

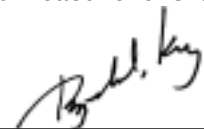
RF MEASUREMENT TEST REPORT

PRODUCT : TWO WAY Pager
MODEL/TYPE NO : ST900
FCC ID : ODGST900
TRADE NAME : Hantel
Hantel Co., Ltd.
Suntech city, 513-15, Sangdaewon-Dong, Jungwon-Gu,
APPLICANT : Seongnam-city, Kyunggi-Do, 462-806, Korea

FCC RULE PART(S) : FCC Part 2 & 24 and 90
FCC PROCEDURE : Certification
FCC CLASSIFICATION : PCB : PCS Licensed Transmitter
EMISSION DESIGNATOR : Direct FSK, 10KF1D
FREQUENCY RANGE : 929.000 to 942.000 MHz (RX)
896.000 to 902.000 MHz (TX)
RF OUTPUT POWER : 0.6 to 1.92 W
DATES OF TEST : May 10~15, 2004
DATES OF ISSUE : May 17, 2004
TEST REPORT No. : BWS-04-RF-015
TEST LAB. : BWS Tech., Inc. (Registration No. : 553281)

This RF Reapter Model SHPR19-F1 has been tested in accordance with the measurement procedures specified CFR 47 Part 2.947 and ANSI C63.4-2000 at the BWS TECH/RF Test Laboratory and has been shown to be complied with the FCC Technical Specification described above.

I attest to the accuracy of data. All measurement herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.



Kang, Bong Chul
Chief of Laboratory Division

BWS TECH Inc.

www.bws.co.kr

294-9, Jungdae-Dong, Kwangju-Si, Kyunggi-Do, 464-080, Korea

TEL: +82 31 762 0124 FAX: +82 31 762 0126

TABLE OF CONTENTS

	Pages
1. General Information	3
2. DESCRIPTION OF ATTACHMENTS	4
3. INTRODUCTION	5
4. DESCRIPTION OF TESTS	7~12
5. TEST RESULTS	13
6. TEST Data	14~45
7. TEST EQUIPMENT LIST	46
Appendix 1. FCC ID Label and Location	
Appendix 2. Test Setup Photos	
Appendix 3. External Photos	
Appendix 4. Internal Photos	
Appendix 5. Block Diagram	
Appendix 6. Schematics	
Appendix 7. Operational Instruction	
Appendix 8. Part List / Tune up Procedure	
Appendix 9. User Manual	
Appendix 10. RF Exposure statement	

1. General Information (Application for Certification)

Scope – Measurement and determination of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of relevant international standard

2.1033(c)(1)	Name of applicant	: Hantel Co., Ltd.
	Address of applicant	: Suntech city, Sangdaewon-Dong, Jungwon-Gu, Seongnam, Kyunggi-Do, 462-806, Korea
	Contact	: Hoe-Bum Kim
2.1033(c)(2)	FCC Identifier	: ODGST900
	Model Type Number	: ST900
2.1033(c)(3)	Installation and Operating instructions	: User Guide(separate document)
2.1033(c)(4)	Types of emission	: Direct FSK, 10KF1D
2.1033(c)(5)	Frequency Range	: 929.000 to 942.000 MHz(RX) 896.000 to 902.000 MHz (TX)
2.1033(c)(6)	Output power range	: 0.6 to 1.92 W
2.1033(c)(7)	Maximum power rating	: 1.92W
2.1033(c)(8)	dc Voltage	: 3.7V
	dc Current	: 1.4A
2.1033(c)(9)	Tune up procedure for RF power	: N/A
2.1033(c)(10)	Schematic diagram	: Contained in Separate Document
2.1033(c)(11)	Label Information	: Contained in Separate Document
2.1033(c)(12)	Photographs	: Contained in Appendix D
2.1033(c)(13)	Description of modulation	: Contained in Separate Document
2.1033(c)(14)	Test results	: Contained in Appendix A with supporting Graphical data in Appendix B
2.1033(c)(15)	External RF Power Amp	: N/A
2.1033(c)(16)	AM Broadcast Equipment	: N/A

2. DESCRIPTION OF ATTACHMENTS

Appendix 1. FCC ID Label and Location

-. Sample FCC ID Label and location information is shown

Appendix 2. Test Setup Photos

-. Radiated Emission Test setup photos are shown

Appendix 3. External Photos

-. External photos are shown

Appendix 4. Internal Photos

-. Internal photos are shown

Appendix 5. Block Diagram

-. The block diagram is shown

Appendix 6. Schematics

-. The circuit diagrams are shown

Appendix 7. Operational Instruction

-. Explanation of operational instruction for circuit is shown.

Appendix 8. Part List / Tune up Procedure

-. The part lists are shown.

Appendix 9. User Manual

-. The alignment procedure are shown.

Appendix 10. RF Exposure statement

-. The user operating manual is shown.

3. INTRODUCTION

The measurement tests were conducted at the open area test site of BWS TECH Inc. facility located at 294-9, Jungdae-Dong, Kwangju-Si, Kyunggi-Do, Korea. The measurement facilities were constructed in conformance with the requirements of the ANSI C63.4-2000 and CISPR Publication 16. The BWS has site descriptions on file with the FCC for 3 and 10 meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-2000 and registered to the Federal Communications Commission (Registration Number : 553281).

All measurements contained in this application were conducted in accordance with FCC Rules and regulations CFR 47 and American National Standard Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C.63.4-2000).

Measurement Procedure

The radiated and spurious measurements were made outdoors at a 3-meter test range (see Figure 2).

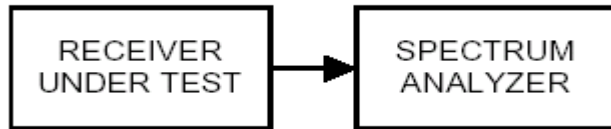
The equipment under testing was placed on a wooden turntable, 3-meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This level was recorded.

For readings above 1 GHz, the above procedure would be repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

4. DESCRIPTION OF TESTS

4.1 Conducted Carrier Output Power Rating- §2.1051

The conducted spurious output power is power that is generated or amplified in a receiver and appears at the receiver's antenna terminals.



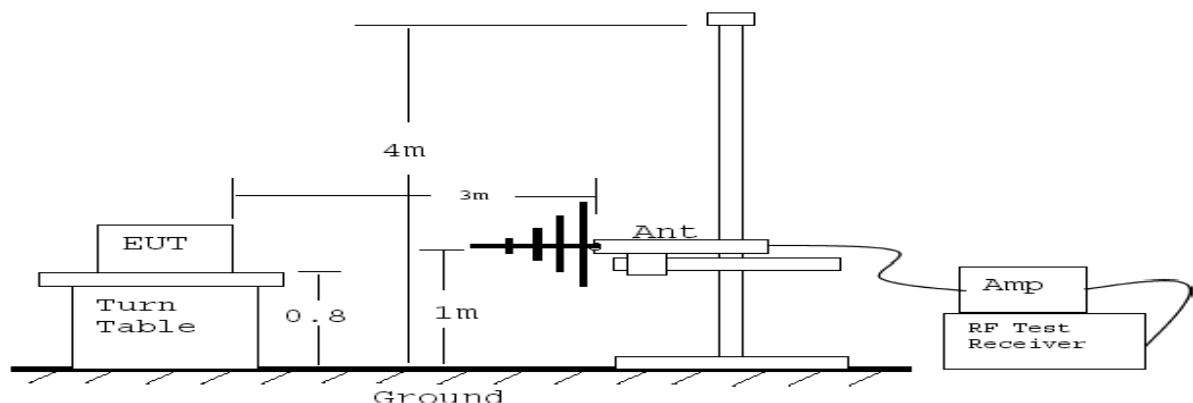
- Connect a spectrum analyzer, using a quasi peak detector, meeting the requirements of IEC CISPR Publication 16, (through a resistive matching network if required to match the receiver input impedance R_n to the spectrum analyzer) to the receiver antenna terminals.
 - Tune the spectrum analyzer to search for spurious outputs. For a superheterodyne receiver not controlled by a digital device, these measurements shall be made from 30 MHz to 1000 MHz, or 2 times the highest local oscillator frequency generated in the receiver, whichever is higher. For a superheterodyne receiver controlled by a digital device, the upper limit test frequency shall be the greater of the requirement for a receiver not controlled by a digital device
- Record all spurious outputs found that are in excess of 20 dB below the specified limit.

- The conducted spurious output power is the largest reading obtained in step b) (corrected for any matching network loss, if used).

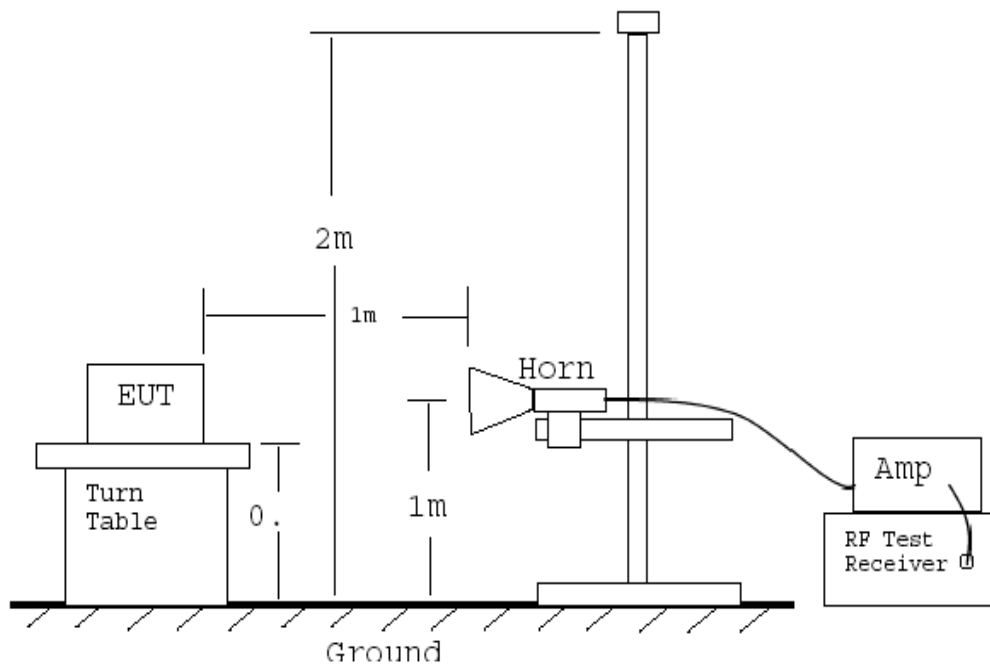
4.2 Radiated Spurious and Harmonic Emissions : §2.1053

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or inter-mediate circuit elements under normal conditions of installation and operation.

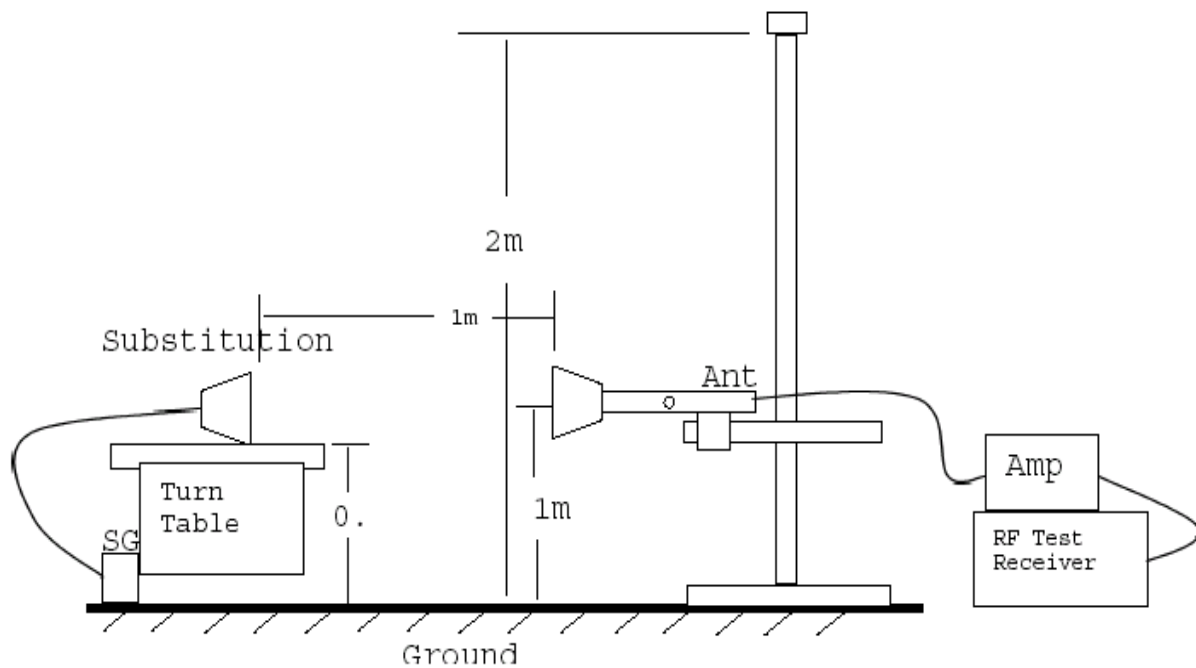
Radiation and harmonic emissions above 1 GHz is measured outdoors at our 3-meter test range. The equipment under test is placed on a wooden turn-table 3-meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer reading. This level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.



Radiated Emission Test 30 – 1000 MHz (Bilog)



Radiated Emission Test 1 – 9 GHz (Horn)



Substitution Method above 1 GHz

5. TEST RESULTS

5.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report.

Detailed measurement data and plots showing the maximum emission of the EUT are reported.

FCC Rules Section	Description	Test Result
Part 2.1051	Spurious emissions at antenna terminals	☒ Pass ☐ Fail
Part 2.1053	Field Strength of Spurious Emission	☒ Pass ☐ Fail

The data collected shows that the Hantel Co., Ltd Model : ST900 complies with technical requirements of the FCC Rule Part 2.947 and Part 24 and 90 related technical specification.

5.2 Modification to EUT

The device tested is not modified anything, mechanical or circuits to improve EMI status during a measurement.

No EMI suppression device(s) was added and/or modified during testing.

6. TEST DATA

6.1 Spurious Emissions at antenna terminals

6.1.1 Low Channel / 896 MHz

Test Standard	: FCC Part 2.1051
Operating Frequency	: 896MHz
Channel	: Low
Carrier Power	: 32.1 dBm
Distance	: Antenna terminal port

Spurious Emission Levels (dBm)		
Frequency Tuned (MHz)	Spectrum Analyzer Reading (dBm)	Substitution Signal Generator Level(dBm)
1792	-45.23	-24.7
2688	-62.25	-42.2
6272	-65.78	-45.5

Limit $P_{(dBm)} - (50 + 10 \log(P))$ $P = \text{Carrier power in watts}$
 $= -20 \text{ dBm}$

6.1.2 Middle Channel / 899 MHz

Test Standard	: FCC Part 2.1051
Operating Frequency	: 899MHz
Channel	: Middle
Carrier Power	: 32.1 dBm
Distance	: Antenna terminal port

Spurious Emission Levels (dBm)		
Frequency Tuned (MHz)	Spectrum Analyzer Reading (dBm)	Substitution Signal Generator Level(dBm)
1800	-47.23	-26.9
2700	-60.23	-41.2
6300	-67.23	-46.5

Limit $P_{\text{dBm}} - (50 + 10 \log(P))$ $P = \text{Carrier power in watts}$
 = -20 dBm

6.1.3 High Channel / 902 MHz

Test Standard	: FCC Part 2.1051
Operating Frequency	: 902MHz
Channel	: High
Carrier Power	: 32.1 dBm
Distance	: Antenna terminal port

Spurious Emission Levels (dBm)		
Frequency Tuned (MHz)	Spectrum Analyzer Reading (dBm)	Substitution Signal Generator Level(dBm)
1804	-46.17	-25.7
2706	-64.23	-44.2
6314	-64.58	-43.5

Limit $P_{\text{(dBm)}} - (50 + 10 \log(P))$ $P = \text{Carrier power in watts}$
 = -20 dBm

6.2 Field Strength of Spurious Radiation

7.2.1 Low Channel / 896 MHz

Test Standard	: FCC Part 2.1053
Operating Frequency	: 896MHz
Channel	: Low
Distance	: 3m

Spurious Emission Levels (effective radiated power(dBm))		
Frequency (MHz)	Polarization of maximum emission (H, V)	Level(dBm)
1792	V	-34.2
2688	V	-41.2
3584	V	-42.5

Limit $P_{\text{dBm}} - (50 + 10 \log(P))$ $P = \text{Carrier power in watts}$
= -20 dBm

Note :

1. The spectrum bandwidth was set to RBW 1000 kHz (freq above 1GHz).

6.2.2 Middle Channel / 900 MHz

Test Standard	: FCC Part 2.1053
Operating Frequency	: 900MHz
Channel	: Middle
Distance	: 3m

Spurious Emission Levels (effective radiated power(dBm))		
Frequency (MHz)	Polarization of maximum emission (H, V)	Level(dBm)
1800	V	-37.2
3600	V	-38.1
4500	V	-38.5

Limit $P_{\text{dBm}} - (50 + 10 \log(P))$ $P = \text{Carrier power in watts}$
 $= -20 \text{ dBm}$

Note :

- The spectrum bandwidth was set to RBW 1000 kHz (freq above 1GHz).

6.2.3 High Channel / 902 MHz

Test Standard	: FCC Part 2.1053
Operating Frequency	: 902MHz
Channel	: High
Distance	: 3m

Spurious Emission Levels (effective radiated power(dBm))		
Frequency (MHz)	Polarization of maximum emission (H, V)	Level(dBm)
1804	V	-35.8
2706	V	-43.2
4510	V	-45.5

Limit $P_{\text{dBm}} - (50 + 10 \log(P))$ $P = \text{Carrier power in watts}$
= -20 dBm

Note :

- The spectrum bandwidth was set to RBW 1000 kHz (freq above 1GHz).

7. TEST EQUIPMENT LIST

List of Test Equipments Used for Measurements

Test Equipment	Model	Mfg.	Serial No.	Cal. Due Date
Spectrum Analyzer	8563E	H.P.	3611A05046	04-05-13
Spectrum Analyzer	8594E	H.P.	3911A08040	04-04-24
Spectrum Analyzer	E7403A	ADVANTEST	61720002	04-08-22
Receiver	ESH3	R & S	892580/014	04-05-21
Signal Generator	E4432B	H.P.	US40053157	04-05-07
Signal Generator	SGT9000	GIGATRONICS	9604010	04-04-25
Power Meter	E4418A	H.P.	GB38272621	04-04-25
Power Sensor	8481A	H.P.	3318A92101	04-04-25
Audio Analyzer	8903B	H.P.	3011A09344	04-05-07
Modulation Analyzer	8901B	H.P.	3028A03124	04-05-03
Synthesized Function Generator	SG-4111	IWATSU	35559	04-05-26
Broadband Power Amplifier	100W 10000M 11	Amplifier Research	18649	05-03-19
Broadband Power Amplifier	75A220	Amplifier Research	15326	04-12-16
Preamplifier	8447E	H.P.	2945A02712	04-08-19
Horn Antenna	BBHA 9120 D	Schwarz Beck	234	04-06-20
Horn Antenna	BBHA 9170	Schwarz Beck	157	04-06-20
Dipole Antenna	VDA6106A / UHA9105	Schaffner-chase	1277	04-09-12
Biconical Antenna	VHA9103	Schwarzbeck	-	04-09-13
Log Periodic Antenna	UPA6109	SCHAFFNER	1076	04-09-13
Attenuator	8325	BIRD	4572	04-05-14
Attenuator	RFA500NMF30	RFA500NMF30	9522	05-01-07
Termination	8173	BIRD	2501	-
Dual directional coupler	772D	H.P.	2839A00395	05-01-07
Dual directional coupler	778D	H.P.	1144A08477	04-10-14
LISN	L3-25	PMM	1110KT0403	04-10-02
LISN	KNW-242C	PMM	8-920-20	04-08-30
Digital Oscilloscope	TDS3032	Tektronix	B081558	04-05-27
Turn-Table	JAC-2	JAEMC	-	-
Antenna Master	JAC-1	Daeil EMC	-	-
Plotter	7550A	H.P.	2725A 75529	-
EMC Anechoic Chamber	-	SEMITECH	000815	-
Temp/Humidity Chamber	-	Seo jin	-	04-09-01
Thermo Hygograph	PC-5000TRH-II	SATO	-	04-10-27
BaroMeter	KEIRYOKI	SATO	564021	04-07-18
Slidacs	DeaKyong Slidacs	DeaKyong	-	-