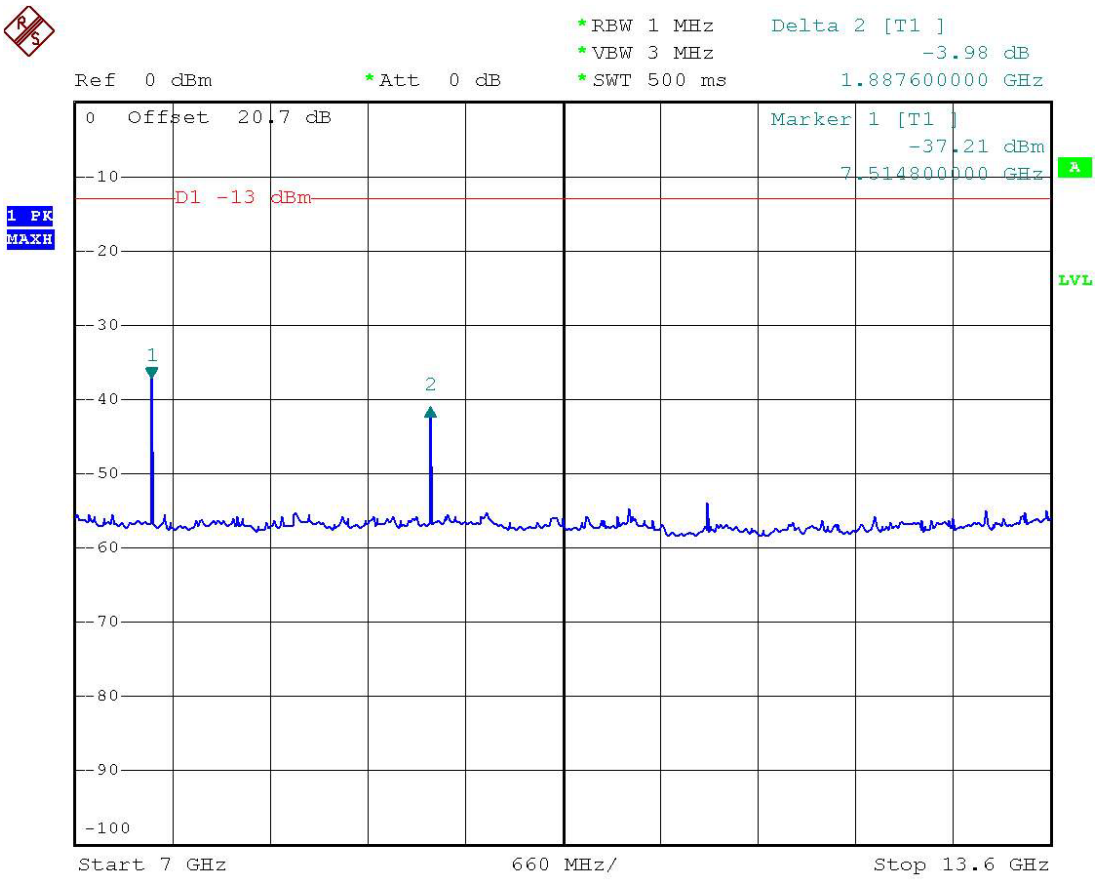
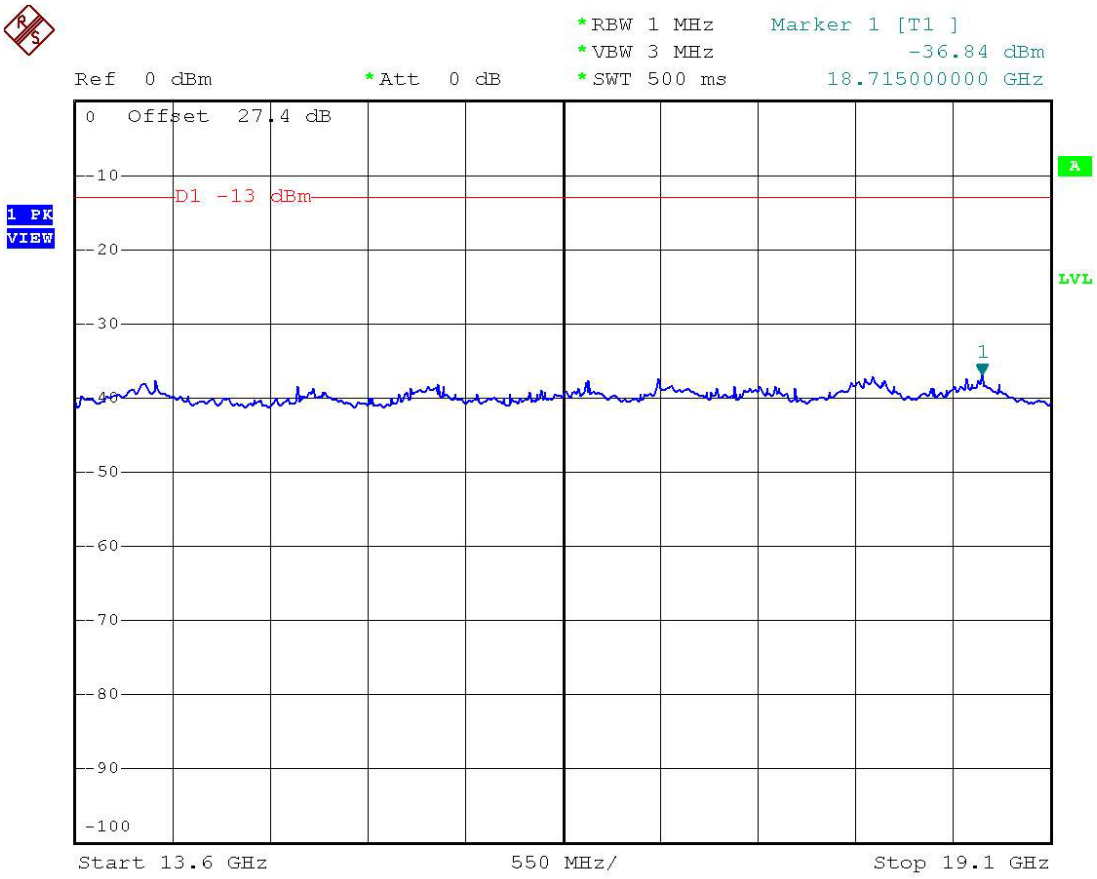
Name of Test: Conducted Spurious Emission
7G-13.6G



Name of Test: Conducted Spurious Emission
13.6 G-19.1 G



Name of Test: Field Strength of Spurious Radiation

Specification: 47 CFR 2.1053(a)

Guide: ANSI/TIA/EIA-603-1992/2001, Paragraph 1.2.12 and Table 16

Measurement Procedure

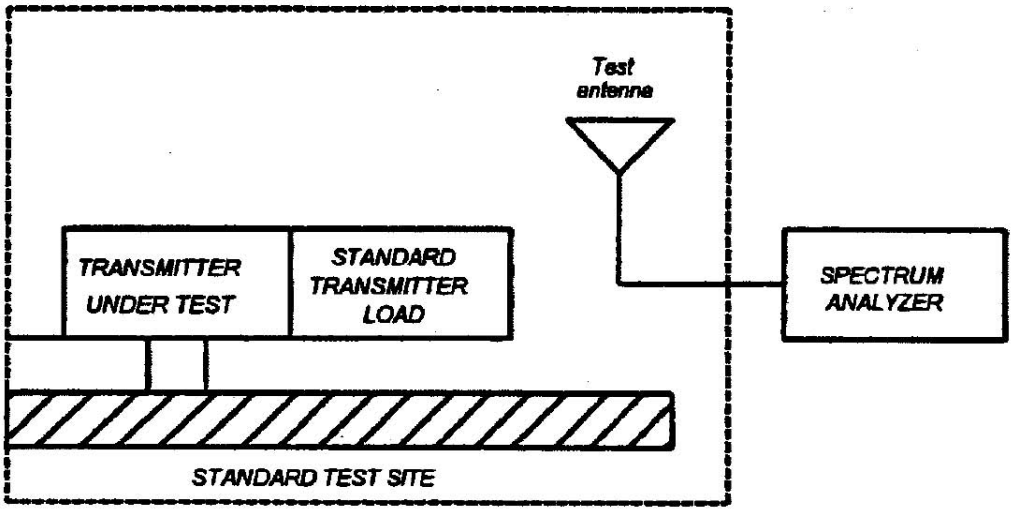
1.2.12.1 Definition: Radiated spurious emissions are emissions from the equipment when transmitting into a non-radiating load on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

1.2.12.2 Method of Measurement

A) Connect the equipment as illustrated

B) Adjust the spectrum analyzer for the following settings:
1) Resolution Bandwidth 100 kHz (<1 GHZ), 1 MHZ (> 1GHz).
2) Video Bandwidth ≥ 3 times Resolution Bandwidth
3) Sweep Speed ≤2000 Hz/second
4) Detector Mode = Mean or Average Power

C) Place the transmitter to be tested on the turntable in the standard test site. If the antenna is detatchable, The transmitter is transmitting into a non-radiating load which is placed on the turntable. The RF cable to this load should be of minimum length.

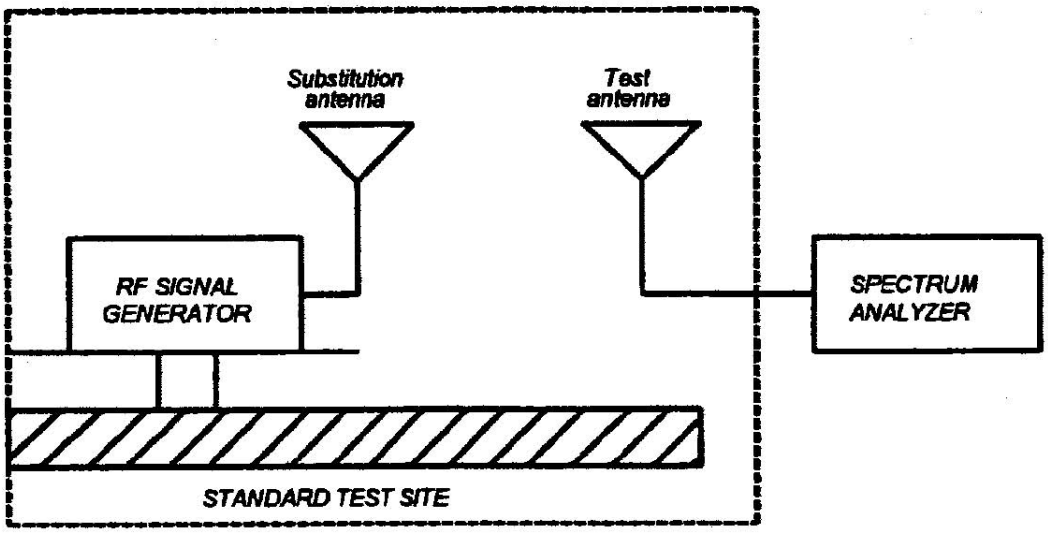


Name of Test: Field Strength of Spurious Radiation (Cont.)

D) For each spurious measurement the test antenna should cover the measured frequency. Measurements shall be made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier, except for the region close to the carrier equal to ± the test bandwidth (see section 1.3.4.4).

E) For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.

F) Repeat step E) for each spurious frequency with the test antenna polarized vertically.



G) Reconnect the equipment as illustrated.

H) Keep the spectrum analyzer adjusted as in step B).

I) Remove the transmitter and replace it with a substitution antenna. The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.

Name of Test: Field Strength of Spurious Radiation (Cont.)

J) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.

K) Repeat step J) with both antennas vertically polarized for each spurious frequency.

L) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps J) and K) by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna.

NOTE: It is permissible that other antennas provided can be referenced to a dipole.

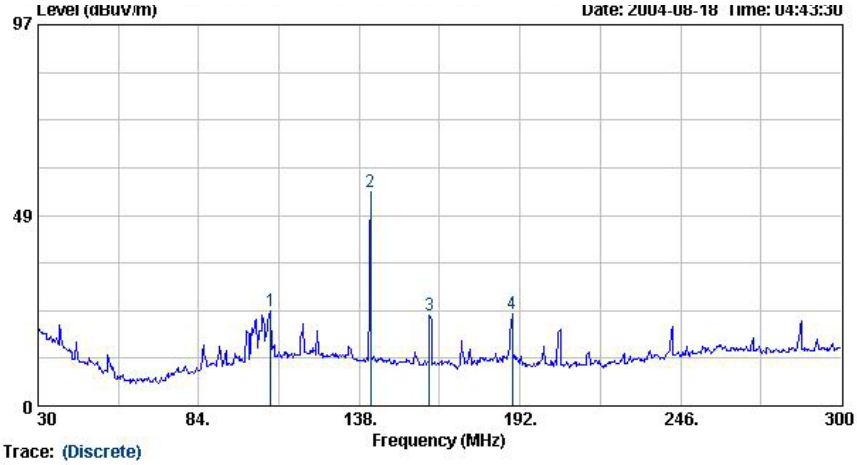
Tested By: Tim Kao

Name of Test: Field Strength of Spurious Radiation
GSM 1900 (Channel 661)

Freq MHz	Pol	Substitution Antenna Input Power (dBm)	Substitution Antenna Gain (dBi)	Et (dBuV/m)	Es (dBuV/m)	Et - Es (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
108.30	H	-1.13	1.77	24.18	92.65	-68.47	-67.84	-13.0	-54.84
141.78	H	-1.08	1.26	54.61	91.94	-37.33	-37.15	-13.0	-24.15
161.49	H	-1.05	1.61	22.90	91.14	-68.24	-67.68	-13.0	-54.68
189.30	H	-1.19	1.45	23.50	90.40	-66.90	-66.64	-13.0	-53.64
405.00	H	-1.66	1.59	25.38	94.46	-69.08	-69.15	-13.0	-56.15
567.40	H	-1.91	1.50	26.17	94.67	-68.50	-68.91	-13.0	-55.91
2942.00	H	-5.01	7.41	48.79	99.51	-50.72	-48.32	-13.0	-35.32
3758.00	H	-5.25	7.45	57.63	99.07	-41.44	-39.24	-13.0	-26.24
5638.00	H	-6.67	8.44	56.32	98.79	-42.47	-40.70	-13.0	-27.70
7518.00	H	-8.44	8.52	64.00	94.67	-30.67	-30.59	-13.0	-17.59
9398.00	H	-9.78	8.94	57.10	95.76	-38.66	-39.51	-13.0	-26.51
37.29	V	-0.63	0.41	33.60	68.58	-34.98	-35.19	-13.0	-22.19
42.69	V	-0.64	0.26	34.31	71.54	-37.23	-37.61	-13.0	-24.61
53.76	V	-0.75	0.32	27.94	81.50	-53.56	-53.99	-13.0	-40.99
141.78	V	-1.08	1.26	56.45	91.94	-35.49	-35.31	-13.0	-22.31
189.30	V	-1.19	1.45	26.97	90.40	-63.43	-63.17	-13.0	-50.17
486.20	V	-1.87	2.04	27.21	94.15	-66.94	-66.78	-13.0	-53.78
567.40	V	-1.91	1.50	31.29	94.67	-63.38	-63.79	-13.0	-50.79
648.60	V	-2.13	1.31	28.05	94.41	-66.36	-67.17	-13.0	-54.17
816.60	V	-2.46	0.48	28.28	93.49	-65.21	-67.19	-13.0	-54.19
2942.00	V	-5.01	7.41	48.45	99.51	-51.06	-48.66	-13.0	-35.66
3758.00	V	-5.25	7.45	56.38	99.07	-42.69	-40.49	-13.0	-27.49
5638.00	V	-6.67	8.44	57.03	98.79	-41.76	-39.99	-13.0	-26.99
7518.00	V	-8.44	8.52	62.79	94.67	-31.88	-31.80	-13.0	-18.80

Radiated Scanned Data

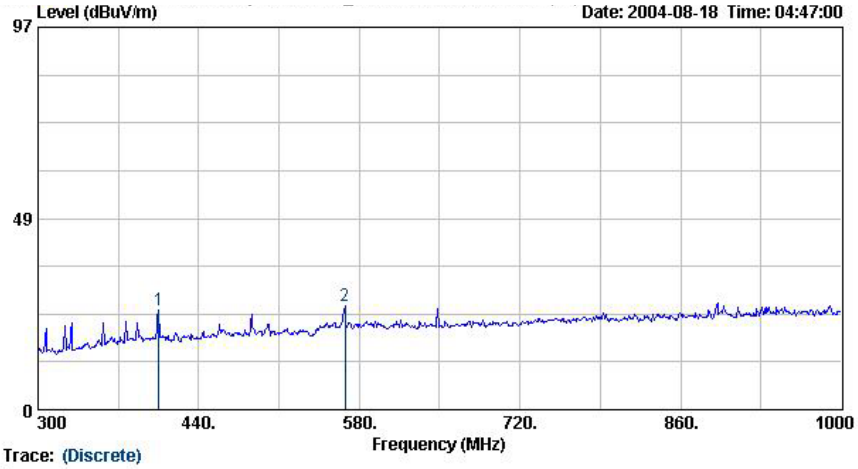
GSM1900, Horizontal Polarization



Trace: (Discrete)

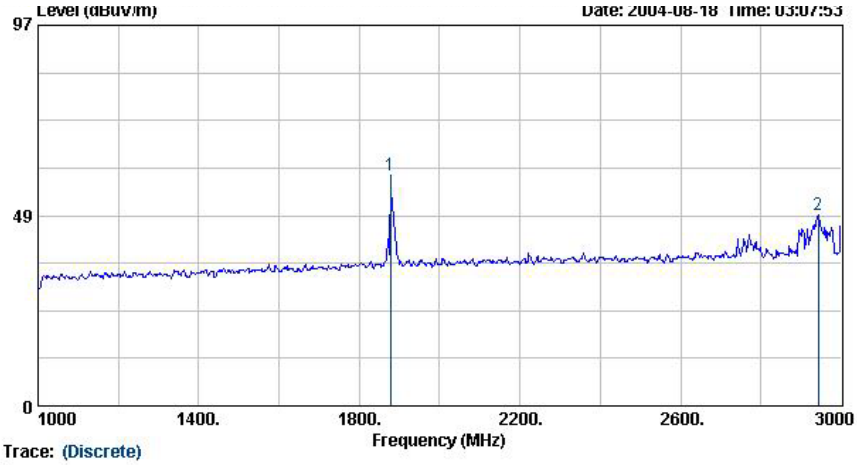
Site : 03CH06
Condition : 3m BI LOG 2004 0629 HORIZONTAL
EUT : Tri Band 900/1800/1900 Handset
Power : 120Vac/60Hz
Model : S700
Memo : PCS Link Mode ; CH 661

	Freq	Over Limit	Level	Limit Line	Antenna Factor	Preamp Factor	Cable Loss	Remark	Ant Pos	Table Pos
	MHz	dB	dBuV/m	dBuV/m	dB/m	dB	dB		cm	deg
1 @	108.30	------	24.18	------	11.28	32.15	0.92	Peak	---	---
2 @	141.78	------	54.61	------	10.74	32.27	1.03	Peak	---	---
3 @	161.49	------	22.92	------	9.45	32.13	1.09	Peak	---	---
4 @	189.30	------	23.50	------	8.30	31.95	1.21	Peak	---	---



Site : 03CH06
Condition : 3m BI LOG 2004 0629 HORIZONTAL
EUT : Tri Band 900/1800/1900 Handset
Power : 120Vac/60Hz
Model : S700
Memo : PCS Link Mode ; CH 661

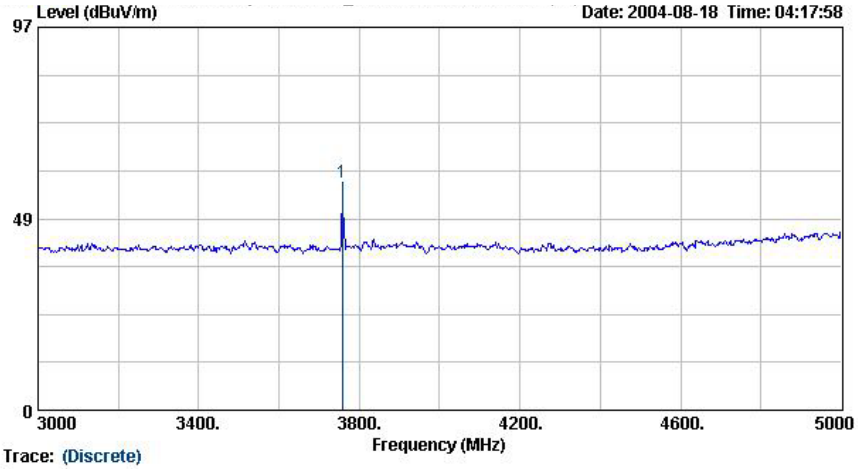
	Freq	Over Limit	Level	Limit Line	Antenna Factor	Preamp Factor	Cable Loss	Remark	Ant Pos	Table Pos
	MHz	dB	dBuV/m	dBuV/m	dB/m	dB	dB		cm	deg
1 @	405.00	------	25.38	------	16.13	31.71	1.84	Peak	---	---
2 @	567.40	------	26.17	------	18.69	31.39	2.23	Peak	---	---



Site : 03CH06
Condition : 3m HF-HORN AH-118 HORIZONTAL
EUT : Tri Band 900/1800/1900 Handset
Power : 120Vac/60Hz
Model : S700
Memo : PCS Link Mode ; CH 661

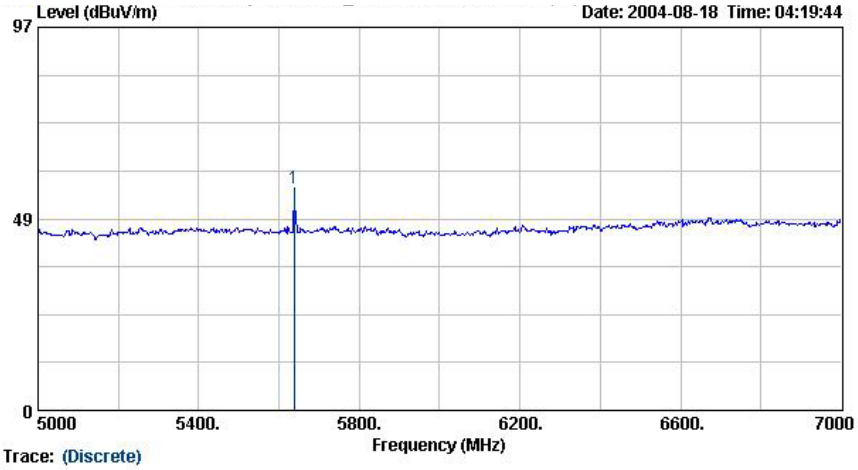
	Freq	Over Limit	Level	Limit Line	Antenna Factor	Preamp Factor	Cable Loss	Remark	Ant Pos	Table Pos
	MHz	dB	dBuV/m	dBuV/m	dB/m	dB	dB		cm	deg
1 @	1878.00	------	58.72	------	27.42	44.40	2.93	Peak	---	---
2 @	2942.00	------	48.79	------	29.80	44.12	3.41	Peak	---	---

Remark: 1. #1 Fundamental Signal



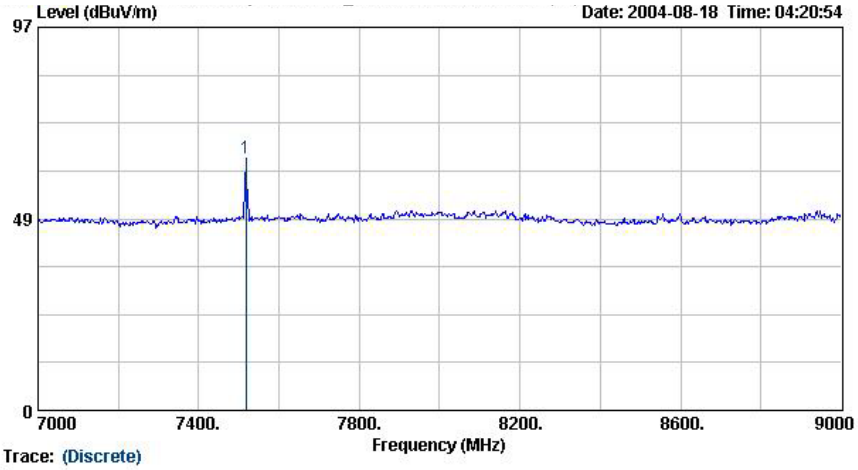
Site : 03CH06
Condition : 3m HF-HORN AH-118 HORIZONTAL
EUT : Tri Band 900/1800/1900 Handset
Power : 120Vac/60Hz
Model : S700
Memo : PCS Link Mode ; CH 661

	Freq	Over Limit	Level	Limit Line	Antenna Factor	Preamp Factor	Cable Loss	Remark	Ant Pos	Table Pos
	MHz	dB	dBuV/m	dBuV/m	dB/m	dB	dB		cm	deg
1 @	3758.00	------	57.63	------	30.26	44.75	4.22	Peak	---	---



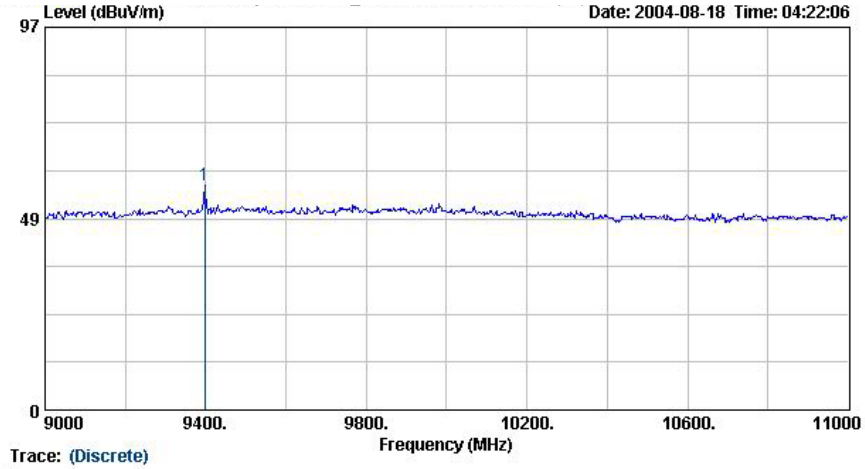
Site : 03CH06
Condition : 3m HF-HORN AH-118 HORIZONTAL
EUT : Tri Band 900/1800/1900 Handset
Power : 120Vac/60Hz
Model : S700
Memo : PCS Link Mode ; CH 661

	Freq	Over Limit	Level	Limit Line	Antenna Factor	Preamp Factor	Cable Loss	Remark	Ant Pos	Table Pos
	MHz	dB	dBuV/m	dBuV/m	dB/m	dB	dB		cm	deg
1 @	5638.00	------	56.32	------	34.01	46.55	5.35	Peak	---	---



Site : 03CH06
Condition : 3m HF-HORN AH-118 HORIZONTAL
EUT : Tri Band 900/1800/1900 Handset
Power : 120Vac/60Hz
Model : S700
Memo : PCS Link Mode ; CH 661

	Freq	Over Limit	Level	Limit Line	Antenna Factor	Preamp Factor	Cable Loss	Remark	Ant Pos	Table Pos
	MHz	dB	dBuV/m	dBuV/m	dB/m	dB	dB		cm	deg
1 @	7518.00	------	64.00	------	36.03	46.19	6.19	Peak	---	---

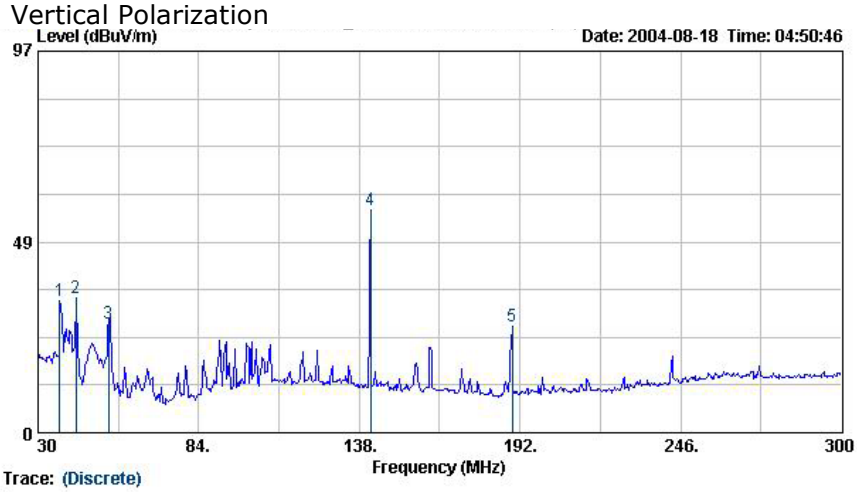


Site : 03CH06
Condition : 3m HF-HORN AH-118 HORIZONTAL
EUT : Tri Band 900/180(
Power : 120Vac/60Hz
Model : S700
Memo : PCS Link Mode ; CH 661

	Freq	Over Limit	Level	Limit Line	Antenna Factor	Preamp	Cable ss	Remark	Ant Pos	Table Pos
	MHz	dB	dBuV/m	dBuV/m	dB/m	dB	dB		cm	deg
1 @	9398.00	------	57.10	------	37.79	44.62	7.80	Peak	---	---

- Mark:
  Frequency from 11000MHz to 19000MHz, the emission emitted by the EUT is too low to be measured.

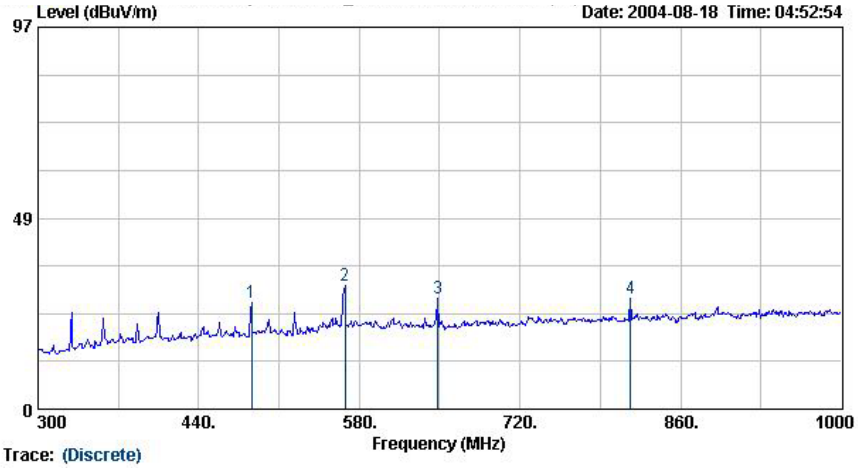
GSM1900, Vertical Polarization



Trace: (Discrete)

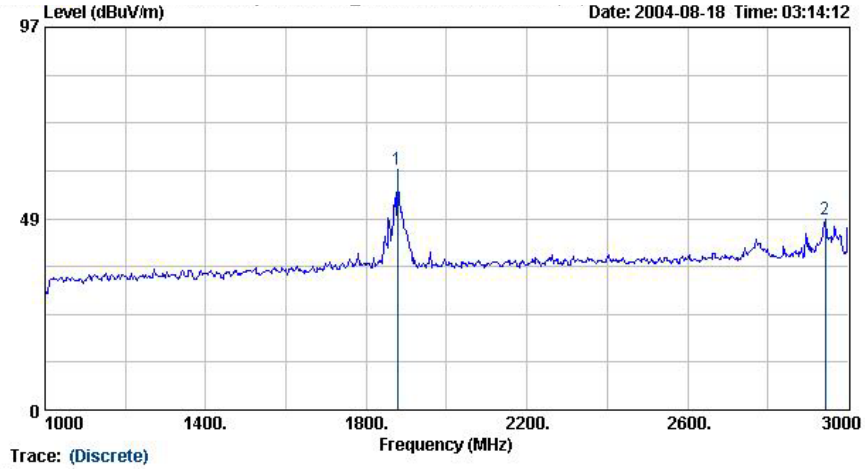
Site : 03CH06
Condition : 3m BI LOG 2004 0629 VERTICAL
EUT : Tri Band 900/1800/1900 Handset
Power : 120Vac/60Hz
Model : S700
Memo : PCS Link Mode ; CH 661

	Freq	Over Limit	Level	Limit Line	Antenna Factor	Preamp Factor	Cable Loss	Remark	Ant Pos	Table Pos
	MHz	dB	dBuV/m	dBuV/m	dB/m	dB	dB		cm	deg
1 @	37.29	------	33.60	------	13.45	32.15	0.54	Peak	---	---
2 @	42.69	------	34.31	------	11.03	32.25	0.56	Peak	---	---
3 @	53.76	------	27.94	------	8.25	32.45	0.62	Peak	---	---
4 @	141.78	------	56.45	------	10.74	32.27	1.03	Peak	---	---
5 @	189.30	------	26.97	------	8.30	31.95	1.21	Peak	---	---



Site : 03CH06
Condition : 3m BI LOG 2004 0629 VERTICAL
EUT : Tri Band 900/1800/1900 Handset
Power : 120Vac/60Hz
Model : S700
Memo : PCS Link Mode ; CH 661

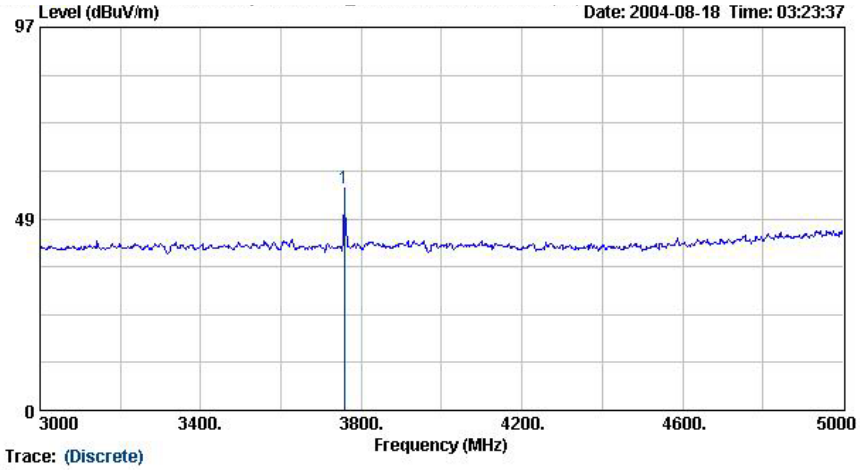
	Freq	Over Limit	Level	Limit Line	Antenna Factor	Preamp Factor	Cable Loss	Remark	Ant Pos	Table Pos
	MHz	dB	dBuV/m	dBuV/m	dB/m	dB	dB		cm	deg
1 @	486.20	------	27.21	------	17.22	31.71	2.04	Peak	---	---
2 @	567.40	------	31.29	------	18.69	31.39	2.23	Peak	---	---
3 @	648.60	------	28.05	------	18.84	31.54	2.44	Peak	---	---
4 @	816.60	------	28.28	------	20.27	31.81	2.94	Peak	---	---



Site : 03CH06
Condition : 3m HF-HORN AH-118 VERTICAL
EUT : Tri Band 900/1800/1900 Handset
Power : 120Vac/60Hz
Model : S700
Memo : PCS Link Mode ; CH 661

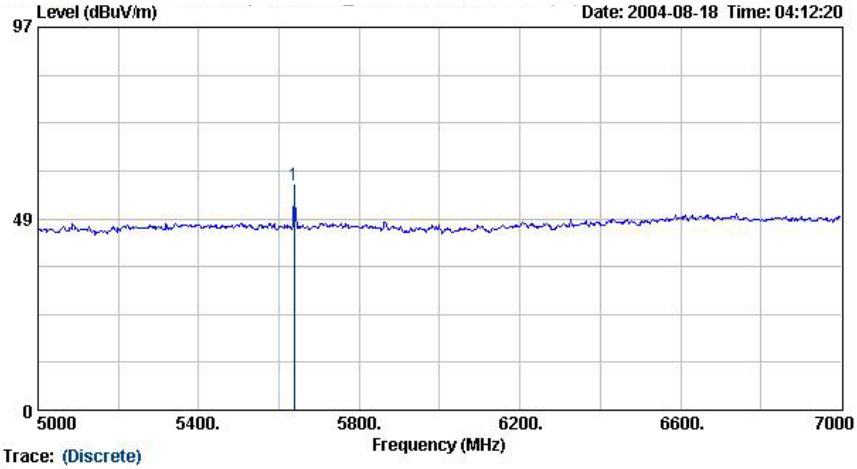
	Freq	Over Limit	Level	Limit Line	Antenna Factor	Preamp Factor	Cable Loss	Remark	Ant Pos	Table Pos
	MHz	dB	dBuV/m	dBuV/m	dB/m	dB	dB		cm	deg
1 @	1878.00	------	60.80	------	27.42	44.40	2.93	Peak	---	---
2 @	2942.00	------	48.45	------	29.80	44.12	3.41	Peak	---	---

Remark: 1. #1 Fundamental Signal



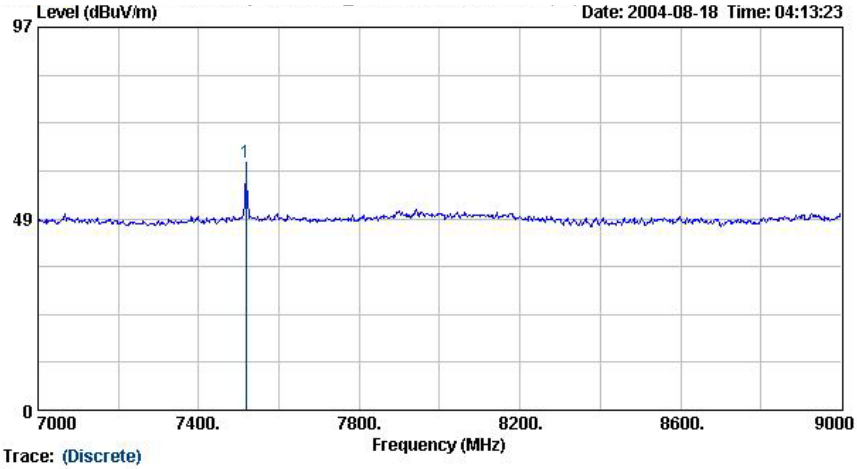
Site : 03CH06
Condition : 3m HF-HORN AH-118 VERTICAL
EUT : Tri Band 900/1800/1900 Handset
Power : 120Vac/60Hz
Model : S700
Memo : PCS Link Mode ; CH 661

	Freq	Over Limit	Level	Limit Line	Antenna Factor	Preamp Factor	Cable Loss	Remark	Ant Pos	Table Pos
	MHz	dB	dBuV/m	dBuV/m	dB/m	dB	dB		cm	deg
1 @	3758.00	------	56.38	------	30.26	44.75	4.22	Peak	---	---



Site : 03CH06
Condition : 3m HF-HORN AH-118 VERTICAL
EUT : Tri Band 900/1800/1900 Handset
Power : 120Vac/60Hz
Model : S700
Memo : PCS Link Mode ; CH 661

	Freq	Over Limit	Level	Limit Line	Antenna Factor	Preamp Factor	Cable Loss	Remark	Ant Pos	Table Pos
	MHz	dB	dBuV/m	dBuV/m	dB/m	dB	dB		cm	deg
1 @	5638.00	------	57.03	------	34.01	46.55	5.35	Peak	---	---



Site : 03CH06
Condition : 3m HF-HORN AH-118 VERTICAL
EUT : Tri Band 900/180(
Power : 120Vac/60Hz
Model : S700
Memo : PCS Link Mode ; CH 661

	Freq	Over Limit	Level	Limit Line	Antenna Factor	Preamp	Cable ss	Remark	Ant Pos	Table Pos
	MHz	dB	dBuV/m	dBuV/m	dB/m	dB	dB		cm	deg
1 @	7518.00	------	62.79	------	36.03	46.19	6.19	Peak	---	---

- Mark:
  Frequency from 9000MHz to 19000MHz, the emission emitted by the EUT is too low to be measured.

Name of Test: Frequency Stability (Temperature Variation)

Specification: 47 CFR 2.1055(a)(1)

Test Conditions: As Indicated

Test Equipment: As per previous page

Measurement Procedure

1. The EUT and test equipment were set up as shown on the following page.

2. With all power removed, the temperature was decreased to –30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute.

3. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.

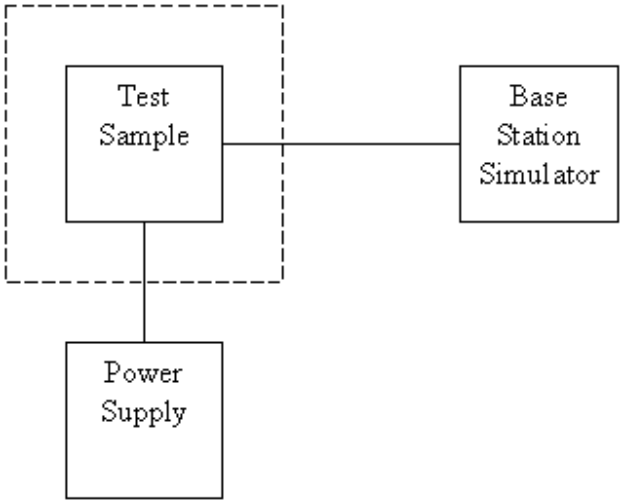
4. The temperature tests were performed for the worst case.

5. Measurement Results: Attached

Tested By: Tim Kao

Transmitter Test Set-Up

Frequency Stability: Temperature Variation
Frequency Stability: Voltage Variation



Asset	Model Name	S/N
Temperature & Humidity Controller	P-9000	612
AC/DC Power Source	HPA-500W	HPA0100024
Base Station Simulator	CMU200	102278
Base Station Simulator	E5515C	GB43460754

Name of Test: Frequency Stability (Temperature Variation)

GSM 1900 (Channel 661)

Temperature(°C)	Change, Hz	Change, ppm
-30	25	0.01
-20	-17	-0.01
-10	-38	-0.02
0	-44	-0.02
10	-36	-0.02
20	-29	-0.02
30	-38	-0.02
40	-31	-0.02
50	-33	-0.02

Name of Test: Frequency Stability (Voltage Variation)

Specification: 47 CFR 2.1055 (b)(1)

Test Equipment: As per previous page

Measurement Procedure

1. The EUT was placed in a temperature chamber at 25±5°C and connected as for "Frequency Stability - Temperature Variation" test.

2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.

3. The variation in frequency was measured for the worst case.

Results: Frequency Stability (Voltage Variation)

GSM1900 (Channel 661)

Nominal Value (Voltage) = 3.6

Battery End Point (Voltage) = 3.25

Voltage(Volt)	Change, Hz	Change, ppm
4.2	-38	-0.02
BEP	-34	-0.02
4.83	-18	-0.01

Limit: Must remain within authorized frequency block.

Tim Kao

Tested By: Tim Kao

Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	15.35	4.50	1000	24.10	3.92
35	13.63	1.13	2000	27.40	5.66
40	11.11	1.18	3000	30.00	7.20
45	10.59	1.26	4000	32.60	9.36
50	6.47	1.31	5000	33.40	9.16
55	5.83	1.34	6000	34.20	10.70
60	5.18	1.43	7000	35.30	12.16
65	4.81	1.52	8000	36.90	13.12
70	4.43	1.56	9000	38.10	13.81
75	5.10	1.57	10000	39.00	14.83
80	5.91	1.60	11000	38.60	15.83
85	7.33	1.66	12000	39.50	17.11
90	8.74	1.75	13000	39.30	17.62
95	9.05	1.76	14000	41.60	18.37
100	9.36	1.83	15000	40.60	19.10
110	9.65	1.86	16000	37.20	19.72
120	9.97	1.92	17000	40.20	21.98
130	10.51	2.00	18000	48.90	21.22
140	10.32	2.11	19000	37.60	23.90
150	9.42	2.18	20000	37.30	24.07
160	8.09	2.22	21000	37.00	25.49
170	7.43	2.26	22000	38.00	24.92
180	7.60	2.31	23000	38.70	25.60
190	7.43	2.37	24000	38.60	25.70
200	7.26	2.43	25000	24.10	3.92
220	9.11	2.56	14000	27.40	5.66
240	10.88	2.70	15000	30.00	7.20
260	11.75	2.83	16000	32.60	9.36
280	11.55	2.93	17000	33.40	9.16
300	11.36	3.03	18000	34.20	10.70
320	12.03	3.13	19000	35.30	12.16
340	12.69	3.23	20000	36.90	13.12
360	13.33	3.32	21000	38.10	13.81
380	14.00	3.41	22000	39.00	14.83
400	14.63	3.48	23000	38.60	15.83
450	15.33	3.71	24000	39.50	17.11
500	16.03	3.85	25000	39.30	17.62
550	16.65	4.03			
600	17.29	4.32			
650	17.64	4.51			
700	18.00	4.54			
750	18.39	4.90			
800	18.79	5.04			
850	19.10	5.04			
900	19.42	5.20			
950	19.58	5.28			
1000	19.75	5.58			

List of Measuring Equipments

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum analyzer	R&S	FSP40	100057	9KHz-40GHz	Feb. 26, 2004	Radiation (03CH06-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz -2GHz	Dec. 18, 2003	Radiation (03CH06-HY)
Horn Antenna	Com-Power	AH118	071025	1G-18G	Feb. 11, 2004	Radiation (03CH06-HY)
PreAmplifier	Com-Power	PA-103	161055	1MHz - 1000MHz	Apr. 26, 2004	Radiation (03CH06-HY)
HF Amplifier	MITEQ	AFS44	973248	0.1G - 26.5G	May. 20, 2004	Radiation (03CH06-HY)

Uncertainty of Test Site

Uncertainty of Radiated Emission Measurement (30MHz ~ 1000MHz) (03CH03)

Contribution	Uncertainty of x_i		$u(x_i)$
	dB	Probability Distribution	
Receiver reading	0.41	Normal(k=2)	0.21
Antenna factor calibration	0.83	Normal(k=2)	0.42
Cable loss calibration	0.25	Normal(k=2)	0.13
Pre Amplifier Gain calibration	0.27	Normal(k=2)	0.14
RCV/SPA specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site imperfection	1.43	Rectangular	0.83
Mismatch Receiver VSWR Γ1= 0.20 Antenna VSWR Γ2= 0.23 Uncertainty=20log(1-Γ1*Γ2)	+0.39/-0.41	U-shaped	0.28
combined standard uncertainty Uc(y)	**1.27**		
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)	**2.54**		

Uncertainty of Radiated Emission Measurement (1GHz ~ 40GHz)

Contribution	Uncertainty of x_i		$u(x_i)$	Ci	$Ci*u(x_i)$
	dB	Probability Distribution			
Receiver reading	±0.10	Normal(k=1)	0.10	1	0.10
Antenna factor calibration	±1.70	Normal(k=2)	0.85	1	0.85
Cable loss calibration	±0.50	Normal(k=2)	0.25	1	0.25
Receiver Correction	±2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	±1.50	Rectangular	0.87	1	0.87
Site imperfection	±2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR Γ1= 0.197 Antenna VSWR Γ2= 0.194 Uncertainty=20log(1-Γ1*Γ2*Γ3)	+0.34/-0.35	U-shaped	0.244	1	0.244
Combined standard uncertainty Uc(y)	**2.36**				
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	**4.72**				

U=$\sqrt{}${(1/2)²+(0.3/2)²+(2²+0.5²+2²+0.25²+2²)/3+(0.54)²/2}=2.2 for 10m test distance

U=$\sqrt{}${(1/2)²+(0.3/2)²+(2²+3²+2²+0.25²+2²)/3+(0.54)²/2}=2.7 for 3m test distance

END OF TEST REPORT