HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

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CERTIFICATE OF COMPLIANCE

FCC Part 24 & 90 Certification

Communication Network Interface, Inc.

3F, JungSoft Bldg., 274-5 Seohyeon-Dong, Bundang-Gu,
Seongnam-Si, Gyeonggi-Do, 463-824 Korea

Date of Issue: March 15, 2005
Test Report No.: HCT-SAR05-0313
Test Site: HYUNDAI CALIBRATION & CERTIFICATION TECHNOLOGIES CO., LTD.
FRN: 0005866421

FCC ID : **N79CNI-900KM**

APPLICANT : **Communication Network Interface, Inc.**

EUT Type:	Two Way Personal Communicator - Prototype
Tx Frequency:	896 MHz — 902 MHz
Rx Frequency:	929 MHz — 942 MHz
Max. RF Output Power:	0.288 mW (24.59 dBm)
Trade Name:	CNI
Model No.:	CNI-900KM
Equipment Class:	PCS Licensed Transmitter
Application Type:	Certification
FCC Rule Part(s):	FCC Part 24 Subpart D/ Part 90
Maximum SAR:	0.827 W/kg Body SAR

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947.

I attest to the accuracy of data. All measurements reported 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 in this report apply only to the sample tested.

Hyundai C-Tech Co., Ltd. certifies that no party to this application has been denied FCC benefits pursuant to section 5301 of the Anti- Drug Abuse Act of 1998, 21 U.S. C. 853(a)

Ki Soo Kim

Report prepared by : Ki-Soo Kim

Manager of Product Compliance Team

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The Communication Network Interface, Inc. Model: CNI-900KM or the "EUT" as referred to in this report is a PCS Private Land Mobile Data Transceiver which measured. The EUT operates at 896 – 902 MHz with maximum power of 24.59 dBm.

**The test data gathered are from production sample serial number N7920050300001 provided by the manufacturer.*

1.2 Objective

This type approval report is prepared on behalf of Communication Network Interface, Inc. in accordance with Part 2, Subpart J, Part 24 Subpart D and Part 90 of the Federal Communication Commissions rules. The objective of the manufacturer is to demonstrate compliance with FCC rules for output power, modulation characteristic, occupied bandwidth, spurious emission at antenna terminal, field strength of spurious radiation, frequency stability, and conducted and radiated margin.

1.3 Related Submittal(s)/Grant(s)

No Related Submittals

1.4 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following individual parts: Part 24D - PCS Part 90 - Private Land Mobile Radio Service Applicable Standards: TIA EIA 137-A, TIA EIA 98-C, TIA/EIA-603, ANSI 63.4-2001, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data are located at the 254-1,Maekok-Ri, Hobup-Myun, Ichon-Si, Kyoungki-Do, 467-701, KOREA. The site is constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 23, 2003(Registration Number: 90661)

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was configured for testing in a typical fashion (as normally used in a typical application).

The final qualification test was performed with the EUT operating at normal mode.

2.2 Block Diagram

Please refer to the attached Block diagram.

2.3 Equipment Modifications

No modifications were necessary for the EUT to comply with the applicable limits and requirements.

2.4 Test Setup Block Diagram

Please refer to Appendix. (Test setup photo)

3 - SUMMARY OF TEST RESULTS

3.1 Frequency Available

According to Part24D, the following frequency bands are available for narrowband PCS:
901 – 902 MHz
930 – 931 MHz
940 – 940 MHz

According to Part90S, the following frequency bands are available for private land mobile radio services:
806 – 824 MHz
851 – 869 MHz
896 – 901 MHz
935 – 940 MHz

3.2 Summary of test results

FCC RULE	DESCRIPTION OF TEST	RESULT
§ 2.1046 § 24.132 § 90.205	RF power output	Compliant
§ 2.1046 § 90.205 § 90.635	Conducted Output Power	Compliant
§ 2.1047	Modulation Characteristics	Compliant
§ 2.1049 § 24.131 § 90.210	Occupied Bandwidth	Compliant
§ 2.1051 § 24.133 § 90.210	Spurious emissions at antenna terminals	Compliant
§ 2.1053 § 24.133 § 90.210	Radiation spurious emission	Compliant
§ 2.1055 § 24.135 § 90.213	Frequency stability	Compliant

3.3 Label Requirement

Each equipment for which a type acceptance applications is filed on or after May 1, 1981, shall bear an Identification plate of label pursuant to § 2.295 (Identification of Equipment) and § 2.926 (FCC identifier).

4 - RF POWER OUTPUT

4.1 Applicable Standard

§2.1046

§24.132(b): <7Watts ERP

§90.205: Power dependent upon station's antenna HAAT and required service area and may be from 1 to 500 watts.

4.2 Test Procedure

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. 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. The conducted power at the terminals of the dipole is measured. The ERP is recorded.

Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

4.4 Test Results

Freq. Tuned (MHz)	REF. LEVEL (dBm)	POL (H/V)	ERP (W)	ERP (dBm)
896	-22.79	V	0.273	24.36
899	-22.56	V	0.288	24.59
902	-22.88	V	0.267	24.27

Note: The power output may depend on the intended use of the EUT. For all tests, the EUT was set to maximum Conditions.

5 - MODULATION CHARACTERISTIC

5.1 Applicable Standard

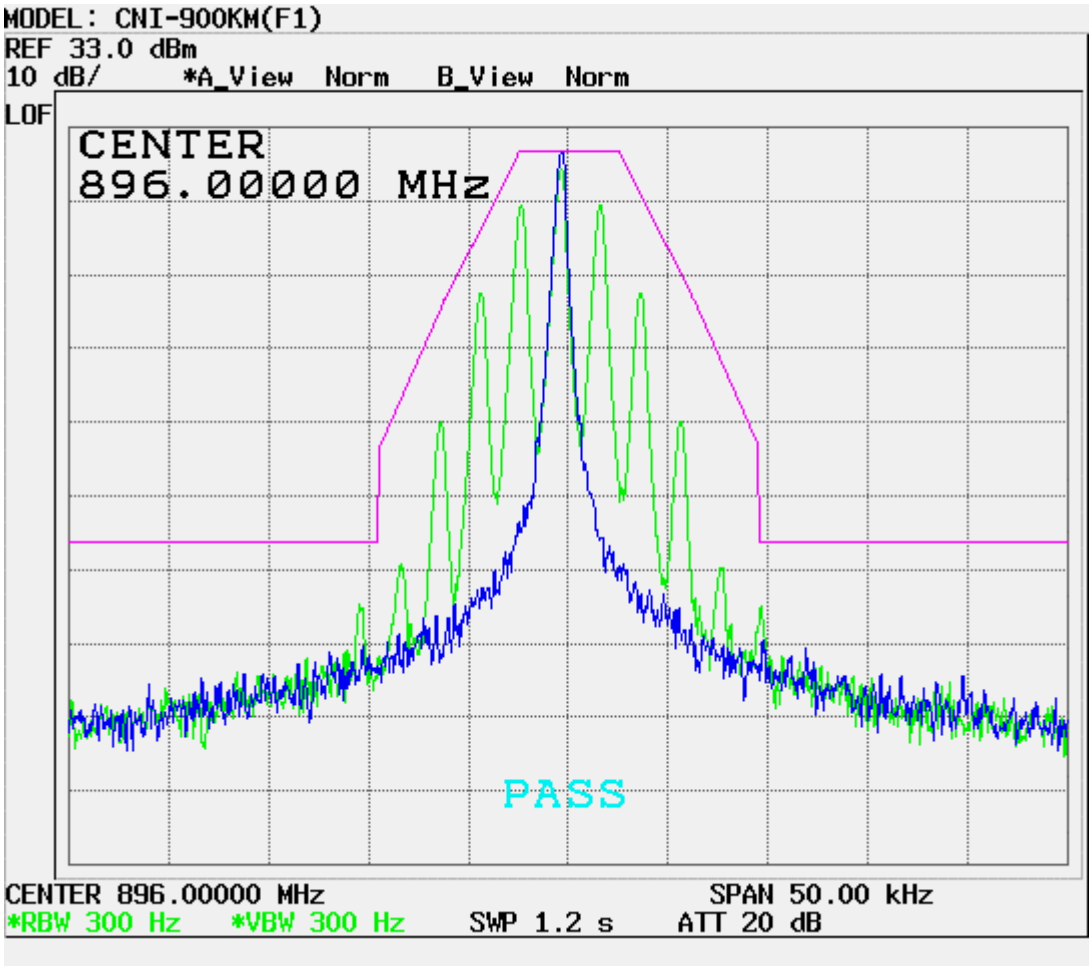
§2.1047: A curve of equipment data which shows that the equipment will meet the modulation requirement.

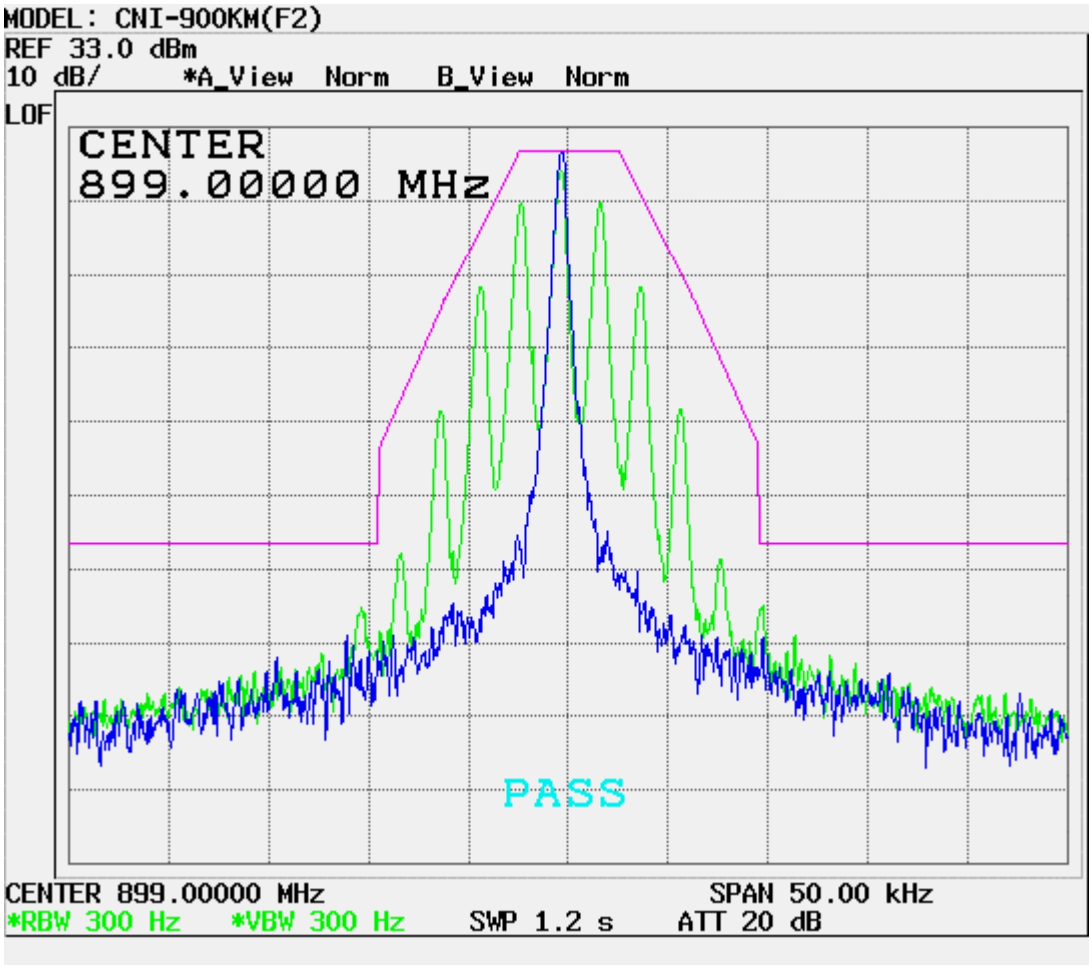
5.2 Test Procedure

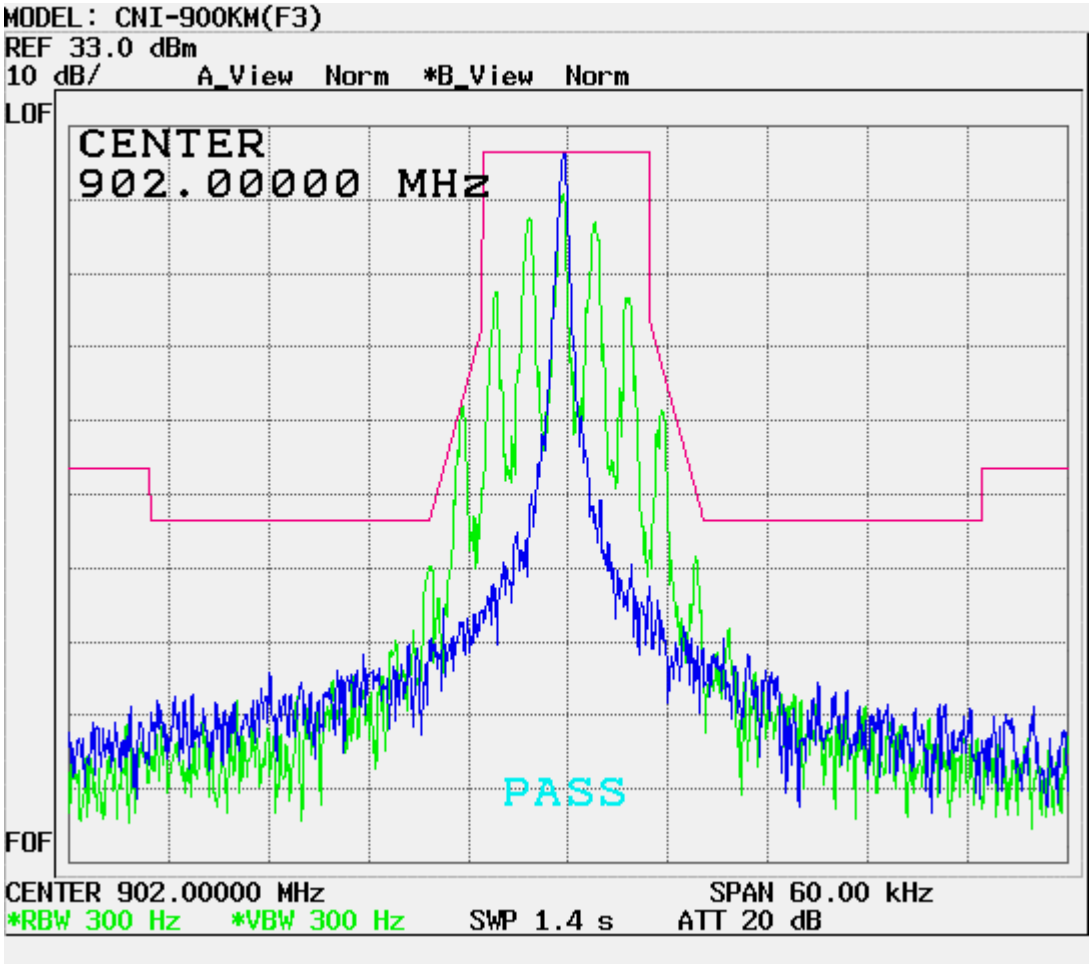
Test Method: TIA/EIA-603 2.2.3

5.3 Test Results

Please refer to the hereinafter plots.


MODEL: CNI-900KM(F1)
REF 33.0 dBm
10 dB/ *A_View Norm B_View Norm
LOF
CENTER
896.00000 MHz
PASS
CENTER 896.00000 MHz
SPAN 50.00 kHz
*RBW 300 Hz
*VBW 300 Hz
SWP 1.2 s
ATT 20 dB


MODEL: CNI-900KM(F2)
REF 33.0 dBm
10 dB/ *A_View Norm B_View Norm
LOF
CENTER
899.00000 MHz
PASS
CENTER 899.00000 MHz
SPAN 50.00 kHz
*RBW 300 Hz
*VBW 300 Hz
SWP 1.2 s
ATT 20 dB


MODEL: CNI-900KM(F3)
REF 33.0 dBm
10 dB/
A_View Norm
*B_View Norm
LOF
CENTER
902.00000 MHz
PASS
FOF
CENTER 902.00000 MHz
SPAN 60.00 kHz
*RBW 300 Hz
*VBW 300 Hz
SWP 1.4 s
ATT 20 dB

6 - OCCUPIED BANDWIDTH

6.1 Applicable Standard

§2.1049, §24.131 and §90.209

According to §24.131, the authorized bandwidth of narrowband PCS channels will be 10KHz for 12.5KHz channels.

According to §90.209(b)(5), the authorized bandwidth will be 13.6KHz for 12.5 Channel spacing PLMR Operating within the band 896 – 901 MHz / 935 –940 MHz.

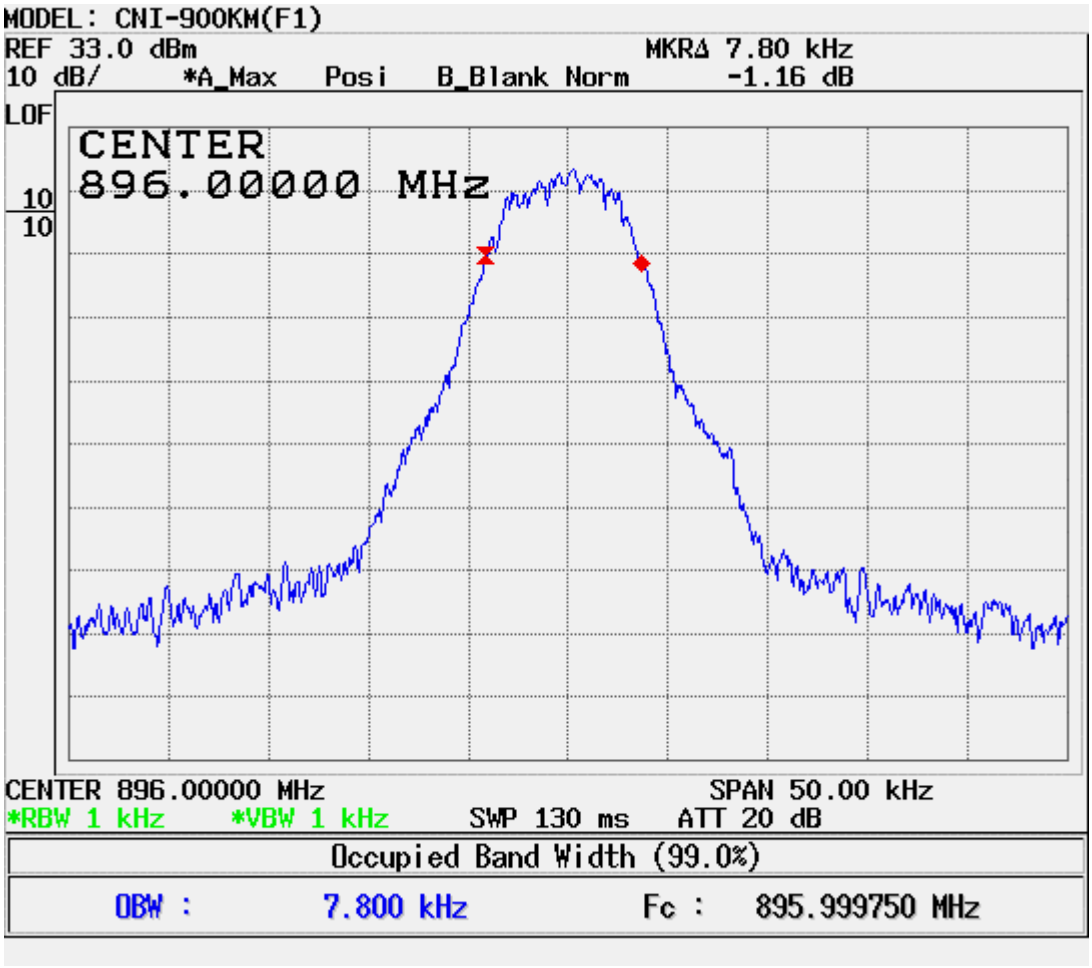
6.2 Test Procedure

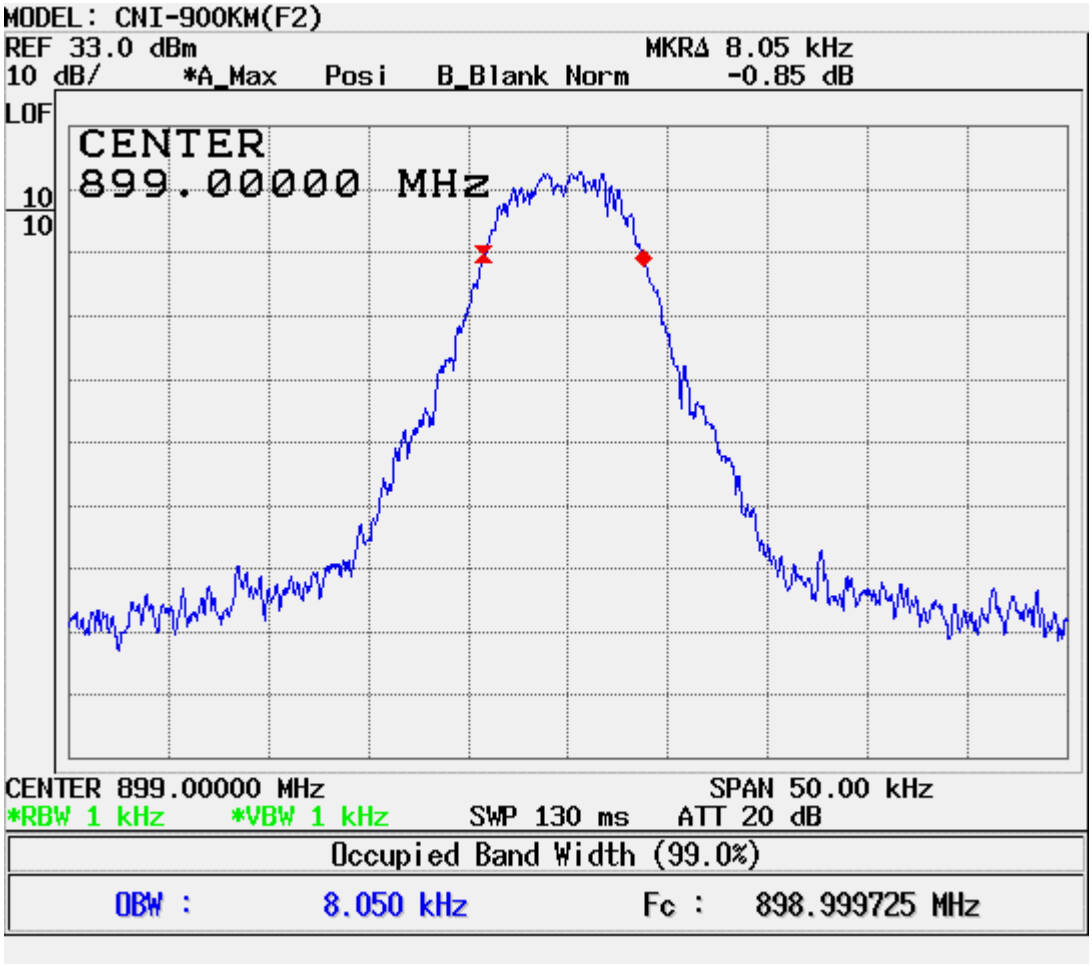
The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

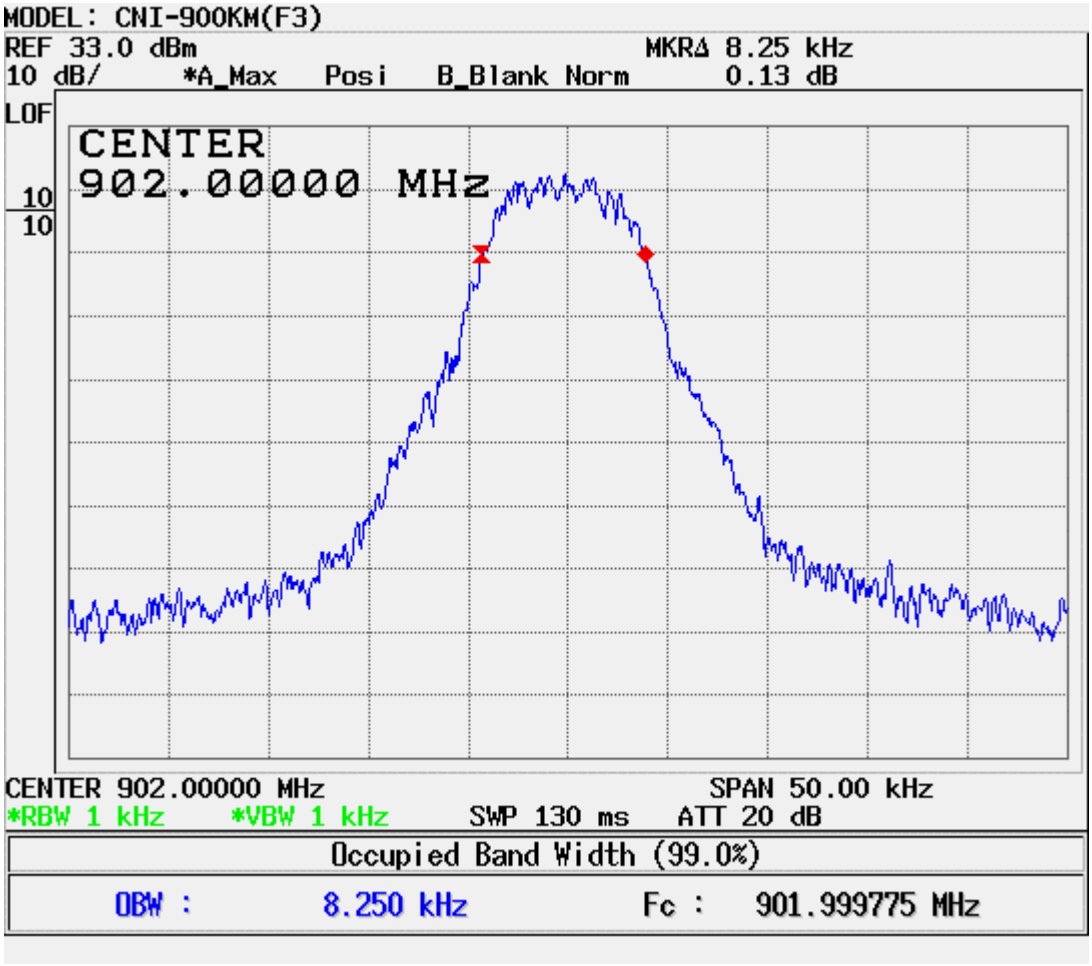
The resolution bandwidth of the spectrum analyzer was set at 30 KHz and the spectrum was recorded in the frequency band ±50 KHz from the carrier frequency.

6.3 Test Results

Please refer to the hereinafter plots.


MODEL: CNI-900KM(F1)
REF 33.0 dBm
MKRΔ 7.80 kHz
10 dB/ *A_Max Posi B_Blank Norm -1.16 dB
LOF
CENTER
896.00000 MHz
10
10
CENTER 896.00000 MHz
SPAN 50.00 kHz
*RBW 1 kHz *VBW 1 kHz SWP 130 ms ATT 20 dB
Occupied Band Width (99.0%)
OBW : 7.800 kHz Fc : 895.999750 MHz


MODEL: CNI-900KM(F2)
REF 33.0 dBm
MKRΔ 8.05 kHz
10 dB/ *A_Max Posi B_Blank Norm -0.85 dB
LOF
CENTER
899.00000 MHz
10
10
CENTER 899.00000 MHz
SPAN 50.00 kHz
*RBW 1 kHz
*VBW 1 kHz
SWP 130 ms
ATT 20 dB
Occupied Band Width (99.0%)
OBW : 8.050 kHz
Fc : 898.999725 MHz


MODEL: CNI-900KM(F3)
REF 33.0 dBm
MKRΔ 8.25 kHz
10 dB/ *A_Max Posi B_Blank Norm 0.13 dB
LOF
CENTER
902.00000 MHz
10
10
CENTER 902.00000 MHz
SPAN 50.00 kHz
*RBW 1 kHz *VBW 1 kHz SWP 130 ms ATT 20 dB
Occupied Band Width (99.0%)
OBW : 8.250 kHz Fc : 901.999775 MHz

7 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

7.1 Applicable Standard

§2.1051, §24.139 and §90.210

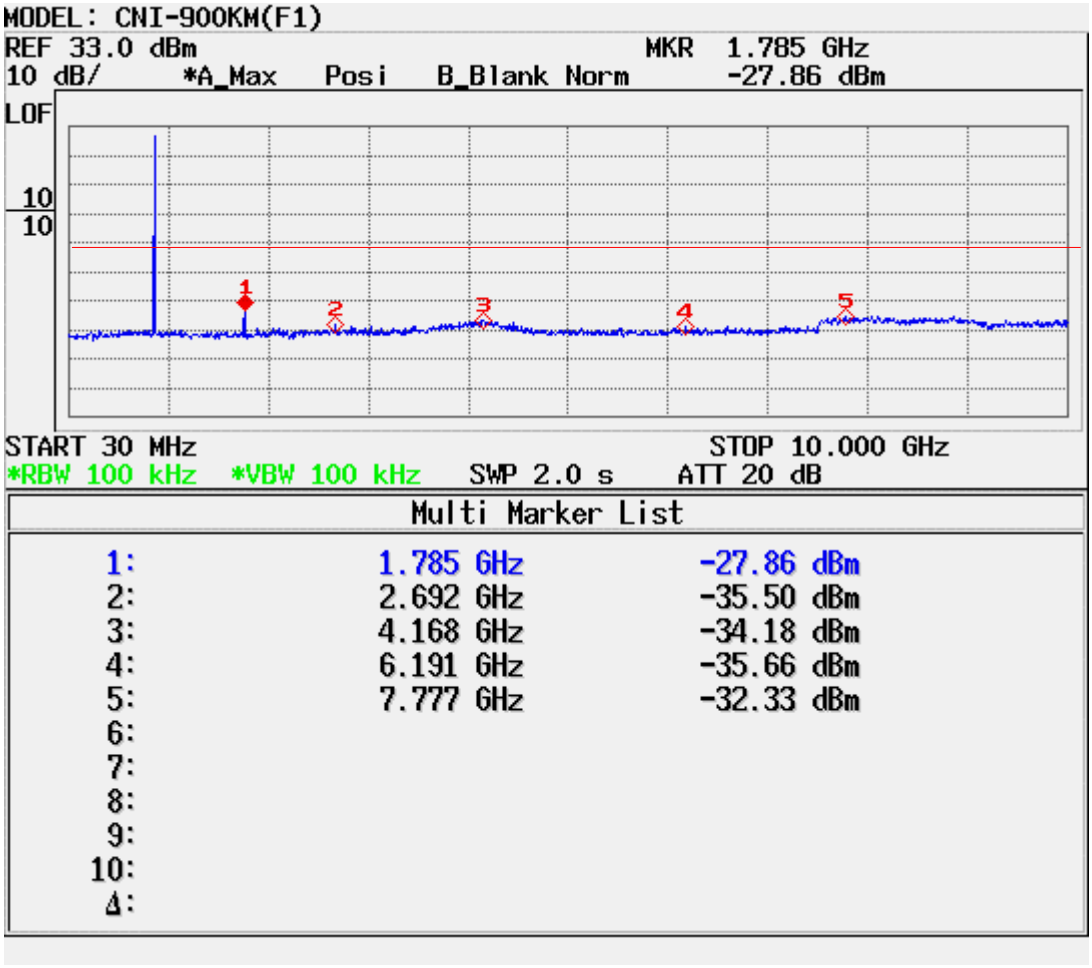
Measurement shall be made to detect spurious emission.

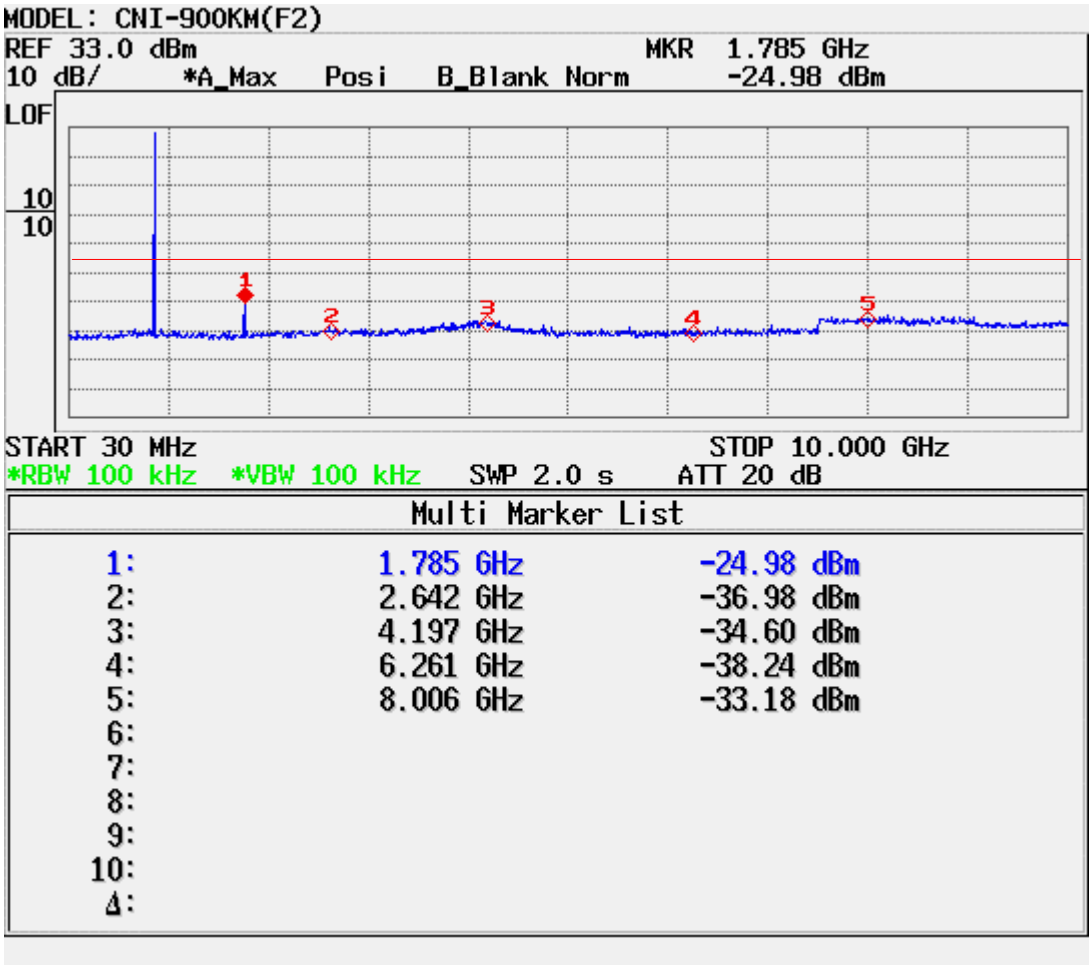
7.2 Test Procedure

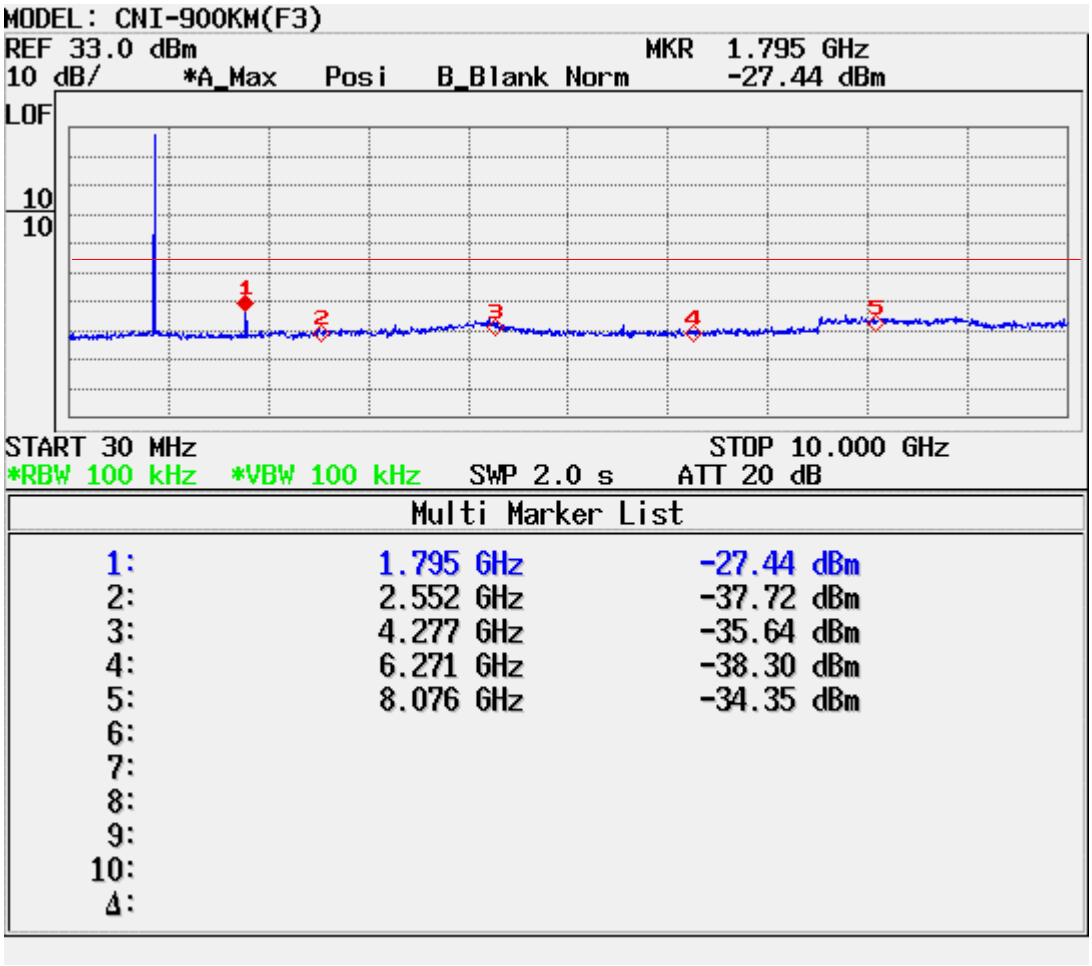
The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

7.3 Test Results

Please refer to the hereinafter plots.


MODEL: CNI-900KM(F1)
REF 33.0 dBm
MKR 1.785 GHz
10 dB/ *A_Max Posi B_Blank Norm -27.86 dBm
LOF
10
10
START 30 MHz
STOP 10.000 GHz
*RBW 100 kHz *VBW 100 kHz SWP 2.0 s ATT 20 dB
Multi Marker List
1: 1.785 GHz -27.86 dBm
2: 2.692 GHz -35.50 dBm
3: 4.168 GHz -34.18 dBm
4: 6.191 GHz -35.66 dBm
5: 7.777 GHz -32.33 dBm
6:
7:
8:
9:
10:
Δ:


MODEL: CNI-900KM(F2)
REF 33.0 dBm
MKR 1.785 GHz
10 dB/ *A_Max Posi B_Blank Norm
-24.98 dBm
LOF
10
10
START 30 MHz
STOP 10.000 GHz
*RBW 100 kHz *VBW 100 kHz SWP 2.0 s ATT 20 dB
Multi Marker List
1: 1.785 GHz -24.98 dBm
2: 2.642 GHz -36.98 dBm
3: 4.197 GHz -34.60 dBm
4: 6.261 GHz -38.24 dBm
5: 8.006 GHz -33.18 dBm
6:
7:
8:
9:
10:
Δ:


MODEL: CNI-900KM(F3)
REF 33.0 dBm
MKR 1.795 GHz
10 dB/ *A_Max Posi B_Blank Norm
-27.44 dBm
LOF
10
10
START 30 MHz
STOP 10.000 GHz
*RBW 100 kHz *VBW 100 kHz SWP 2.0 s ATT 20 dB
Multi Marker List
1: 1.795 GHz -27.44 dBm
2: 2.552 GHz -37.72 dBm
3: 4.277 GHz -35.64 dBm
4: 6.271 GHz -38.30 dBm
5: 8.076 GHz -34.35 dBm
6:
7:
8:
9:
10:
Δ:

8 - RADIATED SPURIOUS EMISSION

8.1 Applicable Standard

§2.1053, §24.133 and §90.210, measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediated circuit elements under normal condition of installation and operation. Information submitted shall include the relative radiated power of spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from a half wave dipole antenna.

8.2 Test Procedure

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. 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 spurious 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 or dipole
antenna are taken into consideration.

Radiated Spurious Emission Measurements by Substitution Method
according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

8.3 Test Result

8.3.1 F1 (Field Strength of SPURIOUS Radiation)

- ▣ OPERATING FREQUENCY: 896 MHz
- ▣ CHANNEL: F1
- ▣ MEASURED OUTPUT POWER: 24.59 dBm = 0.288 W
- ▣ DISTANCE: 3 meters
- ▣ LIMIT: -(43 + 10 $\log_{10}$ (W)) = -37.59 dBc

Freq. (MHz)	LEVEL@ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1649.40	-42.6	7.3	-35.3	V	-54.55
2474.10	-47.9	8.3	-39.6	V	-58.35
3298.80	-54.6	9.7	-44.9	V	-62.74

8.3.2 F2(Field Strength of SPURIOUS Radiation)

- ▣ OPERATING FREQUENCY: 899 MHz
- ▣ CHANNEL: F2
- ▣ MEASURED OUTPUT POWER: 24.59 dBm = 0.288 W
- ▣ DISTANCE: 3 meters
- ▣ LIMIT: -(43 + 10 $\log_{10}$ (W)) = -37.59 dBc

Freq. (MHz)	LEVEL@ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1671.78	-41.6	7.3	-34.3	V	-53.57
2507.67	-48.9	8.3	-40.6	V	-59.35
3343.56	-55.5	9.7	-45.8	V	-63.11

8.3.3 F3(Field Strength of SPURIOUS Radiation)

- ▣ OPERATING FREQUENCY: 902 MHz
- ▣ CHANNEL: F3
- ▣ MEASURED OUTPUT POWER: 24.59 dBm = 0.288 W
- ▣ DISTANCE: 3 meters
- ▣ LIMIT: -(43 + 10 $\log_{10}$ (W)) = -37.59 dBc

Freq. (MHz)	LEVEL@ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBd)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1696.62	-40.1	7.3	-32.8	V	-52.13
2544.93	-49.6	8.3	-41.3	V	-60.07
3393.24	-53.2	9.7	-43.5	V	-61.41

9 - FREQUENCY STABILITY

9.1 Applicable Standard

Requirements: FCC § 2.1055 (a), § 2.1055 (d), § 24.135 and §90.213.

According to FCC §2.1055(a)(1), the frequency stability shall be measure with variation of ambient temperature from –30ºC to +50ºC, and according to FCC 2.1055(d)(2), the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point which is specified by the manufacturer. According to FCC §24.135, the frequency stability shall be within +-1ppm. According to FCC §90.213, the minimum frequency stability for this device is 1.5ppm.

9.2 Test Procedure

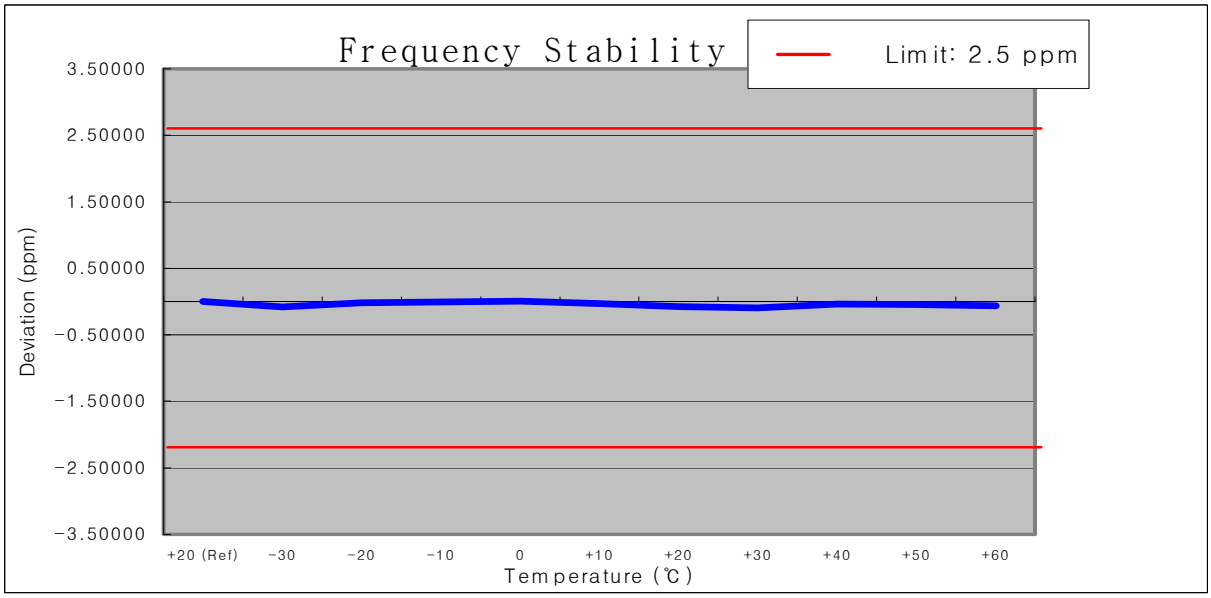
Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.

Frequency Stability vs. Voltage: An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.

9.3 Test Results

Temp. (℃)	Frequency (Hz)	Deviation (%)	Deviation (ppm)
+20 (Ref)	899,000,024	0.000000	0.00000
-30	899,000,096	-0.000008	-0.08009
-20	899,000,043	-0.000002	-0.02113
-10	899,000,029	-0.000001	-0.00556
0	899,000,017	0.000001	0.00779
+10	899,000,053	-0.000003	-0.03226
+20	899,000,091	-0.000007	-0.07453
+30	899,000,112	-0.000010	-0.09789
+40	899,000,057	-0.000004	-0.03671
+50	899,000,063	-0.000004	-0.04338
+60	899,000,081	-0.000006	-0.06340



10.1 LIST OF TEST EQUIPMENT

Type / Model	Calib. Date	S/N
Spectrum Analyzer (20Hz~40GHz) R&S ESI40	Dec. 04	1088.7410
Spectrum Analyzer(100Hz~26.5GHz) R3273	April 04	J04821
Signal Generator HP8373ED (10MHz ~ 20GHz)	July 04	US8710152
Signal Generator MARCONI(10kHz ~ 2.7GHz)	Sep. 04	119331
Power Meter(A) HP 438A	July 04	2822A05909
Power Sensor(A) HP8481B	July 04	3318A08777
Power Meter(B) HP 438A	Nov. 04	2427A00963
Power Sensor(B) HP8481A	Oct. 04	2349A37617
Power Amp A0825-4343-R(800~2.5GHz) +43dB	Sep. 04	A00450
Network Analyzer HP-8753D (30kHz ~ 3GHz)	Sep. 04	3401J02111
Modulation Analyzer HP8901A	June 04	3438A05231
Dipole Antenna UHAP	June 04	557
Dipole Antenna UHAP	June 04	558
AMF-4D-001180-26-10P(0.1~18GHz)	Feb.05	671009
AMF-4D-001180-26-10P(18~26.5GHz)	Feb.05	667624
AMF-4D-001180-26-10P(26~40GHz)	Feb.05	671314
Audio Analyzer HP 8903A	Feb.05	2433A04322
Function Generator HP 8116A	Feb.05	3001A08285
Horn Antenna BBHA 9120D(1~18GHz)	June 04	1099
Horn Antenna BBHA 9120D(1~18GHz)	March 04	1201
Horn Antenna BBHA 9170(15~40GHz)	Feb.05	BBHA9170124
CDMA Mobile Station Test Set HP8924C	June 04	US39063847
PCS Interface HP83236B 1.7 ~ 2.0GHz	June 04	3711J04841
EMI Test Receiver Rohde & Schwarz ESH3	June 04	335.8017
EMI Test Receiver Rohde & Schwarz ESVP	Feb. 05	354.3000
EMI Test Receiver Rohde & Schwarz ESVS30	June 04	826006/013
Spectrum Analyzer HP 8591EM	July 04	3509A00155
LISN EMCO 3825/2	July 04	9706-1070
LISN Rohde & Schwarz ESH2-Z5	July 04	9706-1071
Amplifier Hewlett-Packard 8447E	March 04	2805A03141
Biconical Antenna BBA-9106(30~1000MHz)	June 04	D6901
Log-Periodic Antenna UHALP-9107(300~1000MHz)	June 04	91071107
Antenna VULB9160 (25MHz~1800MHz)	June 04	91071107
Antenna Position Tower HD240	N.A	3241
Turn Table EMCO 1060-06	N.A	1253A
AC Power Source PACIFIC Magnetic Module	N.A	45321
AC Power Source PACIFIC 360AMX	N.A	22B87

11- CONCLUSION

The data collected shows that the Two Way Personal Communicator. **FCC ID: N79CNI-900KM** complies with all the requirements of Parts 24D, 90 of the FCC rules.