FCC ID PER PART 15.225
EMI MEASUREMENT AND TEST REPORT

For

S1 Corporation

10th FI., Samsung Life Insurance & S1 Bidg.
168,Soonhwa-Dong, Jung-Gu
Seoul, Korea 100-130

FCC ID: Q54CDR-0200

2003-06-16

This Report Concerns:	**Equipment Type:**
☒ Original Report	Smart Card Reader

Test Engineer:	James Lee
Report No.:	R0304282
Test Date:	2003-05-27
Reviewed By:	Ming Jing
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *S1 Corporation* 's product, model *CDR-0200* or the "EUT" as referred to in this report is a Smart Card Reader. The EUT measures approximately 5.5" L x 3.5" W x 1.0" H.

** The test data gathered is from typical production samples provided by the manufacturer.*

1.2 Objective

This Type approval report is prepared on behalf of *S1 Corporation* in accordance with Part 2, Subpart J, and Part 15, Subparts A and B of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules, Part 15, sec 15.35, sec 15.209 and sec 15.225 for radiated emission, conducted emission and frequency stability.

1.3 Related Submittal(s)/Grant(s)

No Related Submittals.

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-1992, 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 10 meters.

1.5 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, CISPR 22: 1997, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

1.6 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Spectrum Analyzer	8568B	Panel 2408A00105 Display 2403A06544	2004-05-01
HP	Spectrum Analyzer	8593A	29190A00242	2004-05-01
HP	Amplifier	8447E	1937A01054	2004-05-01
HP	Quasi-Peak Adapter	85650A	2521A00718	2004-05-01
Com-Power	Biconical Antenna	AB-100	14012	2004-05-01
Com-Power	LISN	LI-200	12005	2004-03-28
Com-Power	LISN	LI-200	12008	2004-03-28
Com-Power	Log Periodic Antenna	AL-100	16091	2004-05-01
Com-Power	Log Periodic Antenna	AB-900	15049	2004-05-01
Rohde & Schwarz	EMI Test Receiver	ESPI	1147 8007 07	2003-12-03

*** Statement of Traceability**: Bay Area Compliance Laboratory Corp. certifies that all calibration has been performed using suitable standards traceable to the NIST.

1.7 Local Support Equipment

Manufacturer	Description	Model	Serial Number	FCC ID
HP	Power Supply	6236B	2003A05705	None

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

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

2.2 EUT Exercise Software

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

2.3 Special Accessories

As shown in section 2.7, all interface cables used for compliance testing are shielded as normally supplied by INMAC and their representative. The peripherals featured shielded metal connectors.

2.4 Schematics and Block Diagram

Please refer to Appendix D.

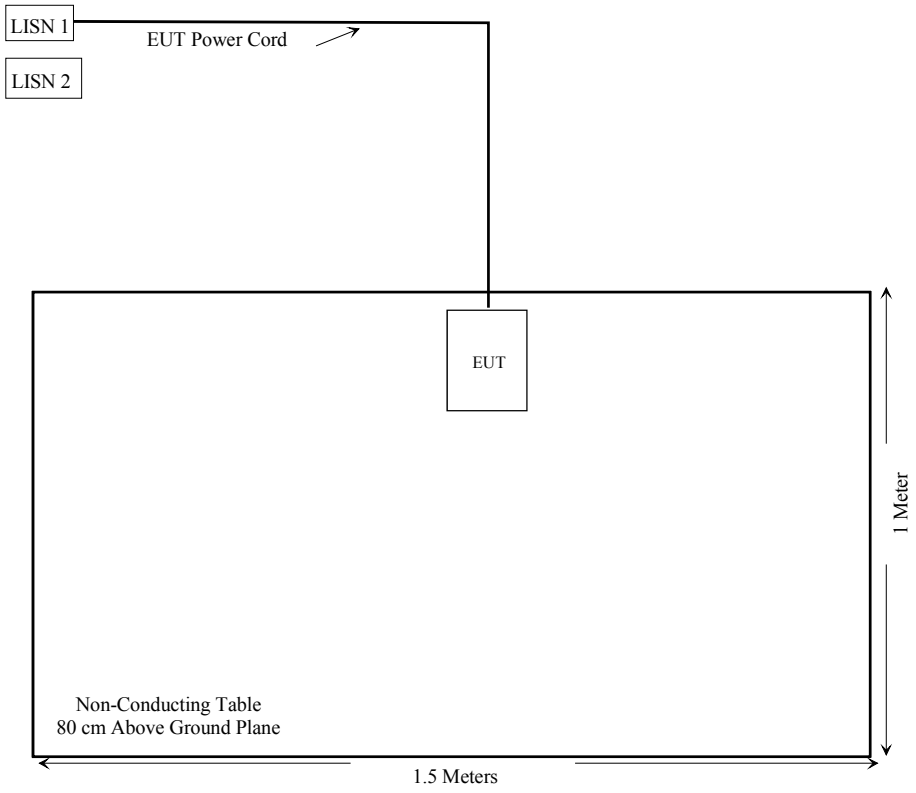
2.5 Equipment Modifications

No modifications were made by BACL to ensure the EUT to comply with the applicable limits and requirements.

2.6 Test Setup Configuration

EUT

2.7 Test Setup Block Diagram



3 - SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.207	Conducted Emission	Compliant
§ 15.225 § 15.209 § 15.35	Radiated Emission	Compliant
§15.225(c)	Frequency Stability	Compliant

4 - CONDUCTED EMISSIONS TEST

4.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is $\pm$2.4 dB.

4.2 EUT Setup

The measurement was performed in the shielded room, using the same setup per ANSI C63.4-1992 measurement procedure. The specification used was FCC 15 Subpart C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The host PC system was connected with 120Vac/60Hz power source.

4.3 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configurations during the conduction test:

Start Frequency..... 150 kHz
Stop Frequency..... 30 MHz
Sweep Speed..... Auto
IF Bandwidth..... 10 kHz
Video Bandwidth..... 10 kHz
Quasi-Peak Adapter Bandwidth..... 9 kHz
Quasi-Peak Adapter Mode..... Normal

4.4 Test Procedure

During the conducted emission test, the power cord of the host system was connected to the auxiliary outlet of the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of each modes tested to ensure EUT is compliant with all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (within -4 dBµV of specification limits). Quasi-peak readings are distinguished with a "**Qp**".

4.5 Test Equipment

Manufacturer	Description	Serial No.	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	1147 8007 07	2003-12-03

4.6 Summary of Test Results

According to the data in section 11.7, the EUT complies with the FCC Conducted margin for a Class B device, with the *worst* margin reading of:

-10.0 dBμV at 13.6 MHz in the Neutral mode

4.7 Conducted Emissions Test Data

LINE CONDUCTED EMISSIONS				FCC PART 15 CLASS B	
Frequency MHz	Amplitude dBμV	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dBμV	Margin dB
13.6	50	Qp	Neutral	60	-10.0
13.6	49	Qp	Line	60	-11.0
13.6	35	Ave	Line	50	-15.0
13.6	33.4	Ave	Neutral	50	-16.6
16.1	22.4	Ave	Neutral	50	-27.6
0.15	34.1	QP	Line	64	-29.9
0.15	34.1	Qp	Neutral	64	-29.9
16.1	28.9	QP	Neutral	60	-31.1
16.1	16.8	Ave	Line	50	-33.2
16.1	22.5	QP	Line	60	-37.5
0.15	10.6	Ave	Line	54	-43.4
0.15	9.6	AVE	Neutral	54	-44.4

4.8 Plot of Conducted Emissions Test Data

Plot(s) of Conducted Emissions Test Data is presented hereinafter as reference.

Bay Area Compliance Laboratory Corp 18. Jun 03 12:56
CISPR CLASS B

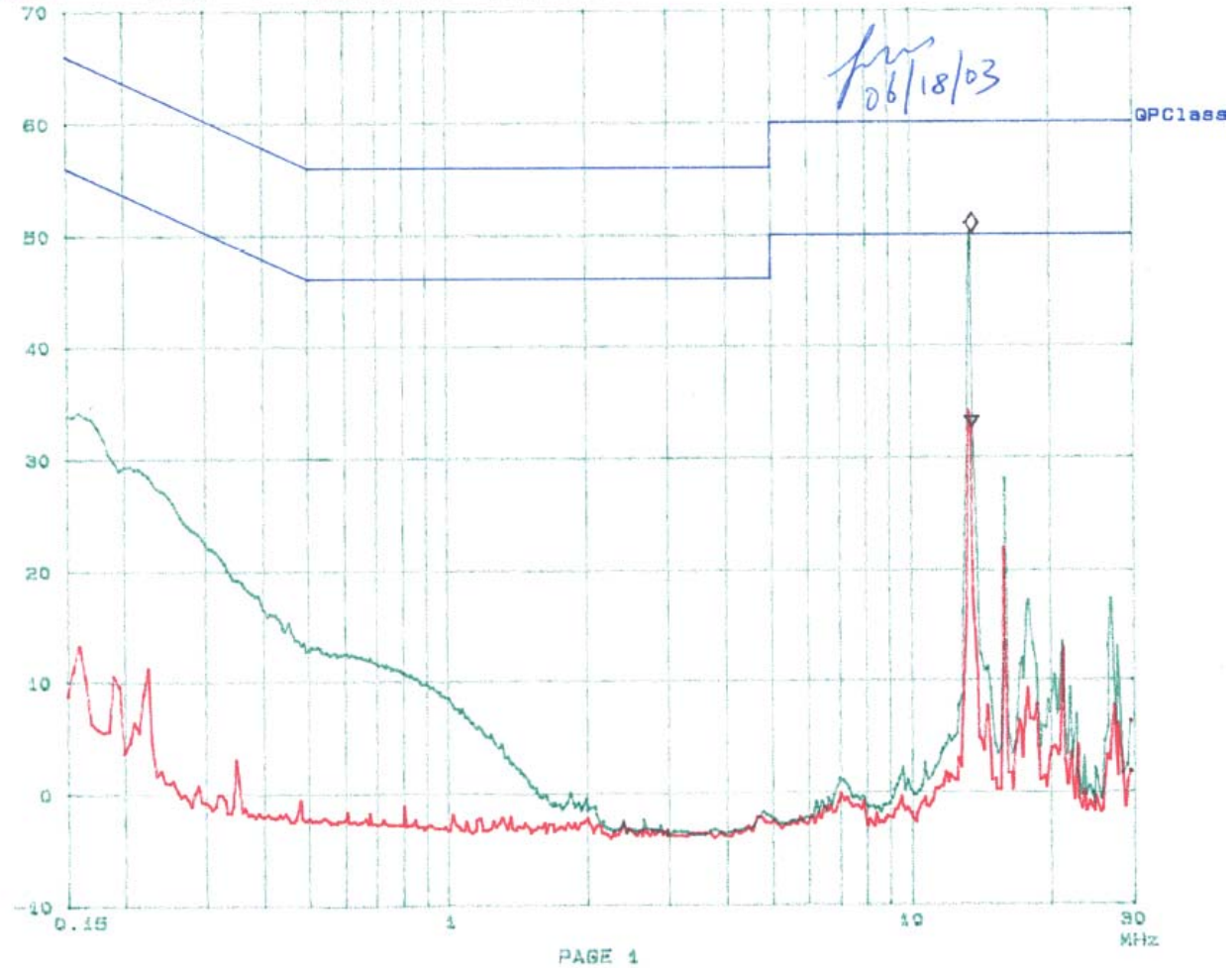
EUT: CDR-200
Manuf: s1 corp
Op Cond: Normal
Operator: James
Comment: N

Scan Settings (3 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	1M	5k	9k	QP+AV	20ms	10dBLN	OFF
1M	3M	10K	9K	QP+AV	1ms	10dBLN	OFF
3M	30M	100k	9K	QP+AV	1ms	10dBLN	OFF

Final Measurement: : QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB

◇ Mkr : 13.60000MHz 50.1 dBuV
▽ Mkr : 13.60000MHz 32.7 dBuV



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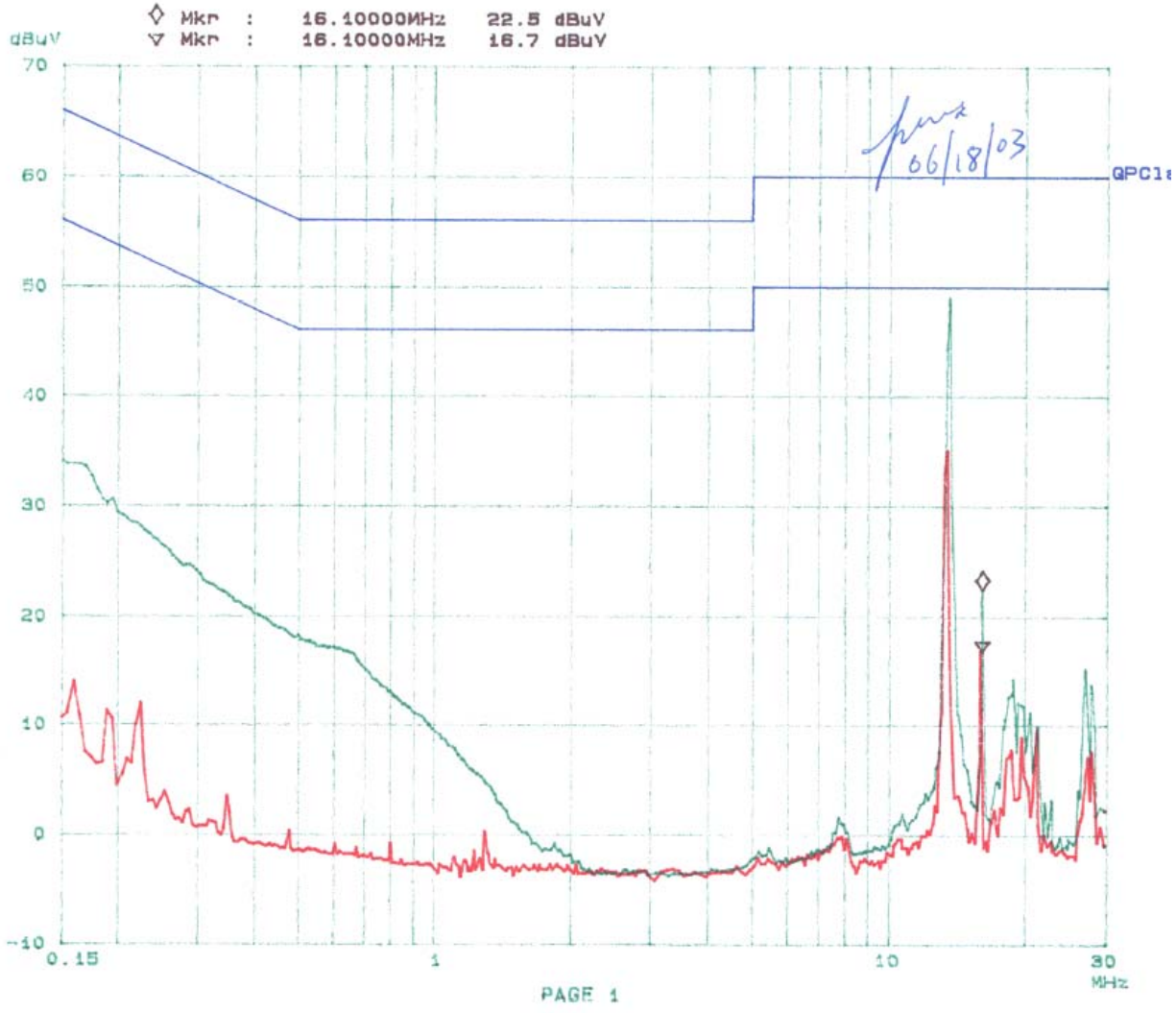
Bay Area Compliance Laboratory Corp 18. Jun 03 12:38
CISPR CLASS B

EUT: CDR-200
Manuf: s1 corp
Op Cond: Normal
Operator: James
Comments: 1

Scan Settings (3 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	1M	5k	9k	QP+AV	20ms	10dBLN	OFF
1M	3M	10k	9k	QP+AV	1ms	10dBLN	OFF
3M	30M	100k	9k	QP+AV	1ms	10dBLN	OFF

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB



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5 - RADIATED EMISSION TEST

5.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is $\pm$4.0 dB.

5.2 EUT Setup

The radiated emission tests were performed in the open area 10-meter test site, using the setup accordance with the ANSI C63.4-1992. The specification used was the FCC Class B limits.

The EUT was placed on the center of the back edge on the test table, connected to a 120Vac/60Hz power source.

5.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR 15.33, the EUT was tested to 1 GHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Start Frequency	1 MHz
Stop Frequency	1 GHz
Sweep Speed	Auto
IF Bandwidth	100 KHz
Video Bandwidth	100 KHz
Quasi-Peak Adapter Bandwidth	120 kHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	100 KHz

5.4 Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings performed only when an emission was found to be marginal (within -4 dBμV of specification limitation), and are distinguished with a "**QP**" in the data table.

The EUT was operating at normal to represent worst case during final qualification test. Therefore, this configuration was used for final test data recorded in the table(s) listed under section 4.7 of this report.

5.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBμV means the emission is 7dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - Limit

5.6 Summary of Test Results

According to the final data in section 5.7, the EUT complied with the FCC 15.225, FCC 15.209 and FCC 15.35 standards, and had the worst margin of:

-26.0 dBμV at 13.567 MHz in the Vertical polarization

5.7 Radiated Emissions Test Result Data

INDICATED		TABLE	ANTENNA		CORRECTION FACTOR				CORRECTEI AMPLITUDI	FCC 15.225	
Frequency MHz	Reading dBμV	Angle Degree	Height Meter	Polar H/ V	Antenna dBμV/m	Cable dB	Amp. dB	15.31 Correction dB	Reading dBμV	Limit dBμ V	Margin dB
13.560	71.2	90	1.0	V	10.8	1.5	26.4	20.0	37.1	80	-42.9*
13.560	70.1	120	1.5	H	10.8	1.5	26.4	20.0	36.0	80	-44.0*
13.567	37.6	-45	1.0	V	10.8	1.5	26.4	20.0	3.5	29.5	-26.0
13.553	31.9	90	1.5	V	10.8	1.5	26.4	20.0	-2.2	29.5	-31.7

* Fundamental Frequency

Compliance Statement:

According to FCC Part 15, at 3-meter distance the emission from an intentional radiator shall not exceed the field strength level 40 dBuV/m within 30-88 MHz, 43.5 dBuV/m within 88-216 MHz, 46dBuV/m within 226-960 MHz, 54BuV/m above 960 MHz. The level of any unwanted emissions shall not exceed the level of the fundamental frequency.

The levels of unwanted emission of this device were too low to be detected. This device was compliant with the FCC Part 15.

Note: Data corrected for test distance in accordance with FCC 15.31 40dB/Decade.

6 - FREQUENCY STABILITY MEASUREMENT

6.1 Provision Applicable

According to FCC §15.225(c), the frequency tolerance of the carrier signal shall be maintained within ± 0.01% of the operating frequency over a temperature variation of –20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

6.2 Test Procedure

6.2.1 Frequency stability versus environmental temperature

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feedthrough attenuators. The EUT was placed inside the temperature chamber.

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

6.2.2 Frequency Stability versus Input Voltage

At room temperature (25±5°C), an external variable DC power supply was connected to the EUT. The frequency of the transmitter was measured for 115%, 100% and 85% of the nominal operating input voltage.

6.3 Test Equipment

Temperature Chamber, -50°C to +100°C
Hewlett Packard HP8566B Spectrum Analyzer
Hewlett Packard HP 7470A Plotter
Hewlett Packard HP 5383A Frequency Counter
Goldstar DC Power Supply, GR303

6.4 Test Results

Reference Frequency: 13.560575 MHz, limit: 100 ppm			
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed	
		MCF (MHz)	PPM Error
50	24V	13.560675	7.4
40	24V	13.560625	3.7
30	24V	13.560505	-5.2
20	24V	13.560495	-5.9
10	24V	13.560645	5.2
0	24V	13.560555	-1.5
-10	24V	13.560675	7.4
-20	24V	13.560495	-5.9

Frequency Stability Versus Input Voltage

Reference Frequency: 13.560575 MHz, limit: 100 ppm						
Power Supplied (Vdc)	Frequency Measure with Time Elapsed					
	2 Minutes		5 Minutes		10 Minutes	
	MHz	PPM	MHz	PPM	MHz	PPM
20.4V	13.560650	5.5	13.560660	6.3	13.56067	7.0
24V	13.560551	-1.8	13.560561	-1.0	13.560555	-1.5
27.4V	13.560620	3.3	13.560630	4.1	13.560635	4.4

End Point = 7.0 V

Conclusion: The EUT complied with the applicable Frequency Stability Limits.