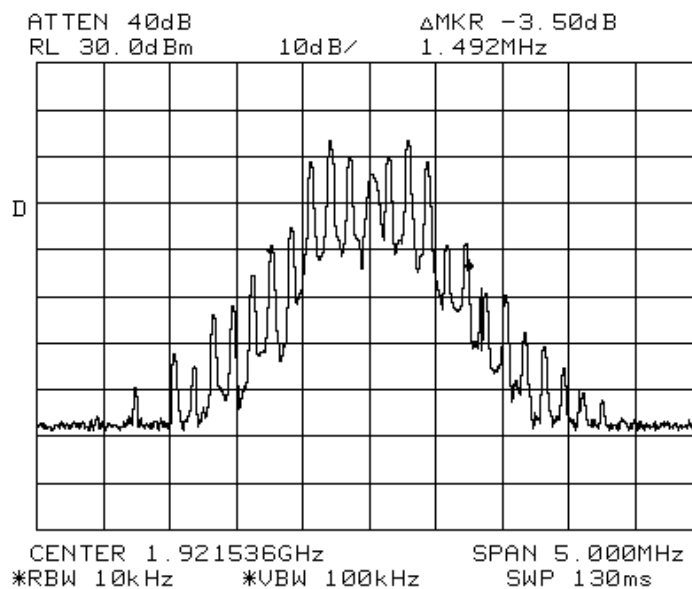
Base emission BW at Middle Channel

3.2 Handset

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Test Mode	Channel No.	Frequency (MHz)	26 dB Bandwidth (kHz)
1 (Mod ON), 2 (Ch 01)	1	1928.448	1475
1 (Mod ON), 2 (Ch 03)	3	1924.992	1483
1 (Mod ON), 2 (Ch 05)	5	1921.536	1492

Worst-case plot follows:



Handset emission BW at Low Channel

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3 CONDUCTED PEAK TRANSMIT POWER

Clause: 15.319 (c) / 8.1

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: RBW $\geq$ Emission BW (or increased until no more than 0.5 dB change in power)

ANSI 6.1.2 VBW $\geq 3 \times$ RBW

Span = zero, centered on channel center

Sweep: fast enough to resolve transmit pulse

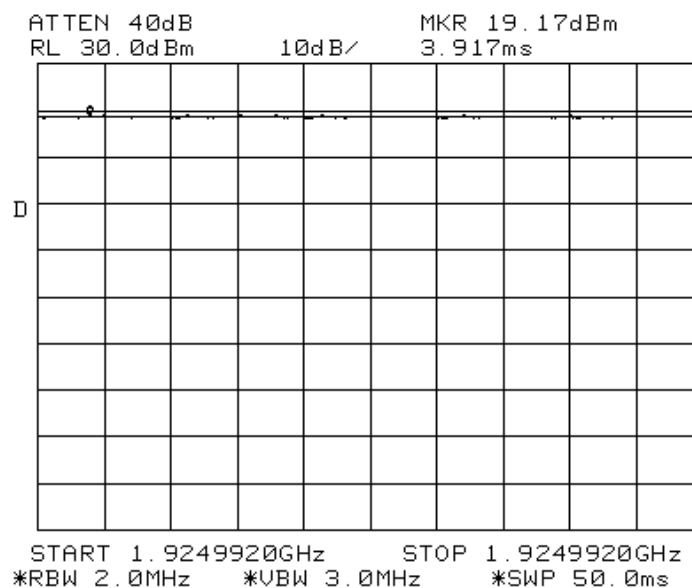
Detection: Peak

Test Result: Base: 19.97 dBm (worst case)
Handset: 20.13 dBm (worst case)

4.1 Base

Test Mode	Chan. No.	Freq. (MHz)	Reading (dBm)	Cable (dB)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
4	1	1928.448	19.00	0.8	19.80	20.8	1.00
5	3	1924.992	19.17	0.8	19.97	20.8	0.83
6	5	1921.536	19.00	0.8	19.80	20.8	1.00

Worst-case plot follows:



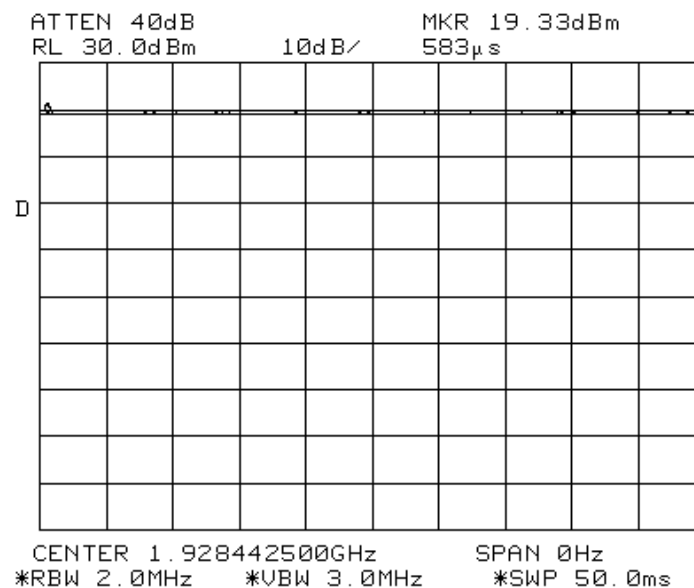
Base peak power at middle Channel

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4.2 Handset

Test Mode	Chan. No.	Freq. (MHz)	Reading (dBm)	Cable (dB)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
1, 2	1	1928.448	19.33	0.8	20.13	20.8	0.67
1, 2	3	1924.992	19.33	0.8	20.13	20.8	0.67
1, 2	5	1921.536	19.33	0.8	20.13	20.8	0.67

Worst-case plot follows:



Handset peak power at High Channel

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4 RADIATED PEAK POWER

Clause: 15.319 (c) / 8.1

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.
 $\leq 118 \text{ dB}\mu\text{V/m}$ at 3m by radiated measurement derived from Friis formula as follows

$$\text{Field Strength } E = \frac{\sqrt{30PG}}{d} = \frac{\sqrt{30 * 0.122 * 1.585}}{3} \text{ V/m} = 97.2 + P \text{ dBm} = 118 \text{ dB}\mu\text{V/m}$$

where $P = 0.122 \text{ W}$ (20.8 dBm from Sec. 4)
 $G = \text{Numeric gain of TX antenna} = 1.585$ (2.0 dBi) worst-case across band
 $d = 3 \text{ m}$

SA Setting: RBW $\geq$ Emission BW (or increased until no more than 0.5 dB change in power)
ANSI 6.1.2 VBW $\geq 3 \times$ RBW
Span = zero, centered on channel center
Sweep: fast enough to resolve transmit pulse
Detection: Peak

Test Result: Base: 18.48 dBm (worst case)
Handset: 17.05 dBm (worst case)

5.1 Base

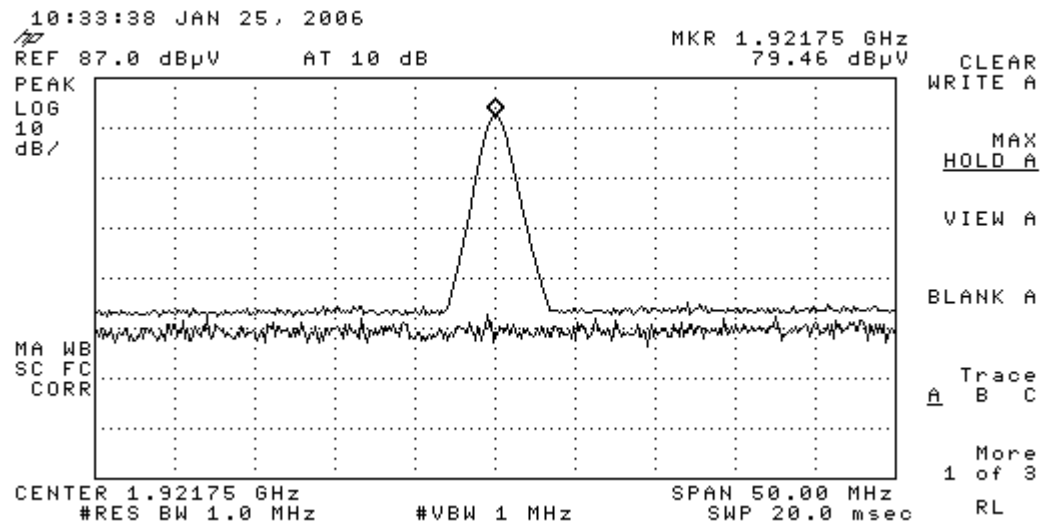
Chan. No.	Frequency (MHz)	Meter Peak Reading (dB μ V)	Coax Loss (dB)	Antenna Factor (Note 2) (dB)	Pre- amp Gain (dB)	Field Strength at 3m (dB μ V/m)	Radiated Power (Note 3) (dBm)	EIRP (mW)
1 (HIGH)	1928.63	77.52	7.52	28.7 V	0	113.74	16.54	45.08
3 (MID)	1925.13	78.24	7.52	28.7 V	0	114.46	17.26	53.21
5 (LOW)	1921.75	79.46	7.52	28.7 V	0	115.68	18.48	70.46

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

Note 3: 97.2 dB taken as factor to convert Field Strength to Radiated Power in numerical value

Worst-case plot follows.

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Radiated Field Strength at Mid Channel

5.2 Handset

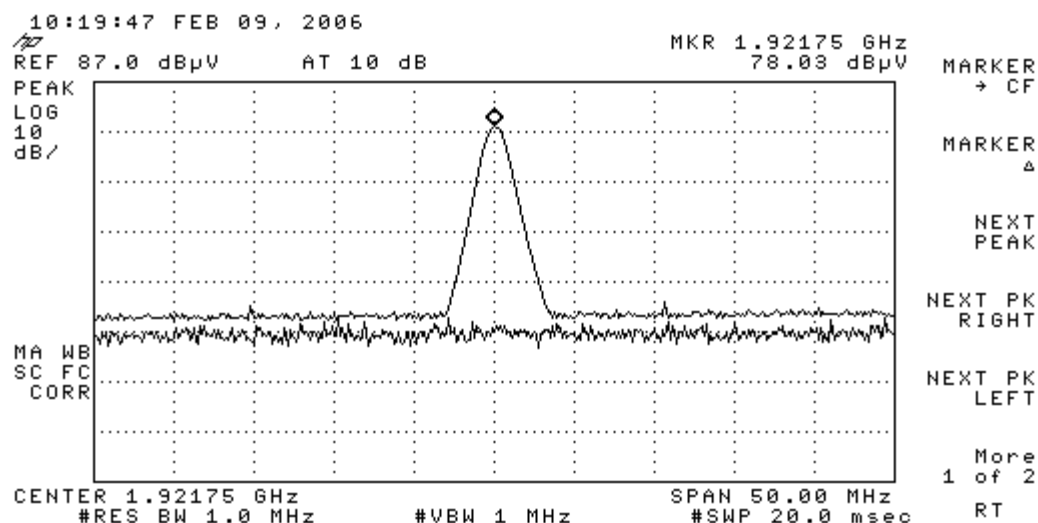
Chan. No.	Frequency (MHz)	Meter Peak Reading (dBμV)	Coax Loss (dB)	Antenna Factor (Note 2) (dB)	Pre-amp Gain (dB)	Field Strength at 3m (dBμV/m)	Radiated Power (Note 3) (dBm)	EIRP (mW)
1 (HIGH)	1928.63	77.36	7.52	28.7 V	0	113.58	16.38	43.45
3 (MID)	1925.13	76.92	7.52	28.7 V	0	113.14	15.94	39.26
5 (LOW)	1921.75	78.03	7.52	28.7 V	0	114.25	17.05	50.69

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

Note 3: 97.2 dB taken as factor to convert Field Strength to Radiated Power in numerical value

Worst-case plot follows.

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Radiated Field Strength at High Channel

5 RF EXPOSURE

Clause: 15.319 (i) / 12.0

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

MPE ≤ 1 mW/cm² at 20 cm

SAR ≤ 1.6 W/kg over any 1 g of tissue

Reference: OET Bulletin 65 for General Population / Uncontrolled Exposure

Test Result: Base: Compliant
Handset: Compliant

6.1 Base MPE

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

$$= 79.5 / 4\pi(20)^2 = 0.016 \text{ mW/cm}^2 < 1 \text{ mW/cm}^2 \text{ limit}$$

6.2 Handset SAR

Refer to separate SAR testing report by Celltech

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6 DUTY CYCLE CORRECTION FACTOR

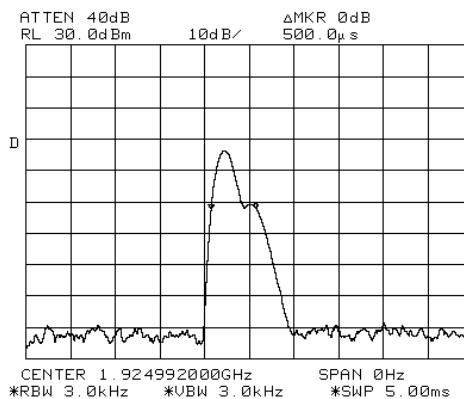
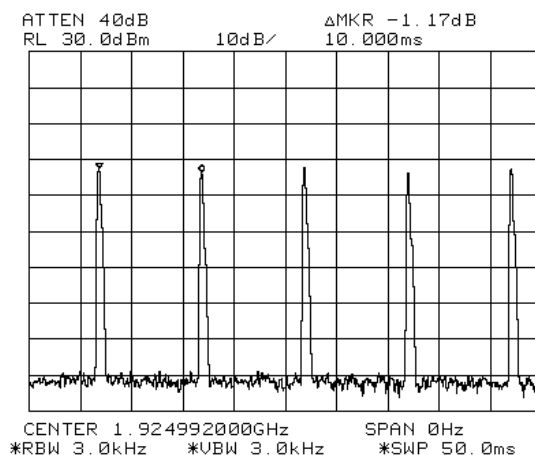
Clause: N/A

Max. Allowed: 6 dB per IC clause 8.2.3

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

7.1 Base

DCF_BS = $10 \log (\text{TX-on Time} / 10 \text{ ms})$ for power in dBm
 = $10 \log (0.5 \text{ ms} \times 5 / 10 \text{ ms})$ from timing plots below
 = -6.02 dB => -6 dB maximum allowed



Base TX pulse width in 10 ms for 1time slot operation

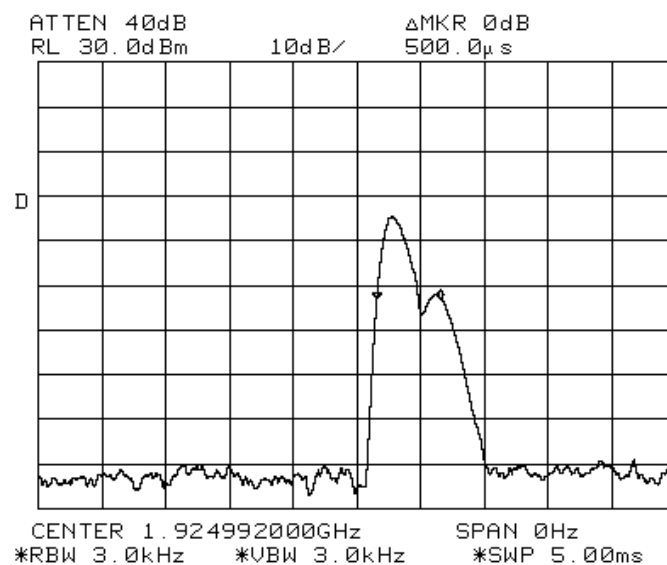
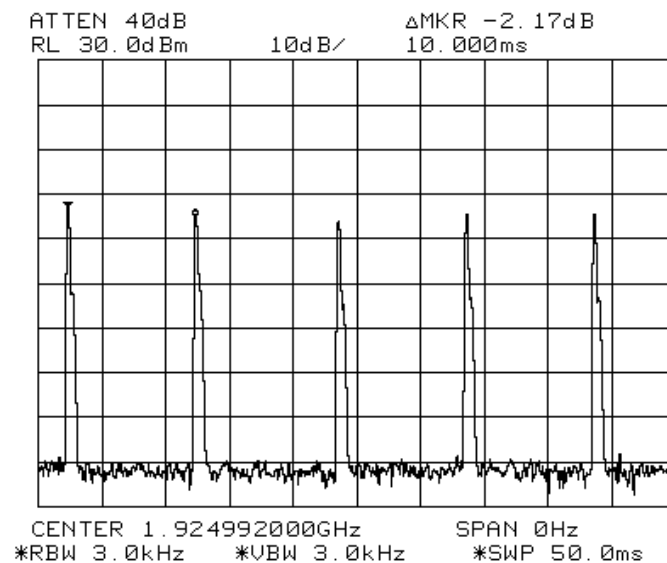
7.2 Handset

DCF_HS = -6 dB maximum allowed (same pulse operation in TDMA as base)

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7.3 Single-Handset Operation

DCF = $10 \log (\text{TX-on Time}/100 \text{ ms})$ for power in dBm
= $10 \log (500 \mu\text{s}/10 \text{ ms})$ from timing plots below
= -13 dB => -6 dB maximum allowed



TX pulse width in 10 ms for 1 time slot in single-handset operation

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7 POWER SPECTRAL DENSITY

Clause: 15.319 (d) / 8.2

Requirement: ≤ 3 mW (4.77 dBm) by average detection or 12 mW (10.8 dBm) by peak-hold detection

SA Setting: RBW = 3 kHz

ANSI 6.1.5 VBW = RBW

Span = B first to locate peak, then 10 kHz to read power within 3 kHz

Sweep: slow enough for at least 2 bursts to occur in each 3 kHz of span swept; e.g. 10 s sweep captures 1000 bursts of 10 ms-burst-rate signal while sweeping across 1.5 MHz, for 2 bursts per 3 kHz interval

Detection: Average or Peak (see applicable limit above)

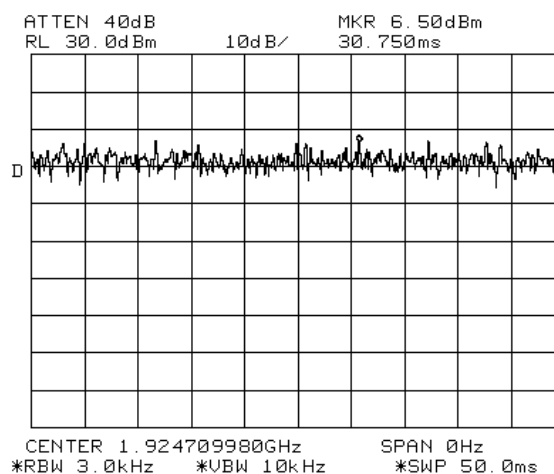
Test Result: Base: 0.13 dBm (worst case)

Handset: 0.63 dBm (worst case)

8.1 Base

Test Mode	Chan. No.	Freq. (MHz)	Reading (dBm)	Cable (dB)	DC Factor	PSD (dBm)	Limit (dBm)	Margin (dB)
4	1	1928.448	6.33	0.8	-6.0	1.13	4.77	3.64
5	3	1924.992	6.50	0.8	-6.0	1.30	4.77	3.47
6	5	1921.536	6.33	0.8	-6.0	1.13	4.77	3.64

Worst-case plot follows:



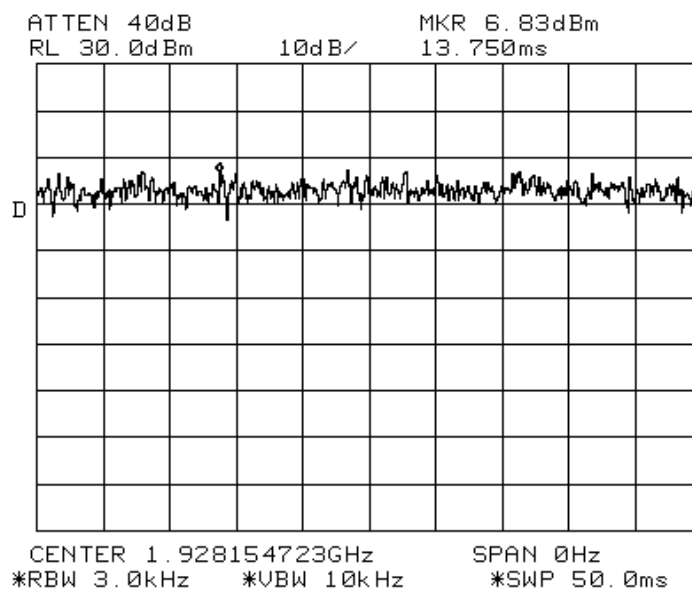
Base PSD at middle Channel

8.2 Handset

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Test Mode	Chan. No.	Freq. (MHz)	Reading (dBm)	Cable (dB)	DC Factor	PSD (dBm)	Limit (dBm)	Margin (dB)
1, 2	1	1928.448	6.83	0.8	-6.0	1.63	4.77	3.14
1, 2	3	1924.992	6.00	0.8	-6.0	0.80	4.77	3.97
1, 2	5	1921.536	6.67	0.8	-6.0	1.47	4.77	3.30

Worst-case plot follows:



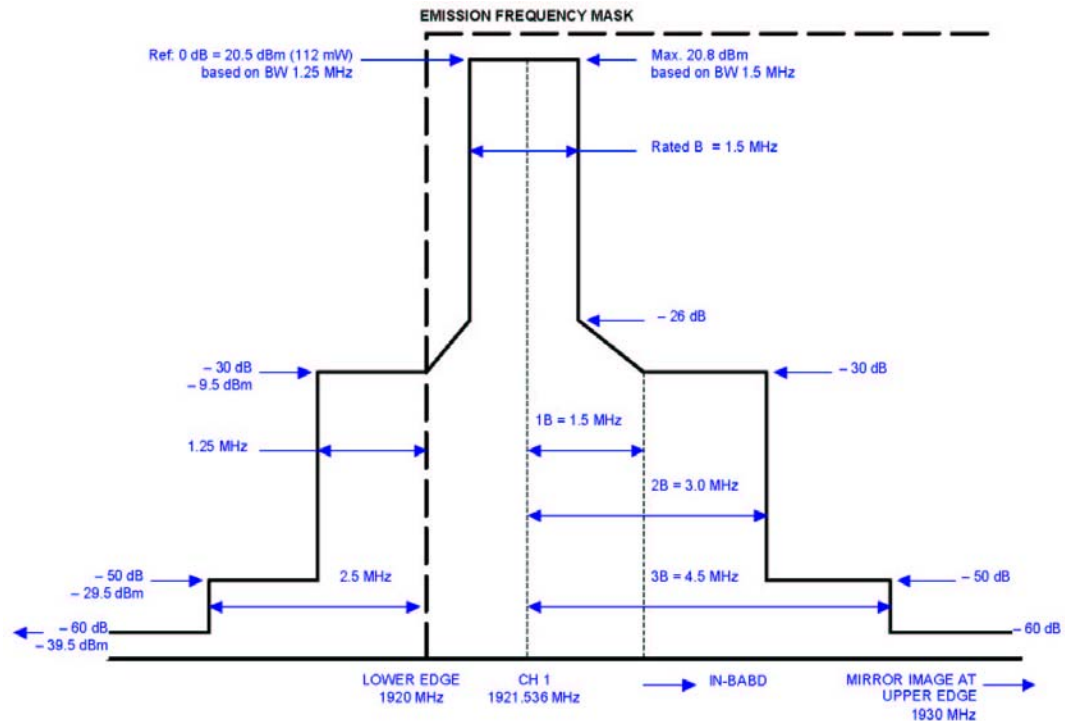
Handset PSD at High Channel

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8 EMISSIONS AT BAND EDGE AND BEYOND

Clause: 15.323 (d) / 8.3.1

Requirement: As shown in diagram of Emission Mask



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

ANSI 6.1.6.2 VBW = 3 x RBW

Span $\geq$ 3.5 x B

Sweep: Sufficient to stabilize trace ($\geq$ pulse repetitive interval x no. of trace elements)

Detection: Peak hold

Test Result: Base: -65.6 dBc (worst case at lower band edge)

Handset: -66.0 dBc (worst case at upper band edge)

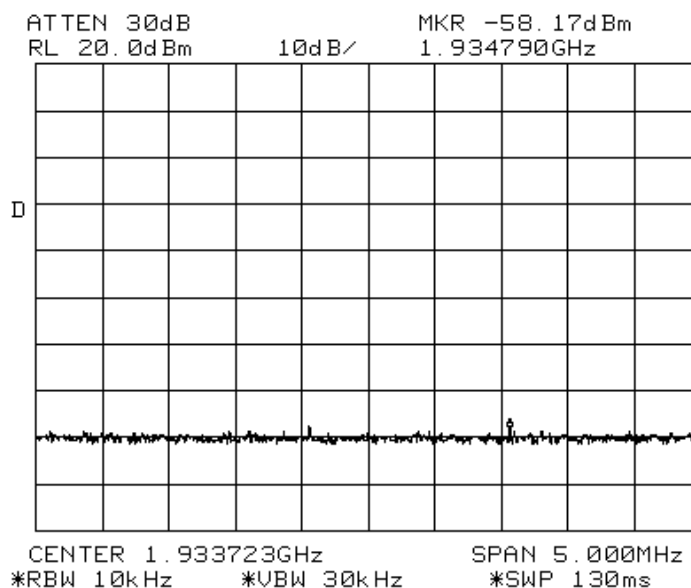
For in-band out-of-channel emissions, since emission bandwidth B is greater than out-band step bandwidth 1.25 MHz and occupied bandwidth is symmetrical about channel center, compliance in out-band emissions will automatically lead to compliance in in-band out-of-channel.

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9.1 Base Near Band Edge

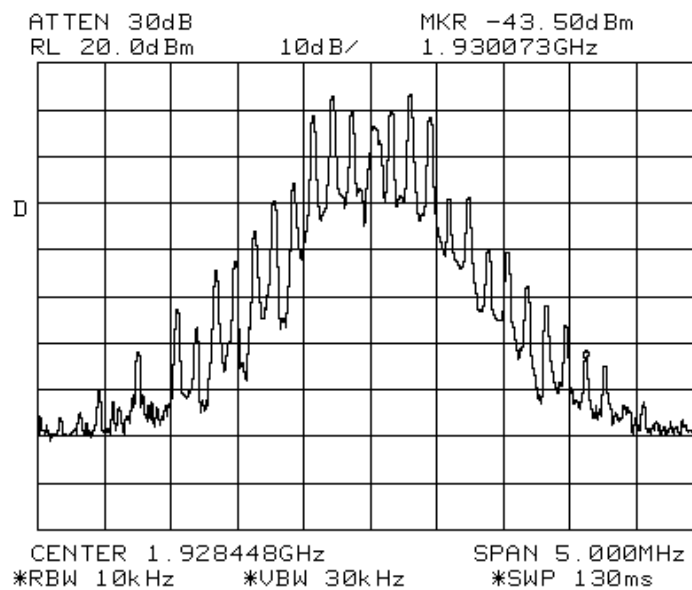
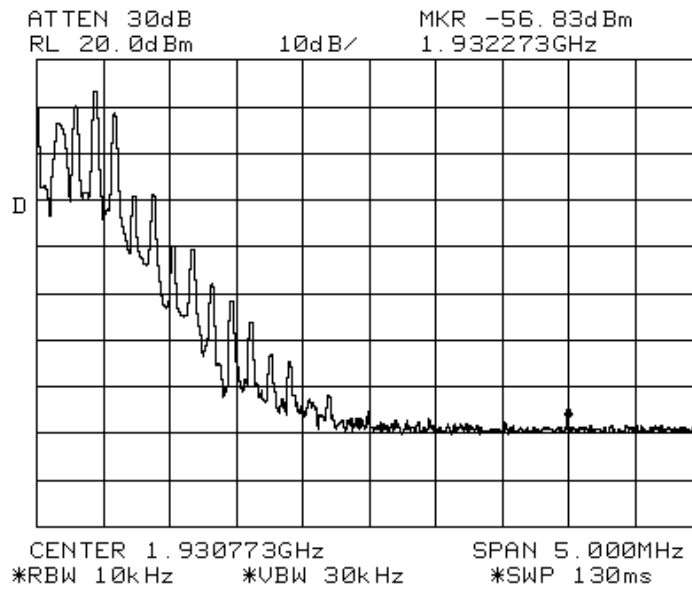
Test Mode	Chan. No.	Freq. (MHz)	Freq. Range (MHz)	Reading (dBm)	Rel. Att. (dBc)	Limit (dBc)	Margin (dB)
4	1	1928.448	Upper edge	18.00	0.00	---	---
		1930.073	1930 ~1931.25	-43.50	-61.50	-30	31.5
		1932.273	1931.25 ~1932.5	-56.83	-74.83	-50	24.83
		1934.790	1932.5 ~ up	-58.17	-76.17	-60	16.17
6	5	1921.536	Lower Edge	18.50	0.00	---	---
		1919.786	1918.75 ~1920	-42.00	-60.50	-30	30.50
		1918.378	1917.5 ~1918.75	-57.83	-76.33	-50	26.33
		1916.819	Down ~1917.5	-58.67	-77.17	-60	17.17

Upper out-band plots follow:



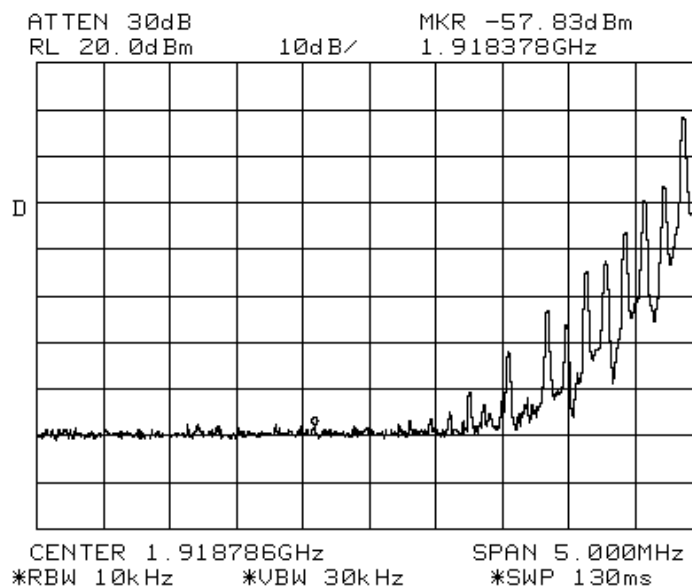
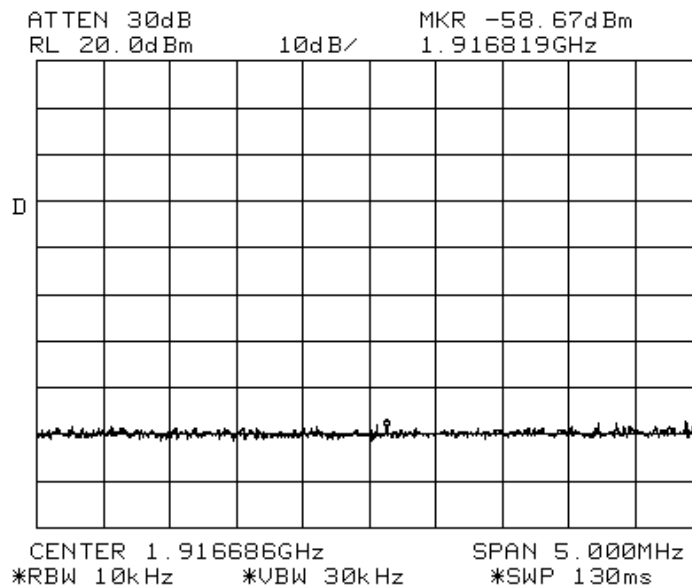
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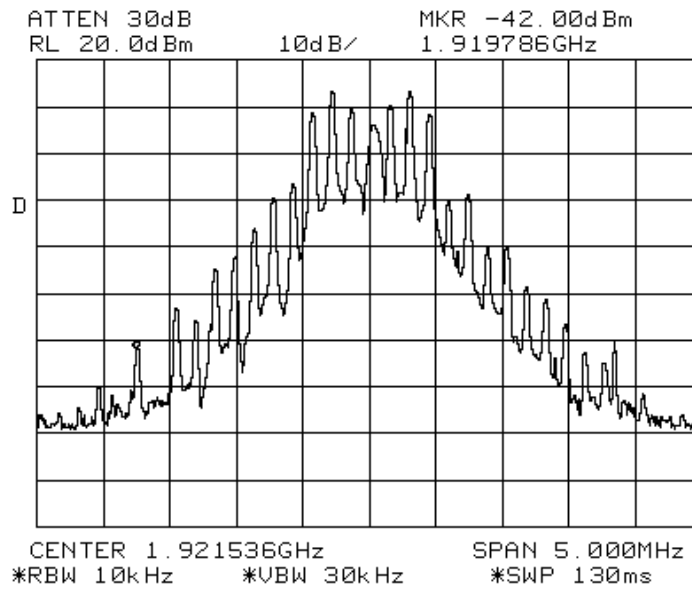


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Lower out-band plots follow:



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9.2 Base Tx Harmonics

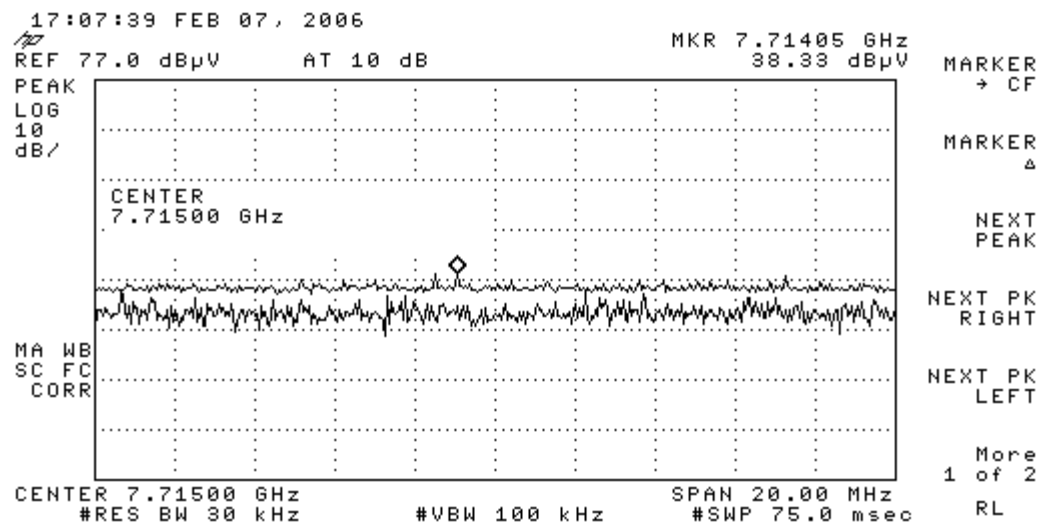
Chan. No.	Frequency (MHz)	Meter Peak Reading (dBμV)	Coax Loss (dB)	Antenna Factor (Note 2) (dB)	Pre- amp Gain (dB)	Field Strength at 3m (dBμV/m)	Rel. Level (dBc)	Rule Limit (dBc)	Margin from Limit (dB)
1 (HIGH)	1928.448					115.68 (Note 4)	0.00	---	---
2 x fc	3857.71	40.65	10.5	33 V	-35	49.15	-66.53	-60	6.53
3 x	5785.65	40.04	11.7	35 V	-35	51.74	-63.94	-60	3.94
4 x	7714.05	38.33	15.2	37 H	-35	55.53	-60.15	-60	0.15
3 (MID)	1924.992					115.68 (Note 4)	0.00	---	---
2 x fc	3850.05	39.97	10.5	33 V	-35	48.47	-67.21	-60	7.21
3 x	5775.15	40.61	11.7	35 V	-35	52.31	63.37	-60	3.37
4 x	7700.25	38.15	15.2	37 H	-35	55.15	-60.53	-60	0.53
5 (LOW)	1921.536					115.68 (Note 4)	0.00	---	---
2 x fc	3843.30	41.34	10.5	33 V	-35	49.84	-65.84	-60	5.84
3 x	5765.69	40.85	11.7	35 V	-35	52.55	-63.13	-60	3.13
4 x	7686.45	37.75	15.2	37 H	-35	54.95	-60.73	-60	0.73

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

Note 4: Referenced to the maximum power measured above

Worst-case plot follows:

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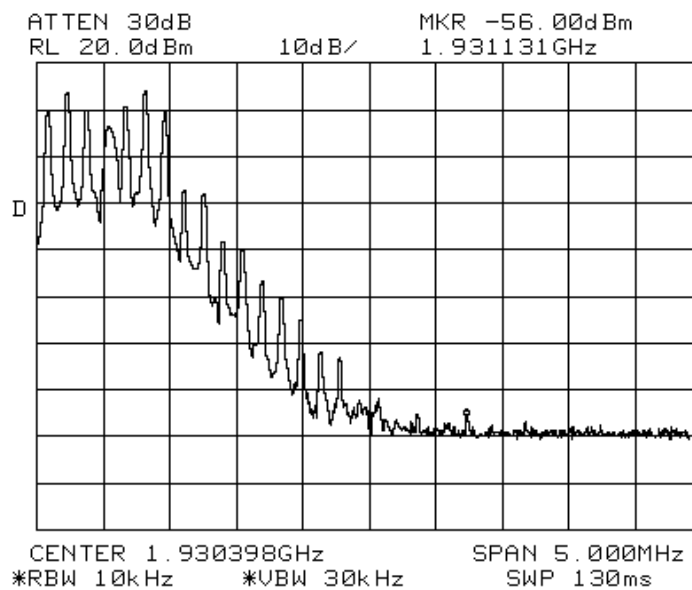
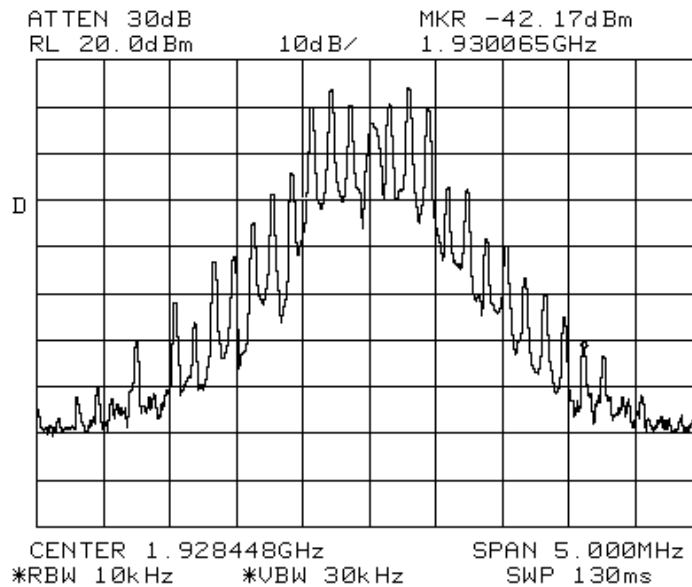
Base 4th Harmonic at High Channel

9.3 Handset Near Band Edge

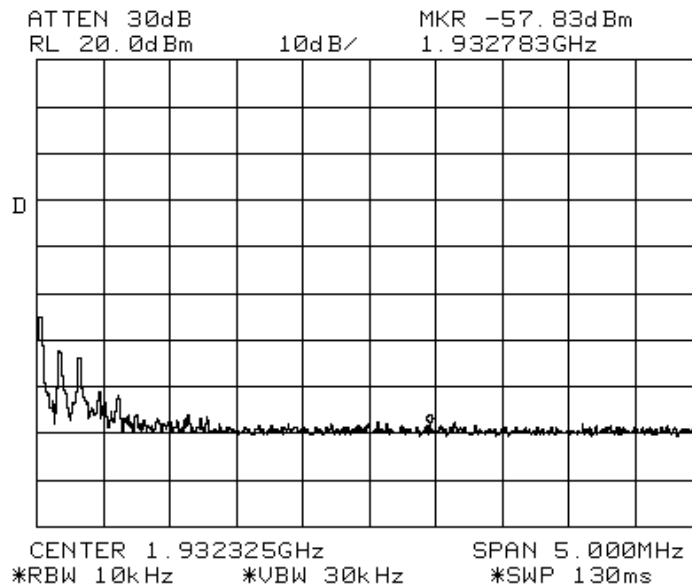
Test Mode	Chan. No.	Freq. (MHz)	Freq. Range (MHz)	Reading (dBm)	Rel. Att. (dBc)	Limit (dBc)	Margin (dB)
1, 2	1	1928.448	Upper edge	18.17	0.0	---	---
		1930.065	1930 ~1931.25	-42.17	-60.34	-30	30.34
		1931.131	1931.25 ~1932.5	-56	-74.17	-50	24.17
		1932.783	1932.5 ~ up	-57.83	-76.00	-60	16.00
1, 2	5	1921.536	Lower Edge	18.17	0.0	---	---
		1919.786	1918.75 ~1920	-40.50	-58.67	-30	28.67
		1917.528	1917.5 ~1918.75	-55.83	-74	-50	24
		1917.203	Down ~1917.5	-57.5	-75.67	-60	15.67

Upper out-band plots follow:

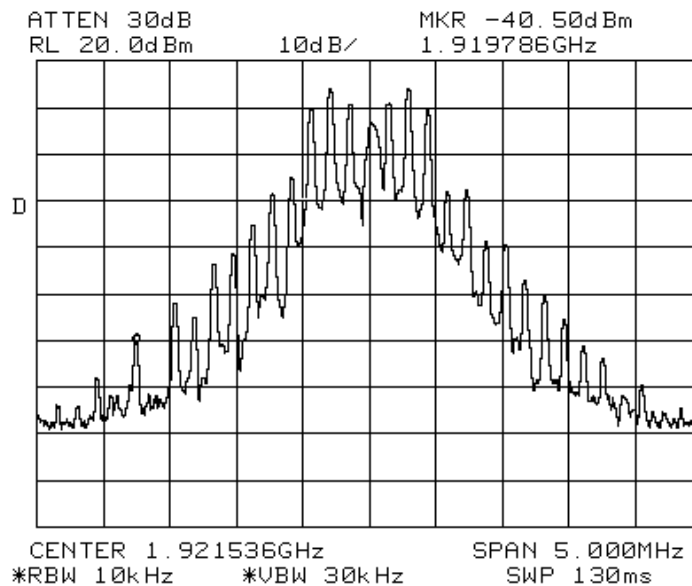
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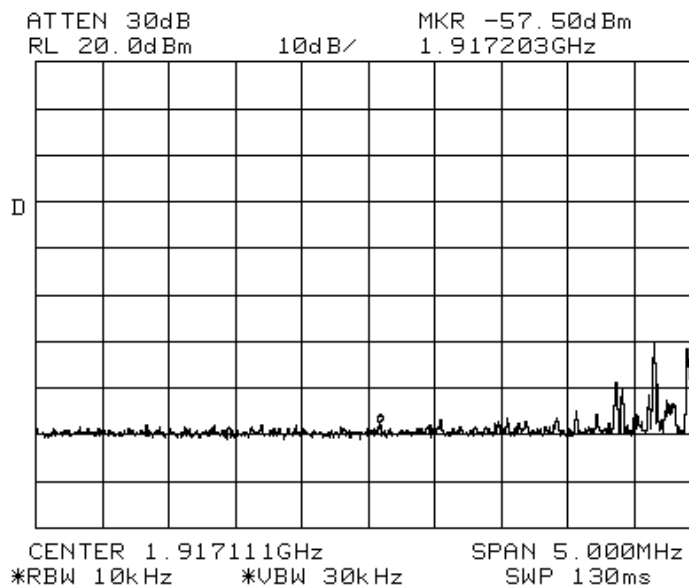
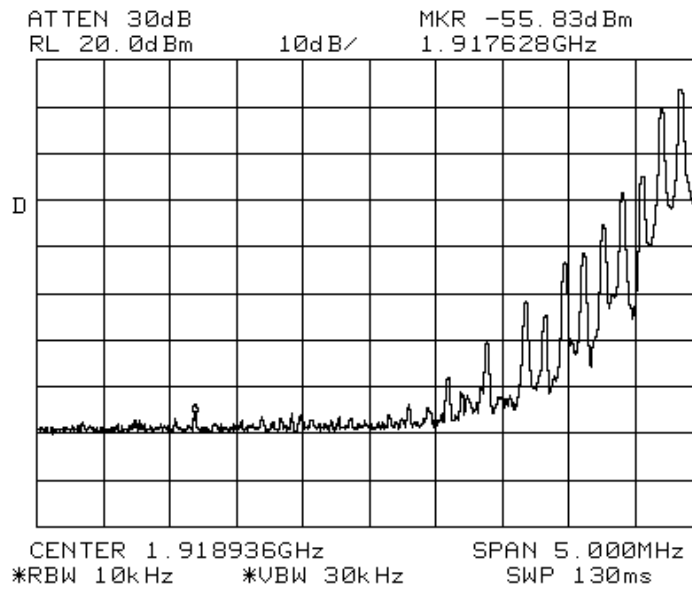
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Lower out-band plots follow:



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9.4 Handset Tx Harmonics

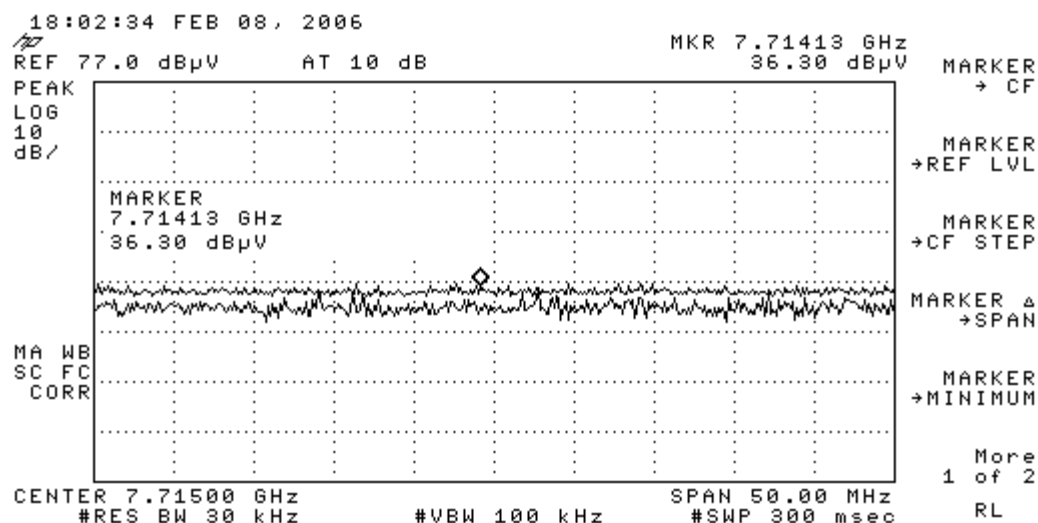
Chan. No.	Frequency (MHz)	Meter Peak Reading (dBμV)	Coax Loss (dB)	Antenna Factor (Note 2) (dB)	Pre- amp Gain (dB)	Field Strength at 3m (dBμV/m)	Rel. Level (dBc)	Rule Limit (dBc)	Margin from Limit (dB)
1 (HIGH)	1928.448					114.25 (Note 4)	0.00	---	---
2 x fc	3856.90	37.32	10.5	33 V	-35	45.82	-68.43	-60	8.43
3 x	5785.75	39.15	11.7	35 V	-35	50.85	-63.40	-60	3.40
4 x	7714.13	36.30	15.2	37 V	-35	53.50	-60.75	-60	0.75
3 (MID)	1924.992					114.25 (Note 4)	0.00	---	---
2 x fc	3850.08	38.29	10.5	33 V	-35	46.79	-67.46	-60	7.46
3 x	5775.50	38.61	11.7	35 V	-35	50.31	-63.94	-60	3.94
4 x	7700.38	36.12	15.2	37 V	-35	53.32	-60.93	-60	0.93
5 (LOW)	1921.536					114.25 (Note 4)	0.00	---	---
2 x fc	3843.07	38.79	10.5	33 V	-35	47.29	-66.96	-60	6.96
3 x	5765.00	37.20	11.7	35 V	-35	48.90	-65.35	-60	5.35
4 x	7687.88	35.75	15.2	37 V	-35	52.95	-61.30	-60	1.30

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

Note 4: Referenced to the maximum power measured above

Worst-case plot follows:

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Handset 4th Harmonic at Mid Channel

9 RADIATED SPURIOUS EMISSIONS

Clause: 15.205 (a), 15.205 (c), 15.209 (a) / 11.0

Limits:

Emission Frequency (MHz)	Field Strength		At Distance (m)	Detector Type
	(μV/m)	(dBμV/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 ≥ 100 kHz for f < 1 GHz, 1 MHz for f ≥ 1 GHz

DA 00-705 VBW ≥ RBW

Span = to fully capture emission being measured

Sweep = auto

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

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10.1 Base

10.1.1 Band 9 kHz – 30 MHz

10.1.2 Band 30 – 88 MHz

10.1.3 Band 88 – 216 MHz

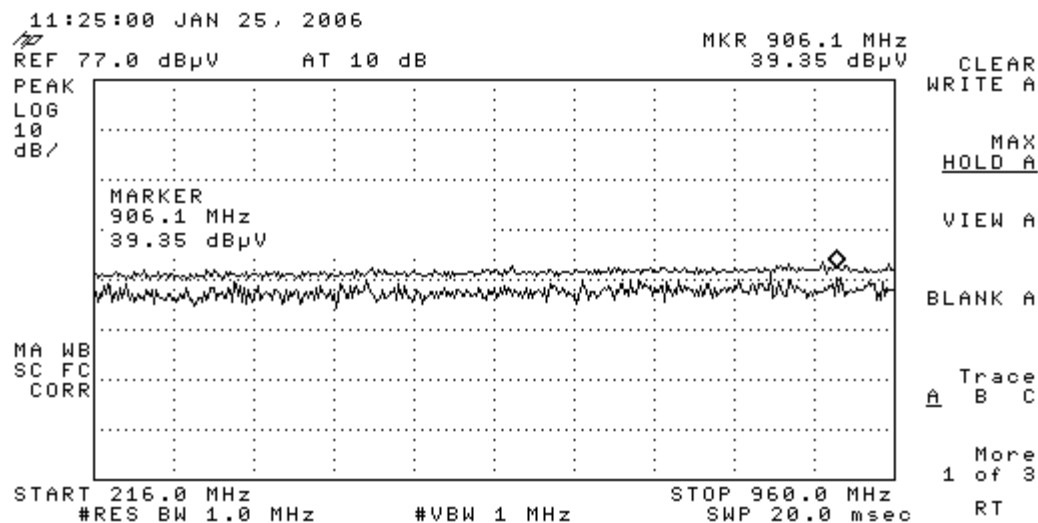
10.1.4 Band 216 – 960 MHz

Band (MHz)	Freq. (MHz)	Meter Peak Reading (dBμV)	Coax Loss (dB)	Antenna Factor (Note 1) (dB)	Pre- amp Gain (dB)	Field Strength at 3m (dBμV/m)	Rule Limit (dBμV/m)	Margin from Limit (dB)
0.009–30		N/A						N/A
30 – 88	80.02	39.55	2.0	10.0 BV	-23.5	28.05	40	11.95
88–216	168.30	40.06	2.5	10.3 BV	-23.5	29.36	43.5	14.14
216–960	906.10	39.35	5.23	21.7 BH	-23.5	44.78	46	3.22

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

Worst-case plot follows:

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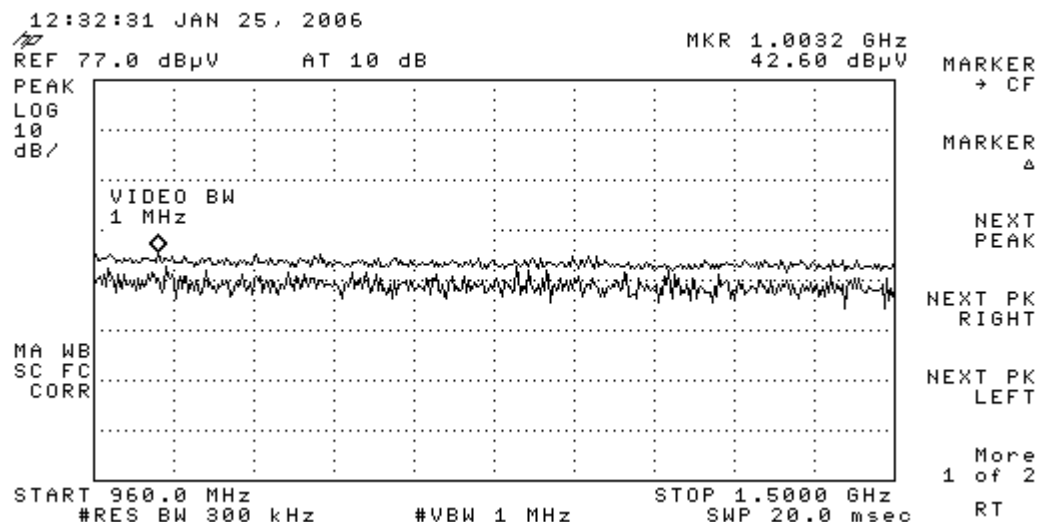
Base spurious emission ≤ 960 MHz

10.1.5 Band above 960 MHz

Test Mode & Chan.	Frequency (MHz)	Meter Peak Reading (dBμV)	Coax Loss (dB)	Antenna Factor (Note 2) (dB)	Pre-amp Gain (dB)	Duty Cycle Factor (dB)	Field Strength at 3m (dBμV/m)	Rule Limit (dBμV/m)	Margin from Limit (dB)
TM 4, 5, 6	1003.20	42.60	5.71	25.7 H	-35	N/A	39.01	54	14.99

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

Worst-case plot follows:



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Base spurious emission > 960 MHz

10.2 Handset

10.2.1 Band 9 kHz – 30 MHz

10.2.2 Band 30 – 88 MHz

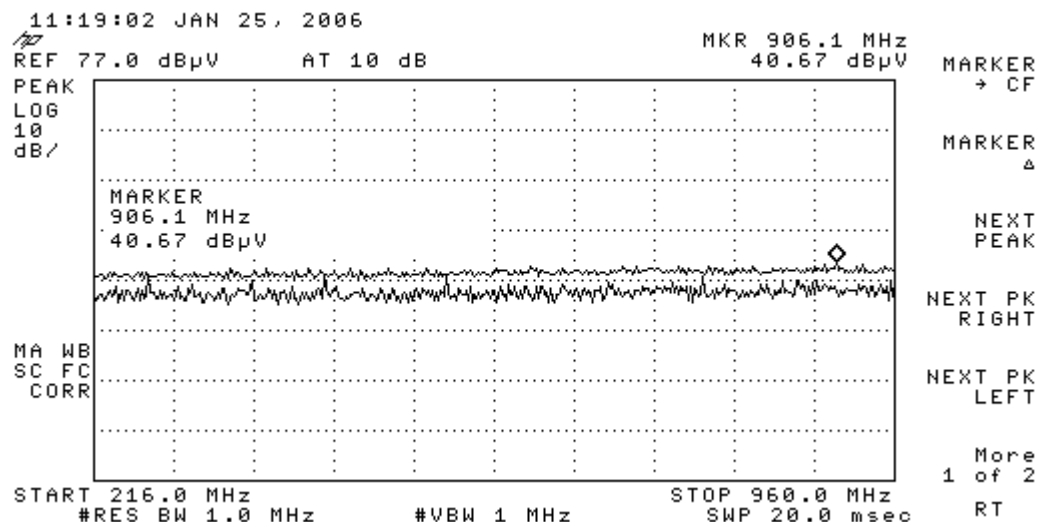
10.2.3 Band 88 – 216 MHz

10.2.4 Band 216 – 960 MHz

Band (MHz)	Freq. (MHz)	Meter Peak Reading (dB μ V)	Coax Loss (dB)	Antenna Factor (Note 1) (dB)	Pre- amp Gain (dB)	Field Strength at 3m (dB μ V/m)	Rule Limit (dB μ V/m)	Margin from Limit (dB)
0.009–30		N/A						N/A
30 – 88	86.40	39.36	2.0	9.6 BV	-23.5	27.46	40	12.54
88–216	139.80	39.26	2.5	12.6 BV	-23.5	30.86	43.5	12.64
216–960	906.1	40.67	5.23	21.7 BH	-23.5	44.10	46	1.90

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

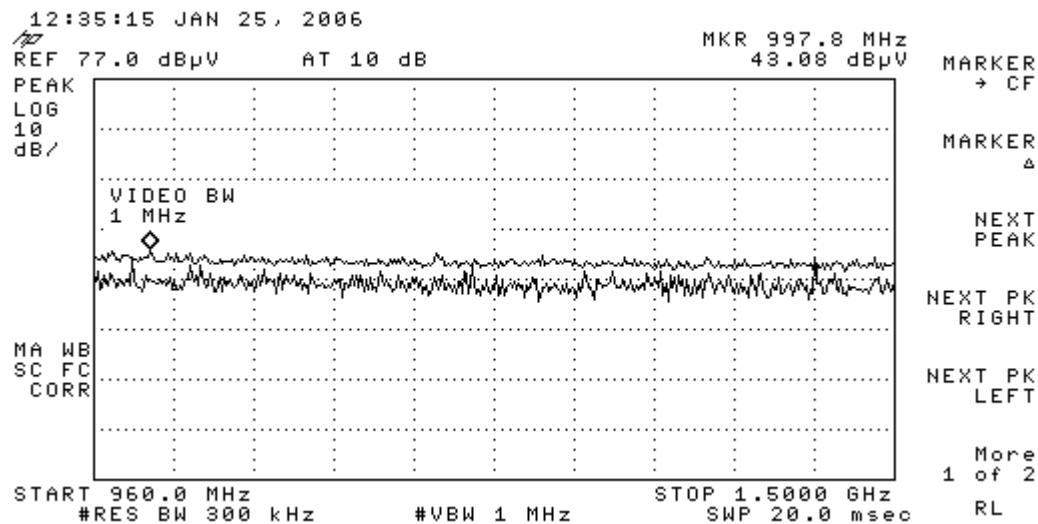
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10.2.5 Band above 960 MHz

Test Mode & Chan.	Frequency (MHz)	Meter Peak Reading (dB μ V)	Coax Loss (dB)	Antenna Factor (Note 2) (dB)	Pre-amp Gain (dB)	Duty Cycle Factor (dB)	Field Strength at 3m (dB μ V/m)	Rule Limit (dB μ V/m)	Margin from Limit (dB)
TM									
1, 2	997.80	43.00	5.71	25.7 V	-35	N/A	39.41	54	14.59

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

Worst-case plot follows:



Base spurious emission > 960 MHz

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10 FREQUENCY STABILITY AND JITTER

Clause: 15.323 (e), 15.323(f) / 9.0

Requirement:

- Frame frequency stability ≤ 50 ppm
- TDMA frame frequency stability ≤ 10 ppm over 1 hour or interval between channel access monitoring, whichever is shorter
(That translates to frequency drift of 19.2 kHz for 1920 MHz carrier)
- Frame jitter ≤ 25 μ s
- Carrier frequency stability over -20 to $+50$ $^{\circ}$ C at normal supply voltage, and over 85% to 115% of rated supply voltage (voltage variation not required for battery operated device)

Equipment: ROHDE & SCHWARZ Digital Radio Tester MODEL CTS60
S/N 100407
Last calibrated 2004-7-20

Eq. Setting: Offset -18 (for UPCS frequency band)
Data Pattern = Fig 31 (specific for frequency drift and jitter tests), or
0000111100001111 for other stability tests
Attenuation 1 dB (to compensate for cable loss to antenna connector)

Test Result: Complies with requirements

11.1 Base

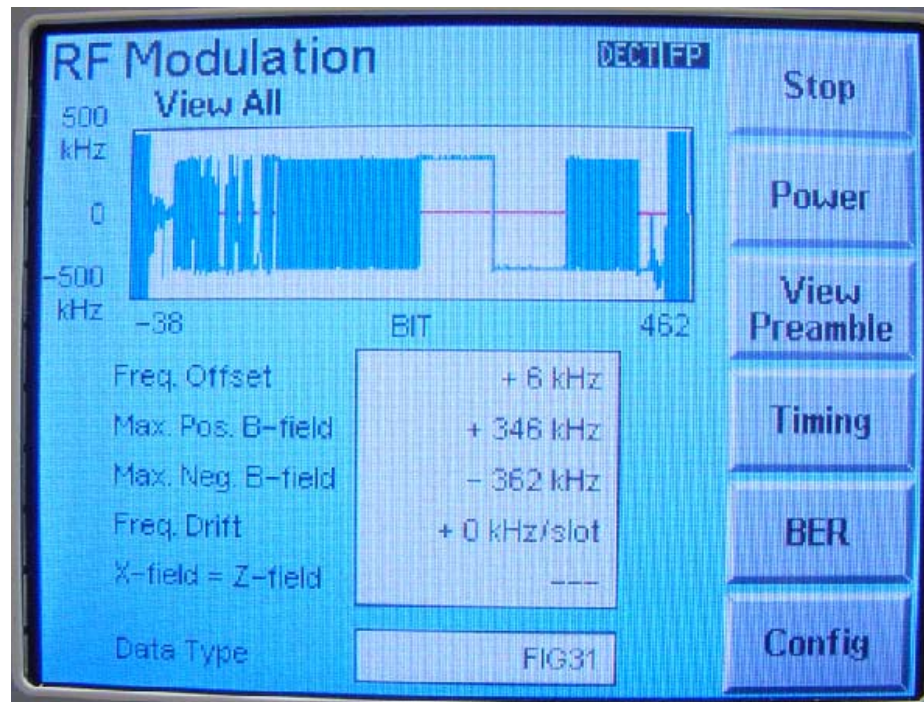
11.1.1 Frame Frequency Drift and Jitter

Test Mode	Channel No.	Frequency (kHz / slot)		Jitter (μ s)	
		Drift	Limit	Meas.	Limit
TBR6	5	0.00	19.2	0.00	25
TBR6	3	0.00	19.2	0.00	25
TBR6	1	0.00	19.2	0.00	25

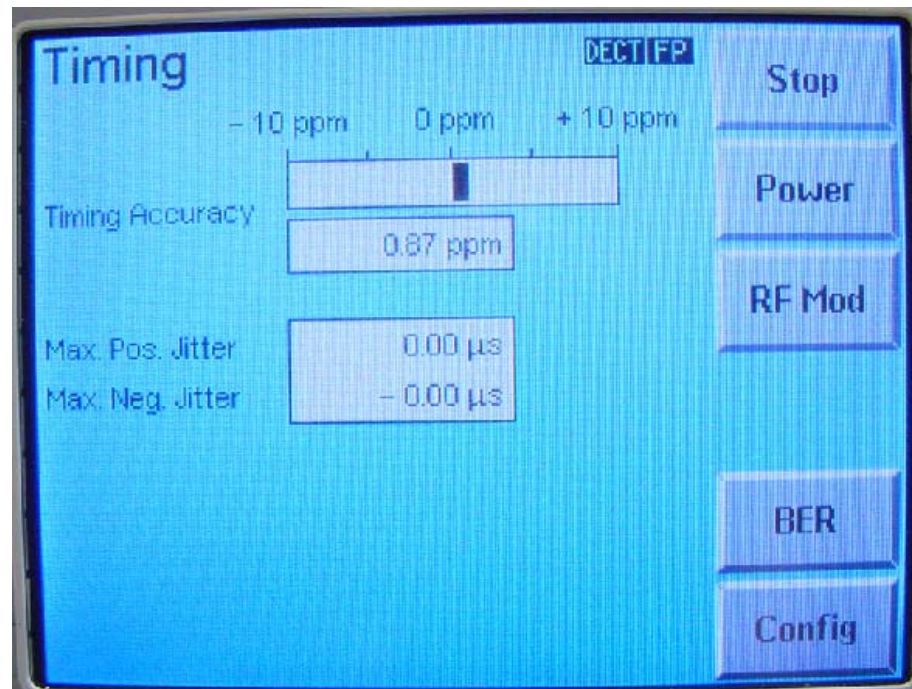
Note: Test Mode TBR6 is built-in per ETSI standard and resides in firmware preceding the FCC test mode in Test Mode Menu.

Photos of worst-case display follow:

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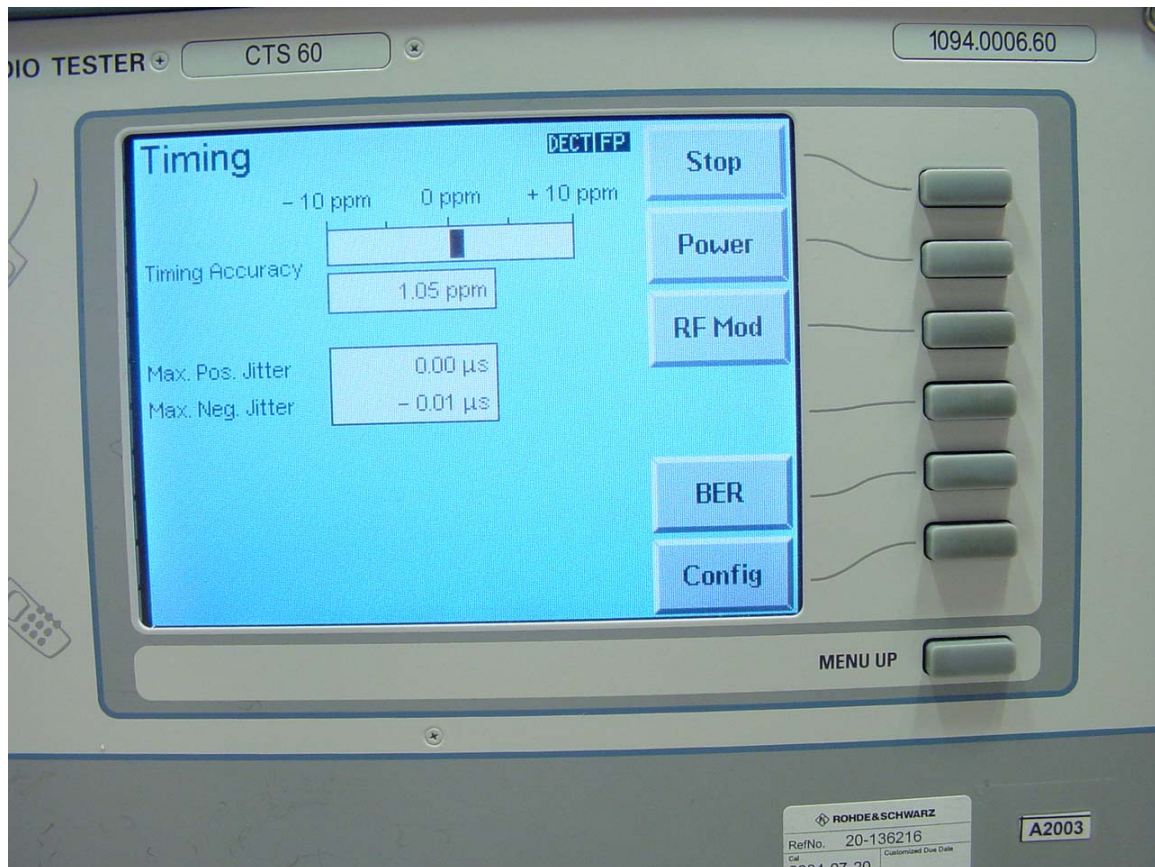
Base Frequency Drift at Mid Channel



Base TDMA Frame Jitter at Mid Channel

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(Enlarged View)

Base TDMA Frame Jitter

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11.1.2 Carrier Frequency Stability with Supply voltage

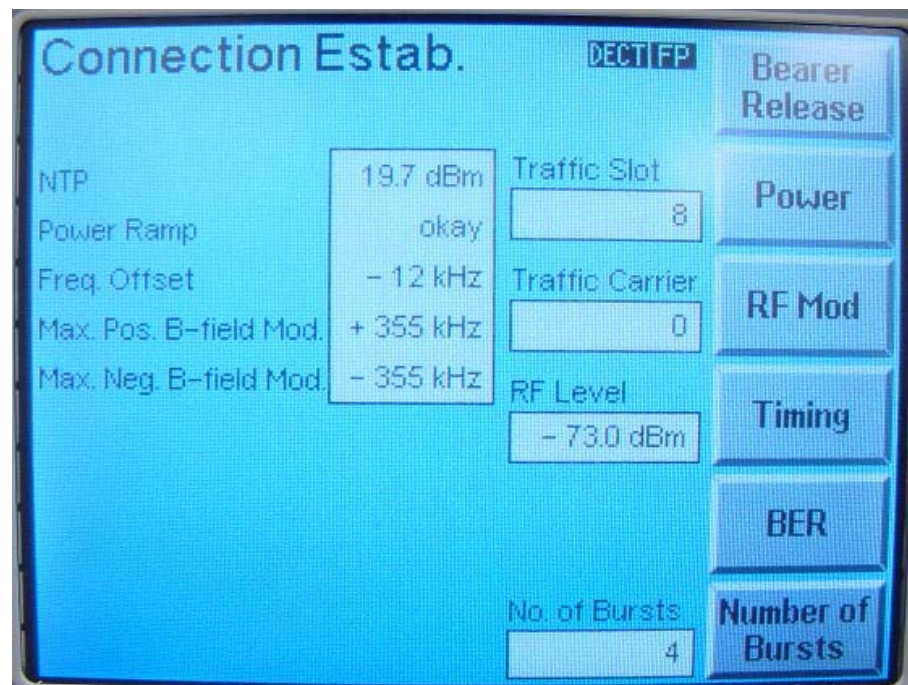
Test Mode	Channel No.	Frequency (kHz / slot)			Limit (kHz / slot)
		102 Vac (85%)	120 Vac (Norm.)	138 Vac (115%)	
TBR6	5	-10	-11	-11	19.2
TBR6	3	-12	-11	-12	19.2
TBR6	1	-9	-8	-8	19.2

Note: Test Mode TBR6 is built-in per ETSI standard and resides in firmware preceding the FCC test mode in Test Mode Menu.

11.1.3 Carrier Frequency Stability with Temperature and Time

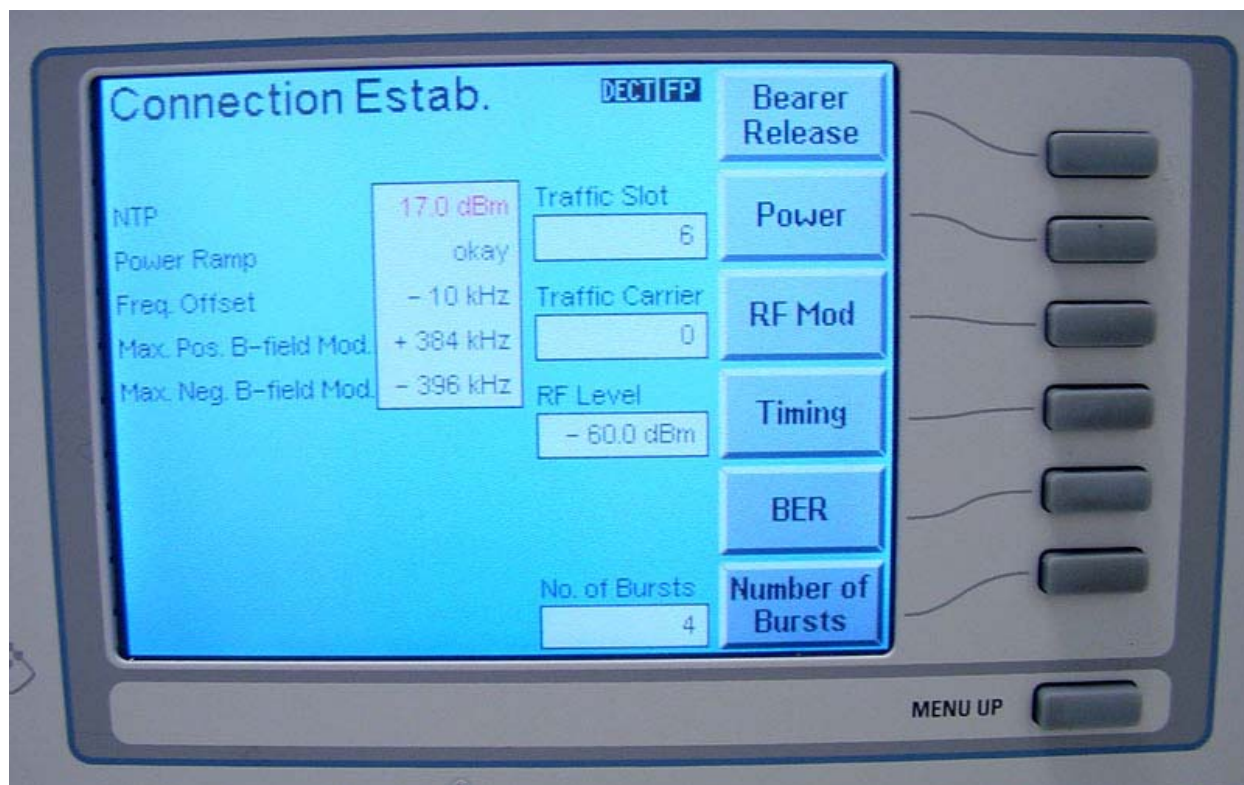
Test Mode	Channel No.	Frequency Offset (kHz)			Limit (kHz)
		-20 °C	25 °C	50 °C	
TBR6	5	-12.0	6.0	-9.0	± 19.2
TBR6	3	-3.0	5.0	-8.0	± 19.2
TBR6	1	-9.0	4.0	-5.0	± 19.2

Test was conducted for duration longer than 1 hour. Photos of worst-case display follow:



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Base Carrier Frequency Offset with Temperature



(Enlarged View)

Base Carrier Frequency Offset with Temperature

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11.2 Handset

11.2.1 Frame Frequency Drift and Jitter

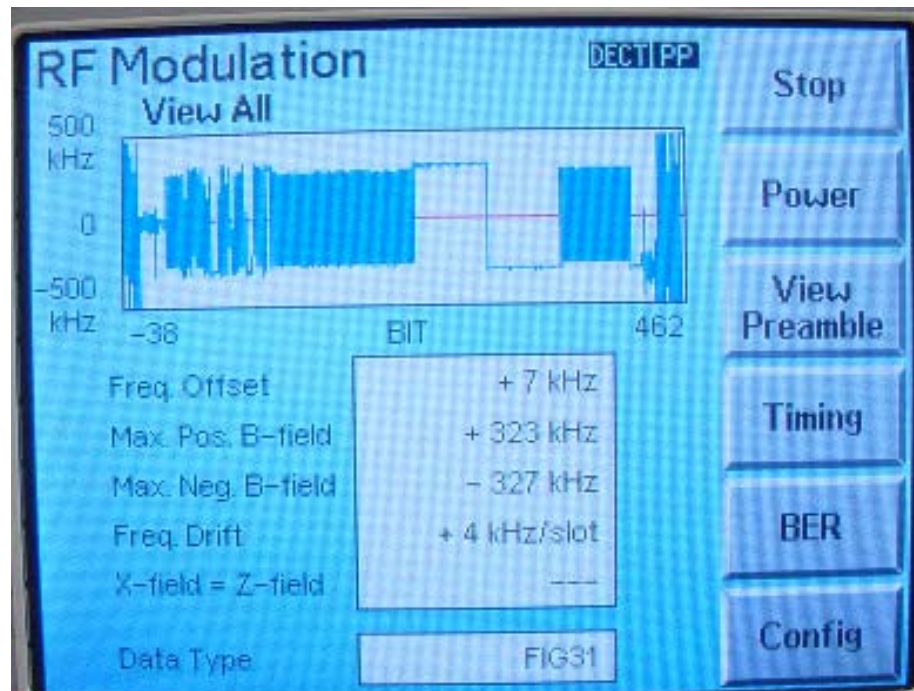
Test Mode	Channel No.	Frequency (kHz / slot)		Jitter (μ s)	
		Drift	Limit	Meas.	Limit
TBR6	5	4.00	19.2	0.00	25
TBR6	3	4.00	19.2	0.08	25
TBR6	1	3.00	19.2	0.00	25

Note: Test Mode TBR6 is built-in per ETSI standard and resides in firmware preceding the FCC test mode in Test Mode Menu.

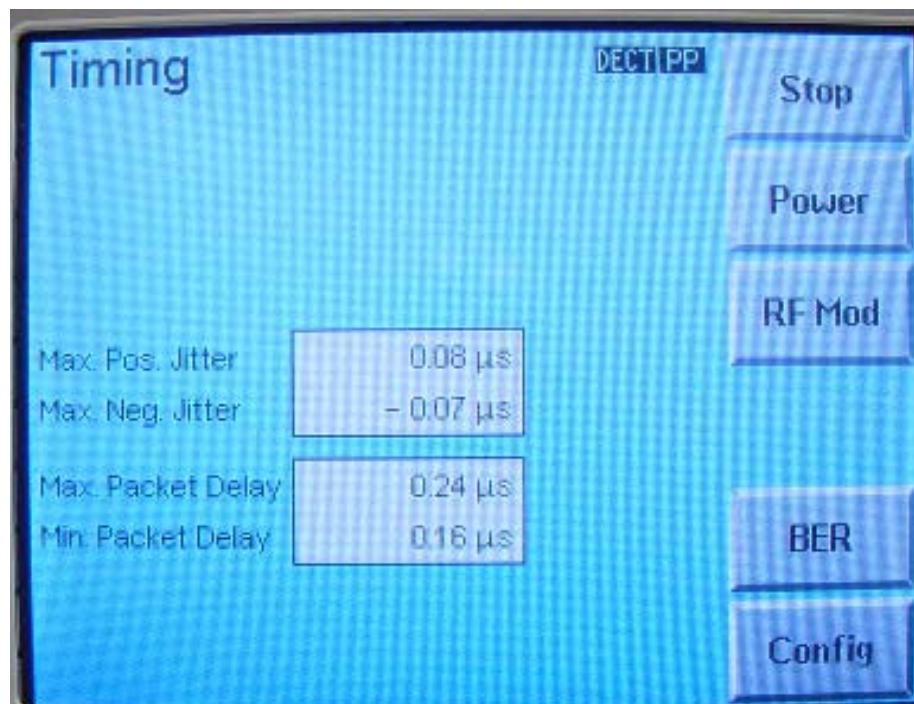
Photos of worst-case display follow:

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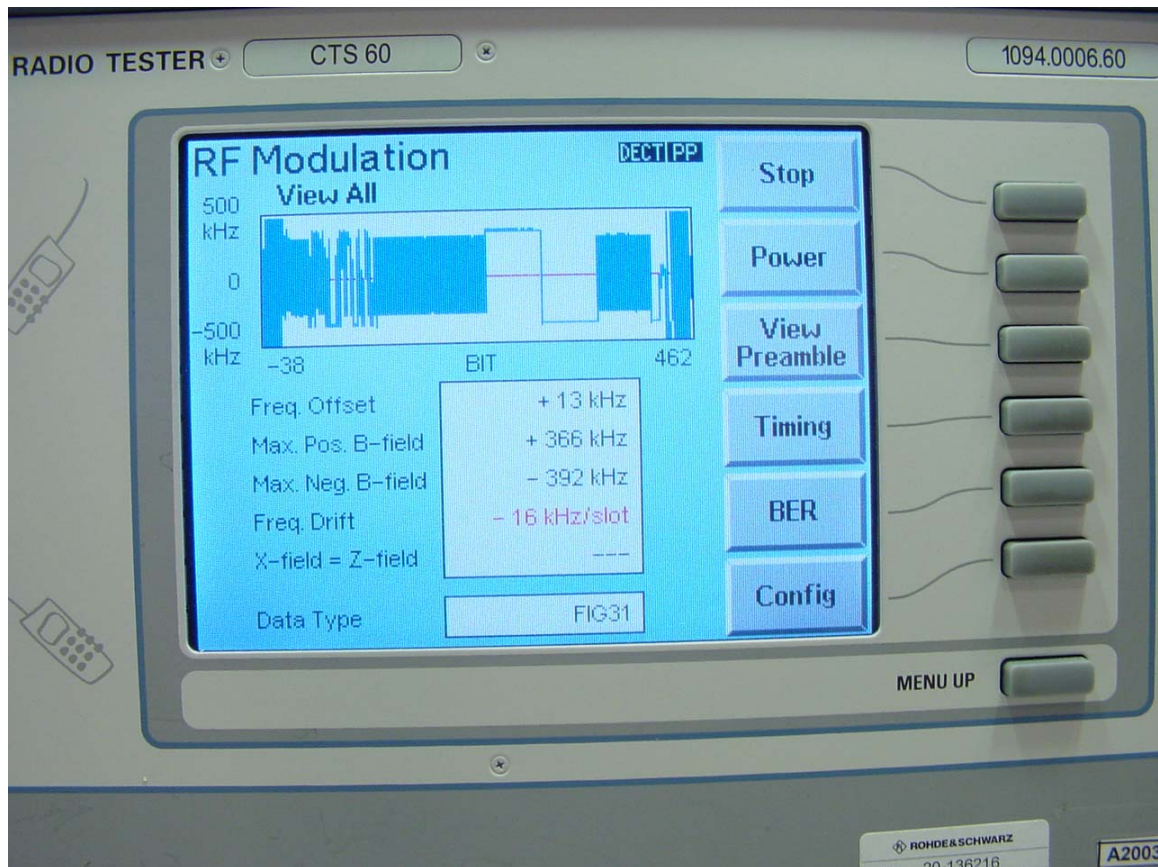
Handset Frequency Drift at Mid Channel



Handset TDMA Frame Jitter

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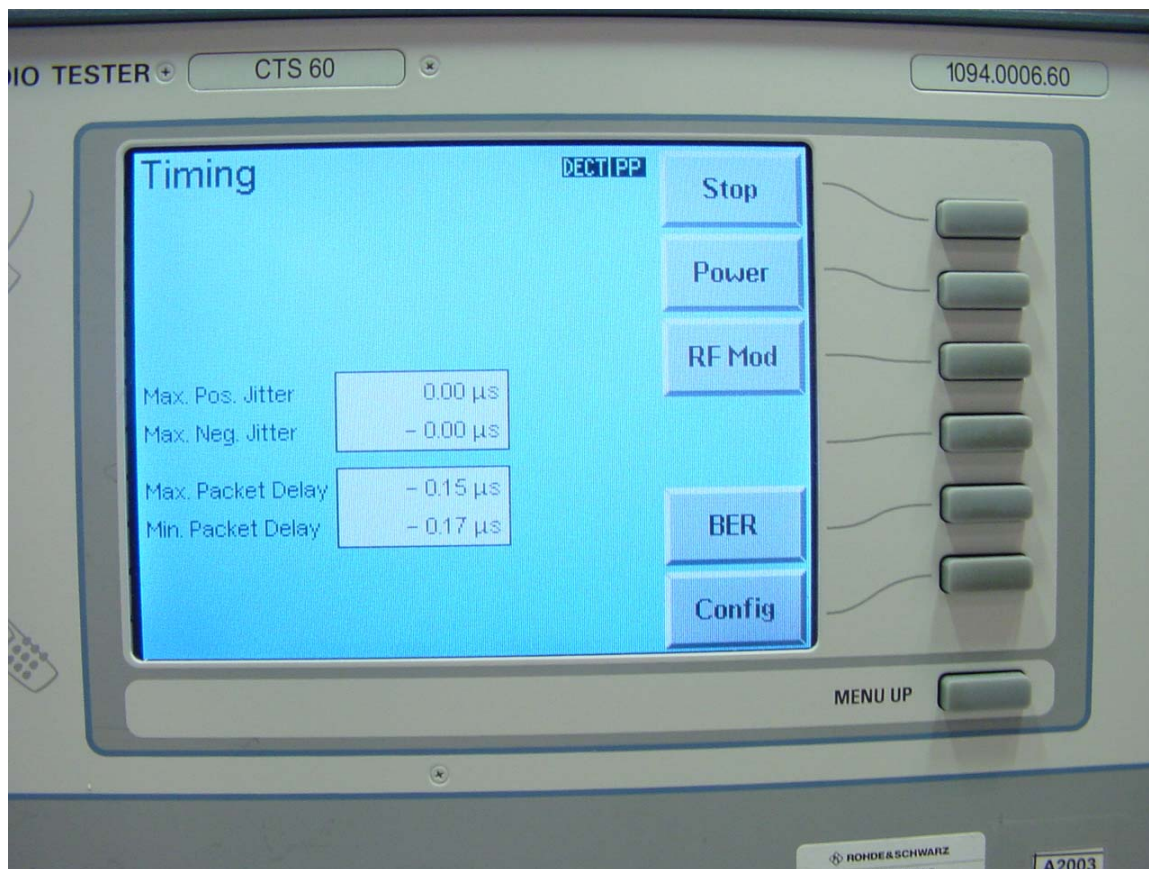


(Enlarged View)

Handset Frequency Drift at Mid Channel

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(Enlarged View)

Handset TDMA Frame Jitter

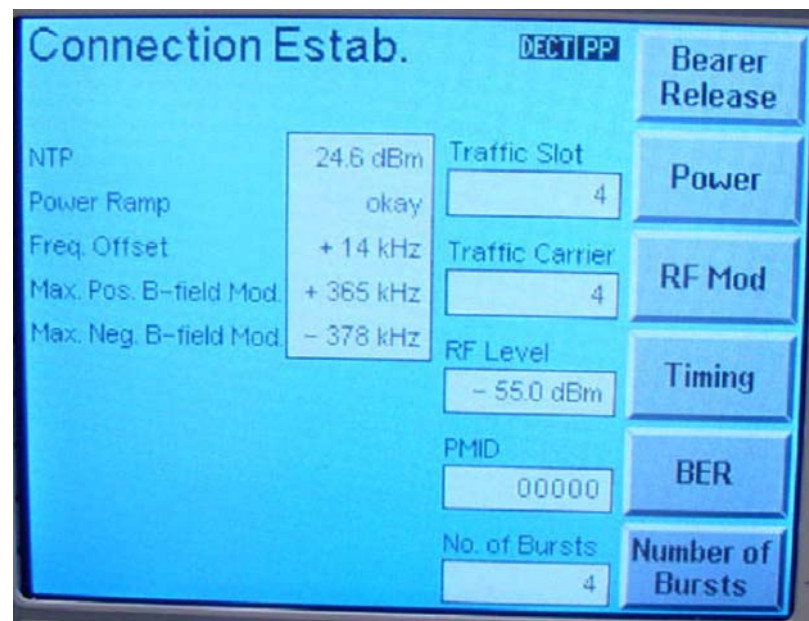
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11.2.2 Carrier Frequency Stability with Temperature and Time

Test Mode	Channel No.	Frequency Offset (kHz)			Limit (kHz)
		-20 °C	25 °C	50 °C	
TBR6	5	10.0	3.0	0.0	± 19.2
TBR6	3	16.0	7.0	0.0	± 19.2
TBR6	1	11.0	6.0	0.0	± 19.2

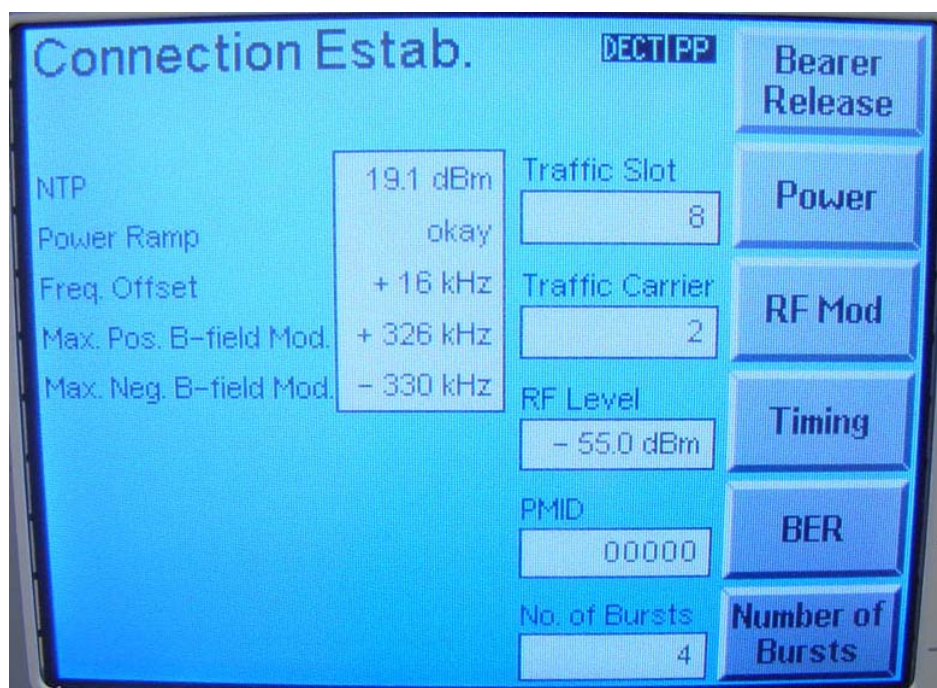
Note: Test Mode TBR6 is built-in per ETSI standard and resides in firmware preceding the FCC test mode in Test Mode Menu.

Test was conducted for duration longer than 1 hour. Photos of worst-case display follow:



Handset Carrier Frequency Offset with Temperature

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(Enlarged View)

Handset Carrier Frequency Offset with Temperature

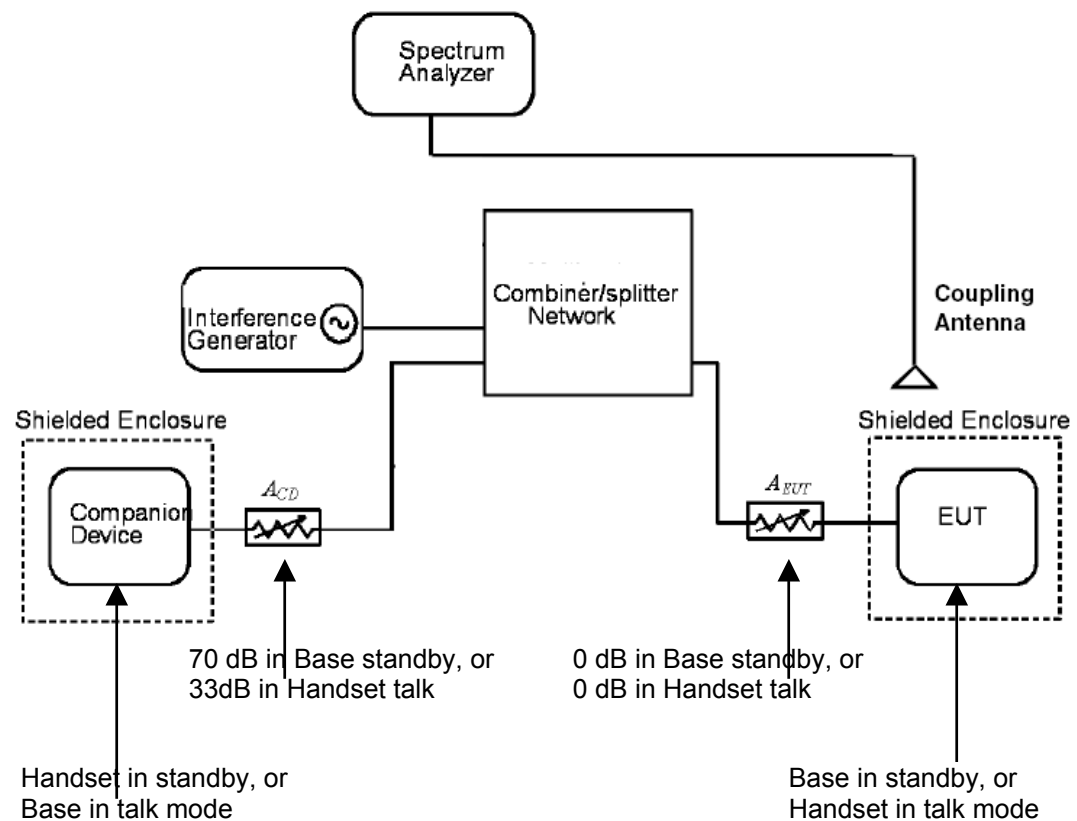
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11 MONITORING THRESHOLD

Clause: 15.323 (c)(5) / 8.4 (c)(5)

Requirement: ≤ -61 dBm for 1.5 MHz BW and 20.5 dBm Tx power derived from formula as follows:
Upper limit = $15 \log B - 184 + 50 - P$ as per ANSI 63.17 Sec. 7.2.1

Test Setup: As shown below per Fig. 8 of 7.1.1 in ANSI C63.17 – 1998



EUT (Base and Handset) modified in

- Tx power purposely reduced by about 10 dB to reduce requirement on external attenuators A_{EUT} and A_{CD}
- Limited 2-channel operation by EEPROM setting

Mode	EUT	A_{EUT} (dB)	Companion Device	A_{CD} (dB)
Standby	Base	0	Handset	70
Talk	Handset	0	Base	33

Test Result: Threshold < -61 dBm

12.1 Standby

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Note:

- Base is the initiator; handset the responding device.
- Main deciding factor in protocol is signal strength RSSI.

Combiner / Coupler insertion loss = 4 dB

Cable loss 1 = 0.8 dB

Cable loss 2 = 1.6 dB

Total insertion loss = 6.4 dB

Measured threshold = Sig Gen reading – Insertion loss
= $-65 - 6.4 = -71.4$ dBm

12.2 Talk

Note:

- Handset is the initiator; base the responding device.
- Main deciding factors in protocol are CRC (or BER), sync pulse and clock jitter besides signal strength RSSI.
- Base conveys information on channel conditions to add to that detected by handset before handset decides on initiating channel change.

Measured threshold = $-64.0 - 6.4 = -70.4$ dBm

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12 POWER LINE CONDUCTED EMISSIONS**Clause:** 15.315, 15.207 (a), 15.107 (a) / 10.0**Limits:** FCC

Emission Frequency (MHz)	Conducted Limit (dBμV)	
	Quasi-peak (QP)	Average (AV)
0.15 - 0.5	66 to 56 *	56 to 46 *
0.5 - 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency.

IC

250 μV (48 dBμV) across 50 Ω at any frequency or within 0.45-30 MHz by CISPR measurement

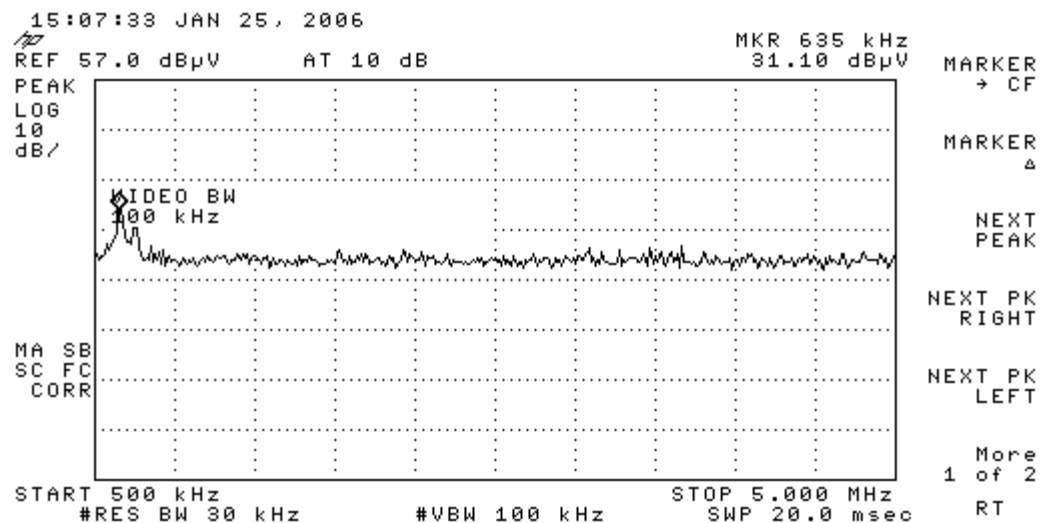
SA Setting: RBW = 10 kHz**Test Result:** Worst-case in each band**13.1 Charger stand-alone**

Line	Band (MHz)	Freq. (MHz)	Reading QP (dBμV)	Loss (dB)	Emission (dBμV)	Limit (dBμV)	Margin (dB)
Live	0.15 - 0.5	0.157	23.16	20	43.16	66	22.84
	0.5 - 5	0.635	31.10	20	51.10	56	4.90
	5 - 30	11.75	26.35	20	46.35	60	13.65
Neutral	0.15 - 0.5	0.171	24.99	20	44.99	64	19.01
	0.5 - 5	0.635	26.95	20	46.95	56	9.05
	5 - 30	11.75	30.33	20	50.33	60	9.67

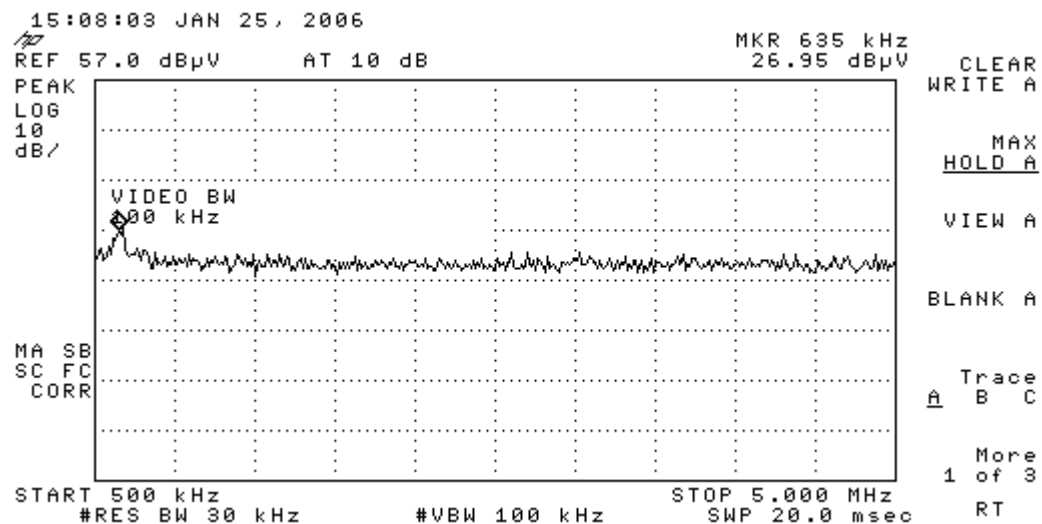
Plots follow.

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Emission from LIVE conductor



Emission from NEUTRAL conductor

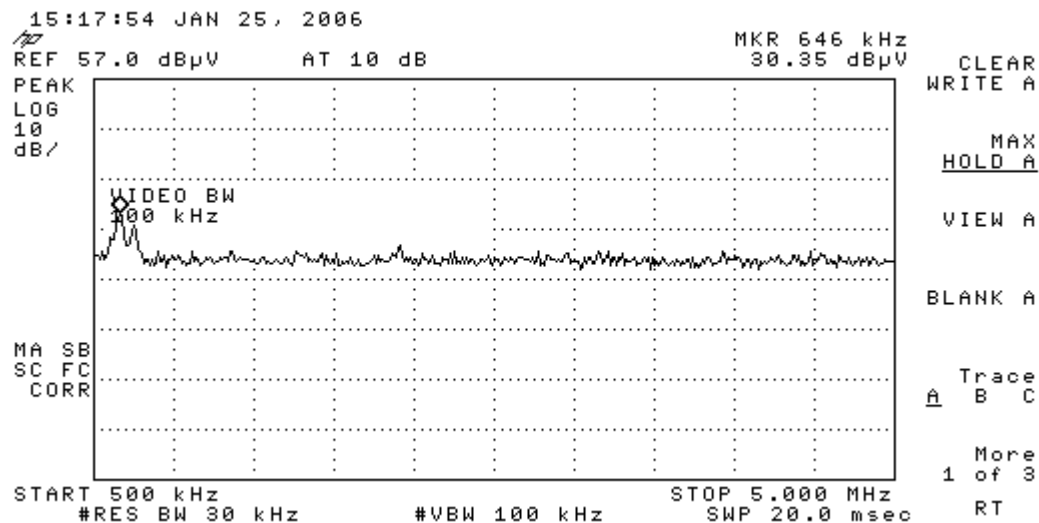


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13.2 Charger with Handset in standby

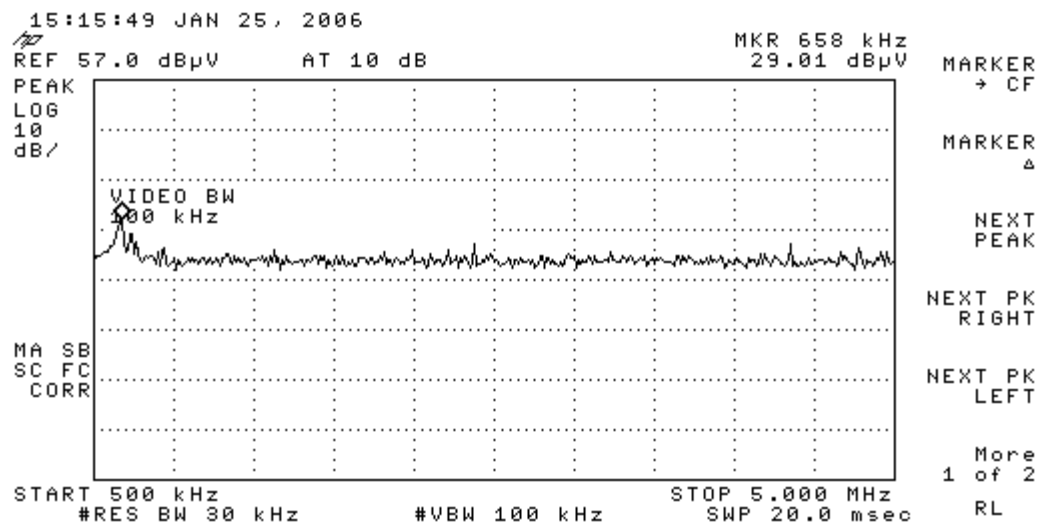
Line	Band (MHz)	Freq. (MHz)	Reading QP (dBμV)	Loss (dB)	Emission (dBμV)	Limit (dBμV)	Margin (dB)
Live	0.15 - 0.5	0.160	22.97	20	42.97	64	21.03
	0.5 - 5	0.646	30.35	20	50.35	56	5.65
	5 - 30	9.50	29.87	20	49.87	60	10.13
Neutral	0.15 - 0.5	0.159	22.92	20	42.92	64	21.08
	0.5 - 5	0.658	29.01	20	49.01	56	6.99
	5 - 30	8.12	29.35	20	49.35	60	10.65

Worst-case plot follows.



Emission from LIVE conductor

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Emission from NEUTRAL conductor

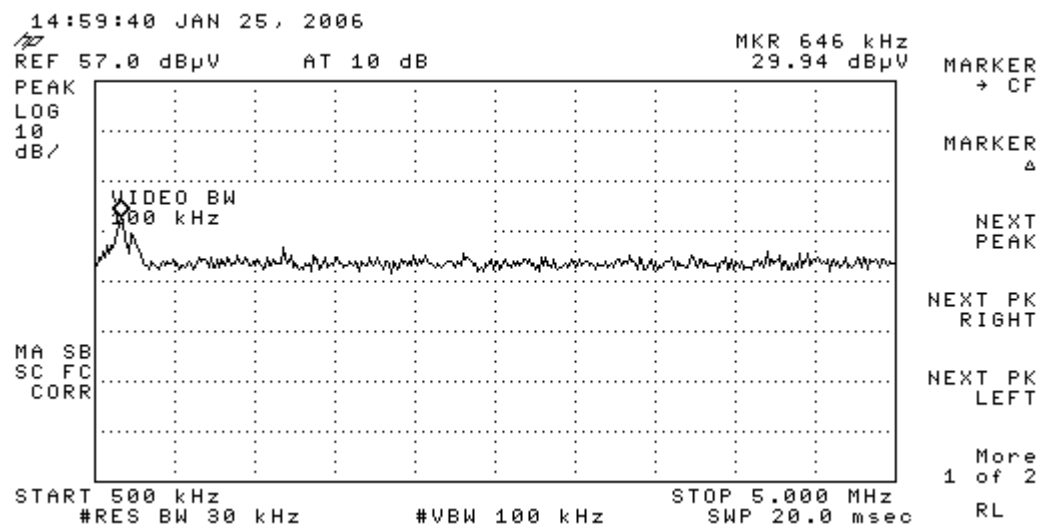
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13.3 Base in phone-on

Handset Tx on Low, Mid or High channel set by Test Mode

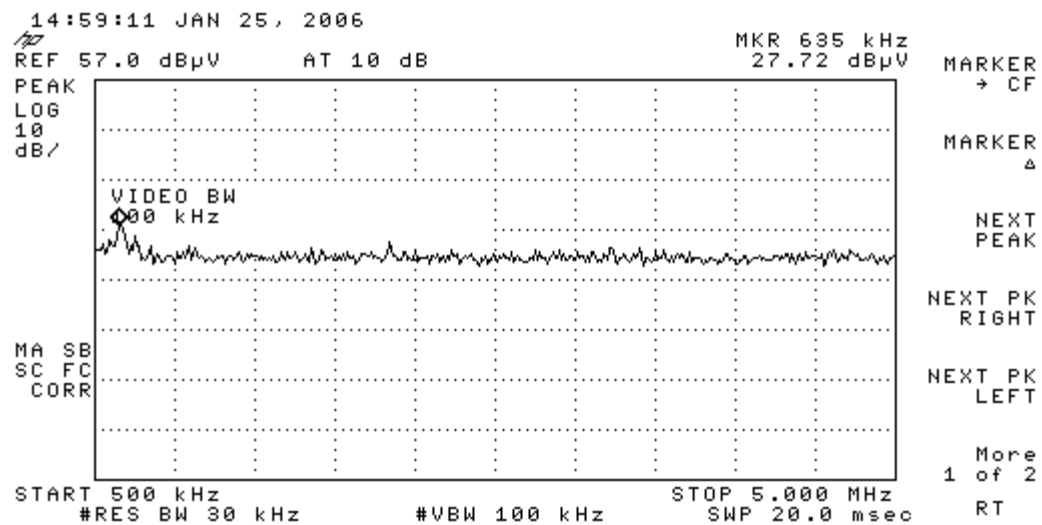
Line	Band (MHz)	Freq. (MHz)	Reading QP (dBμV)	Loss (dB)	Emission (dBμV)	Limit (dBμV)	Margin (dB)
Live	0.15 - 0.5	0.170	23.44	20	43.44	64	20.56
	0.5 - 5	0.646	29.94	20	49.94	56	6.06
	5 - 30	24.00	29.68	20	49.68	60	10.32
Neutral	0.15 - 0.5	0.163	23.96	20	43.96	64	20.04
	0.5 - 5	0.635	27.72	20	47.72	56	8.28
	5 - 30	20.54	20.31	20	40.31	60	19.69

Worst-case plot follows.



Emission from LIVE conductor
(Base on Tx Mid Channel)

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Emission from NEUTRAL conductor
(Base on Tx Mid Channel)

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13 CHARGER RADIATED EMISSIONS

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

13.1 Charger Stand-alone

Clause: 15.109 (a) / 5.0 ICES-003

Limits:

Emission Frequency (MHz)	Class B Field Strength at 3 m	
	(μ V/m)	(dB μ V/m)
30 – 88	100	40
88 – 216	150	43.5
216 – 960	200	46
> 960	500	54

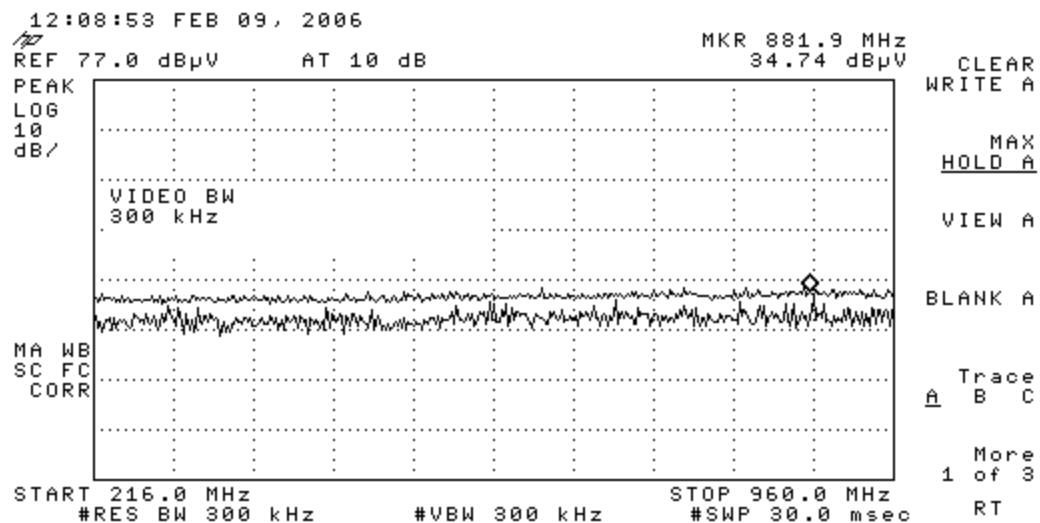
Test Result: Worst-case in each band

- 14.1.1 Band 30 – 88 MHz
- 14.1.2 Band 88 – 216 MHz
- 14.1.3 Band 216 – 960 MHz

Band (MHz)	Freq. (MHz)	Meter Peak Reading (dB μ V)	Coax Loss (dB)	Antenna Factor (Note 1) (dB)	Pre- amp Gain (dB)	Field Strength at 3m (dB μ V/m)	Rule Limit (dB μ V/m)	Margin from Limit (dB)
30 – 88	33.48	31.81	2.0	14.5	-23.5	24.81	40	15.19
88–216	168.60	40.75	3	13.5	-23.5	33.75	43.5	9.75
216–960	881.90	34.74	5	23.3	-23.5	39.54	46	6.46

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

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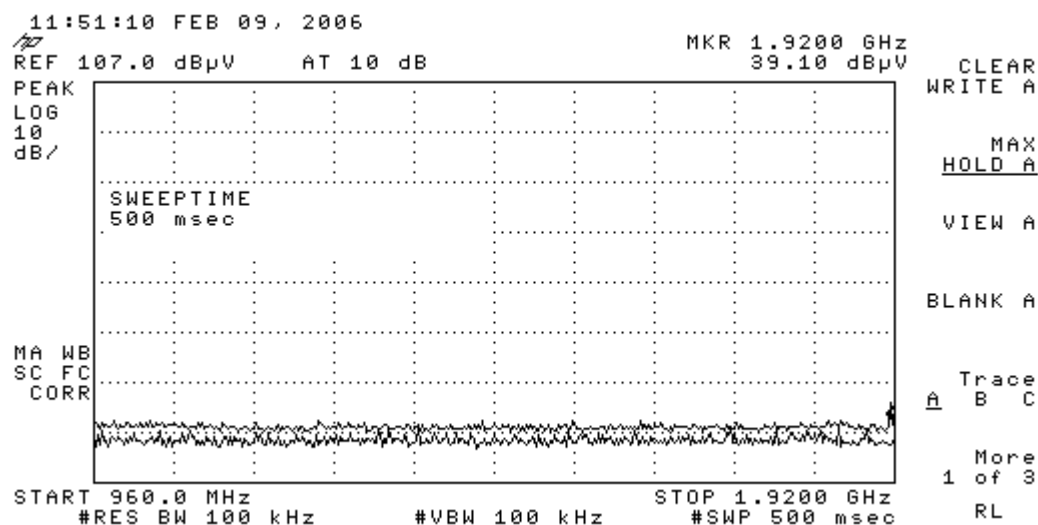


Spurious emission ≤ 960 MHz

14.1.4 Band above 960 MHz

Freq. (MHz)	Meter Peak Reading (dBμV)	Coax Loss (dB)	Antenna Factor (Note 2) (dB)	Pre-amp Gain (dB)	Field Strength at 3m (dBμV/m)	Rule Limit (dBμV/m)	Margin from Limit (dB)
1920	39.10	7.52	28.7H	-35	40.32	54	13.68

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



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Spurious emission > 960 MHz

14.2 Charger with Handset in standby

Clause: 15.205(a), 15.205(c), 15.209 (a) / 11.0

Limits:

Emission Frequency (MHz)	Field Strength		At Distance	Detector
	(μ V/m)	(dB μ V/m)	(m)	Type
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)

Test Result: Worst-case in each band

14.2.1 Band 9 kHz – 30 MHz

14.2.2 Band 30 – 88 MHz

14.2.3 Band 88 – 216 MHz

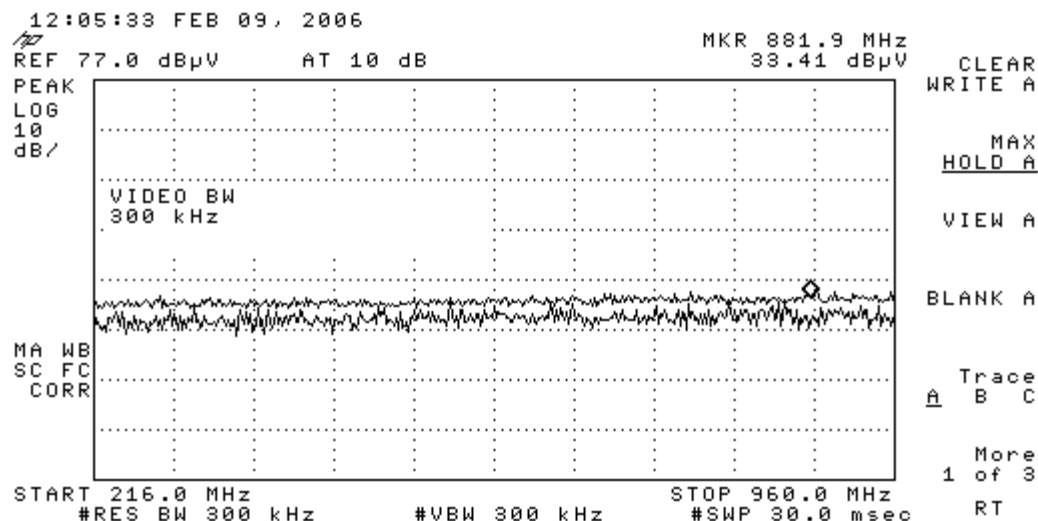
14.2.4 Band 216 – 960 MHz

Band (MHz)	Freq. (MHz)	Meter Peak Reading (dB μ V)	Coax Loss (dB)	Antenna Factor (Note 1) (dB)	Pre- amp Gain (dB)	Field Strength at 3m (dB μ V/m)	Rule Limit (dB μ V/m)	Margin from Limit (dB)
0.009–30		N/A						N/A
30 – 88	32.61	39.09	2	14.5 BV	-23.5	32.09	40	7.90
88–216	168.6	36.30	3	13.5 BV	-23.5	29.30	43.5	14.20
216–960	881.9	33.41	5	23.3 LV	-23.5	38.21	46	7.79

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

Worst-case plot follows:

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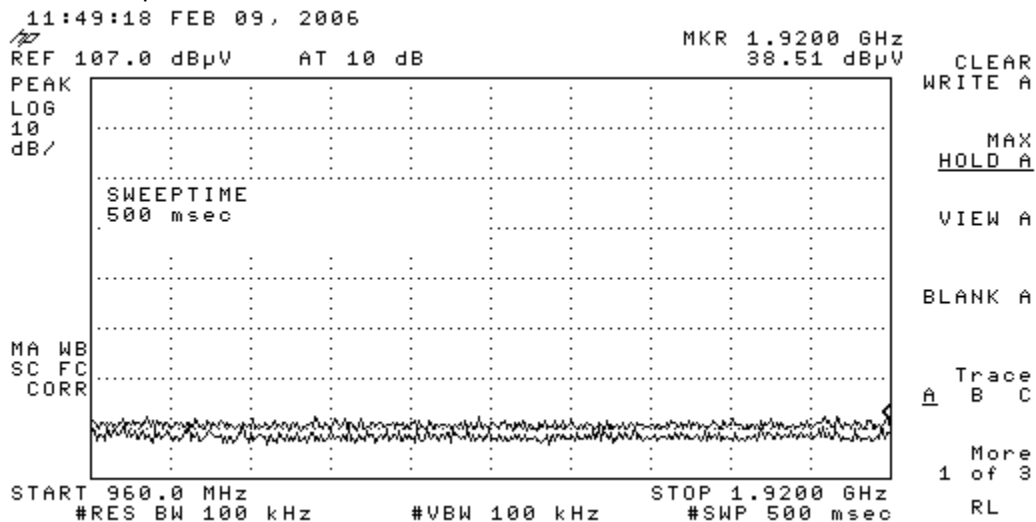
Spurious emission $\leq$ 960 MHz

14.2.5 Band above 960 MHz

Freq. (MHz)	Meter Peak Reading (dBμV)	Coax Loss (dB)	Antenna Factor (Note 2) (dB)	Pre-amp Gain (dB)	Field Strength at 3m (dBμV/m)	Rule Limit (dBμV/m)	Margin from Limit (dB)
1920.00	38.51	7.52	28.5 V	-35	39.53	54	14.47

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

Worst-case plot follows:



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Spurious emission > 960 MHz