Engineering and Testing for EMC and Safety Compliance

TYPE CERTIFICATION REPORT

ComSpace Corporation
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MODEL: CDVSL411SAV00

FCC ID: PCKCDVSL411SAV00

November 20, 2000

STANDARDS REFERENCED FOR THIS REPORT	
PART 2: 1999	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS
PART 15: 1999	§15.109: RADIATED EMISSIONS LIMITS
PART 90: 1998	PRIVATE LAND MOBILE RADIO SERVICES
ANSI C63.4-1992	STANDARD FORMAT MEASUREMENT/TECHNICAL REPORT PERSONAL COMPUTER AND PERIPHERALS
ANSI/TIA/EIA603- 1992	LAND MOBILE FM OR PM COMMUNICATIONS EQUIPMENT MEASUREMENT AND PERFORMANCE STANDARDS
ANSI/TIA/EIA 603-1-1998	ADDENDUM TO ANSI/TIA/EIA 603-1992

FCC Rules Parts	Frequency Range	Output Power (W)	Freq. Tolerance	Emission Designator
2, 15, 90	851-869 MHz	4	2.5	18K9W7W
2, 15, 90	806-824 MHz	4	2.5	18K9W7W

REPORT PREPARED BY:

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Rhein Tech Laboratories, Inc.

Document Number: 2000459 / QRTL00-368

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1 GENERAL INFORMATION

The following Report of a Type Certification is prepared on behalf of ***ComSpace Corporation*** in accordance with the Federal Communications Commissions Rules and Regulations. The Equipment Under Test (EUT) was the ***CDVSL411SAV00; FCC ID: PCKCDVSL411SAV00***. The test results reported in this document relate only to the item that was tested.

All measurements contained in this application were conducted in accordance with FCC Rules and Regulations CFR 47, and ANSI C63.4 Methods of Measurement of Radio Noise Emissions, 1992. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

1.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report dated March 3, 1994, submitted to and approved by the Federal Communication Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 1992).

1.2 Related Submittal(s)/Grant(s)

This is an original application report.

360 Herndon Parkway
Suite 1400
Herndon, VA 20170
http://www.rheintech.com

1.3 Conformance Statement

We, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this attached test record. No modifications were made to the equipment during testing in order to achieve compliance with these standards.

Furthermore, there was no deviation from, additions to or exclusions from the FCC Part 2, FCC Part 90 Certification methodology.

Signature:  Date: November 14, 2000

Typed/Printed Name: Bruno Clavier Position: Vice President of Operations

Signature:  Date: November 14, 2000

Typed/Printed Name: Daniel W. Baltzell Position: Test Engineer

Accredited by the National Voluntary Accreditation Program for the specific scope of accreditation under Lab Code 200061-0.

Note: This report may not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

1.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FI(dBuV/m) = SAR(dBuV) + SCF(dB/m)
FI = Field Intensity
SAR = Spectrum Analyzer Reading
SCF = Site Correction Factor

The Site Correction Factor (SCF) used in the above equation is determined empirically, and is expressed in the following equation:

SCF(dB/m) = - PG(dB) + AF(dB/m) + CL(dB)

SCF = Site Correction Factor
PG = Pre-amplifier Gain
AF = Antenna Factor
CL = Cable Loss

The field intensity in microvolts per meter can then be determined according to the following equation:

$$FI(uV/m) = 10^{FI(dBuV/m)/20}$$

For example, assume a signal at a frequency of 125 MHz has a received level measured as 49.3 dBuV. The total Site Correction Factor (antenna factor plus cable loss minus preamplifier gain) for 125 MHz is
-11.5 dB/m. The actual radiated field strength is calculated as follows:

49.3 dBuV - 11.5 dB/m = 37.8 dBuV/m

$$10^{37.8/20} = 10^{1.89} = 77.6 \text{ uV/m}$$

1.5 Conducted Measurement

N/A

1.6 Radiated Measurement

Before final measurements of radiated emissions were made on the open-field three meter range, the EUT was scanned indoors at a three meter distance in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to insure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three-meter, open-field test site. The EUT was placed on a nonconductive turntable approximately 0.8 meters above the ground plane.

At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations.

Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech quality manual, section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as well as daily calibration methods, technician training, and emphasis to employees on avoiding error.

2 FCC Rules and Regulations Part 2 §2.1046 (a): RF Power Output: Conducted

2.1 Test Procedure

ANSI/TIA/EIA-603-1992, section 2.2.1

The EUT was connected to a coaxial attenuator having a 50 Ω load impedance.

2.2 Test Data

The following channels (in MHz) were tested: 815.0125, 805.0125, and 823.9875 MHz
The worst-case Output Power (highest) levels are shown.

CARRIER OUTPUT POWER (UNMODULATED)

Frequency (MHz)	RF Power measured (Watt)*
815.0125	3.981 W (36 dBm)
805.0125	3.981 W (36 dBm)
823.9875	3.981 W (36 dBm)

*Measurement accuracy: +/- 3%

Rated Power:

Rated Power (W)
4

2.3 Test Equipment

Power Meter	Gigatronics	8651A (Meter) 80401A(sensor)
	HP437B	s/n 2949A02966
	HP 8901A	s/n 2545A04102 (power mode)
Power Sensor	HP8481B	s/n 2702A05059
Frequency Counter	HP8901A	s/n 2545A04102 (Frequency mode)

3 FCC Rules and Regulations Part 2 §2.1051: Spurious Emissions at Antenna Terminals

3.1 Test Procedure

ANSI/TIA/EIA-603-1992, Section 2.2.13

The transmitter is terminated with a 50 Ω load and interfaced with a spectrum analyzer.
The transmitter is modulated with a 2,500 Hz sine wave at an input level 16 dB greater than that required to produce 50% of the rated system deviation at 1000 Hz.

3.2 Test Data

CFR Part 90 Requirements

Frequency range of measurement per Part 2.1057: 9kHz to 10 x Fc

Limits: Mask B (dBm): P(dBm) – (43+10xLOG P(W))
Mask for EA-based systems (dBm): P(dBm) – (50+10xLOG P(W))

The worst case (unwanted emissions) are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit does not need to be recorded.

(823.9875) – 4 Watt and 25 kHz Channel Bandwidth: Mask B

Frequency (MHz)	Level Measured (dBm)	Limit (dBm)	Margin (dB)
0.762	-60.5	-13.0	-47.5
5.000	-45.0	-13.0	-32.0
15.270	-51.2	-13.0	-38.2
24.900	-47.5	-13.0	-34.5
80.000	-39.2	-13.0	-26.2
1647.975	NF		
2471.963	NF		
3295.950	NF		
4119.938	NF		
4943.925	NF		
5767.913	NF		
6591.900	NF		
7415.888	NF		
8239.875	NF		

3.3 Test Equipment

Audio Generator:
Synthesized Level Generator HP3336B s/n 2127A00559
Audio Signal Analyzer Tektronix ASG 100 s/n B032374

Spectrum Analyzer:
HP8564E s/n 3943A01719
HP8546A s/n 3525A00159

4 FCC Rules and Regulations Part 2 §2.1053 (a): Field strength of spurious radiation

4.1 Test Procedure

ANSI/TIA/EIA-603-1992, section 2.2.12. The transmitter is terminated with a 50 Ω.
Refer to section "Radiated Measurement" in this report for further information.

4.2 Test Data

The worst-case emissions test data are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

4 W 25 kHz						
Radiated Emissions (823.9875 MHz) Substitution Method						
Frequency	**S/G level (dBm)**	**Cable Loss***	**TX Ant. gain diff. (ref. To 1/2 wave dipole)**	**Emission level (dBm)**	**Limit (dBm) Mask B**	**Margin (dB)**
1647.975	-41.5	6.9	4.8	-29.8	-13.0	-16.8
2471.963	-77.2	10.9	5.1	-61.2	-13.0	-48.2
3295.950	-42.9	13.6	6.2	-23.1	-13.0	-10.1
4119.938	NF					
4943.925	NF					
5767.913	NF					
6591.900	NF					
7415.888	NF					
8239.875	NF					

*This insertion loss corresponds to the cable connecting the RF Signal Generator to the ½wave dipole antenna.

4.3 Test Equipment

Antenna:	CHASE CBL6112 s/n 2099	
Amplifier:	HP8449B	s/n 3008A00505
Spectrum analyzer:	HP8564E	s/n 3943A01719
RF Signal Generator	HP8648C	s/n 3537A01741
Synthesized Sweeper	HP83752A	s/n 3610A00846

5 FCC Rules and Regulations Part 2 §2.1049 (c) (1): Occupied Bandwidth

OCCUPIED BANDWIDTH - COMPLIANCE WITH THE EMISSION MASKS

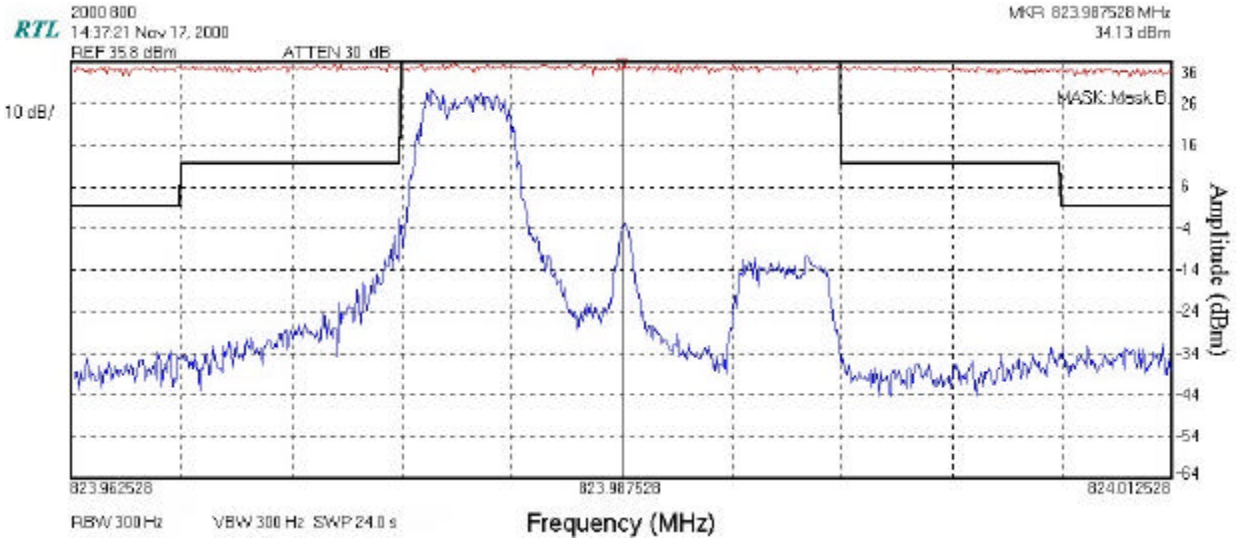
5.1 Test Procedure

ANSI/TIA/EIA-603-1992, section 2.2.11

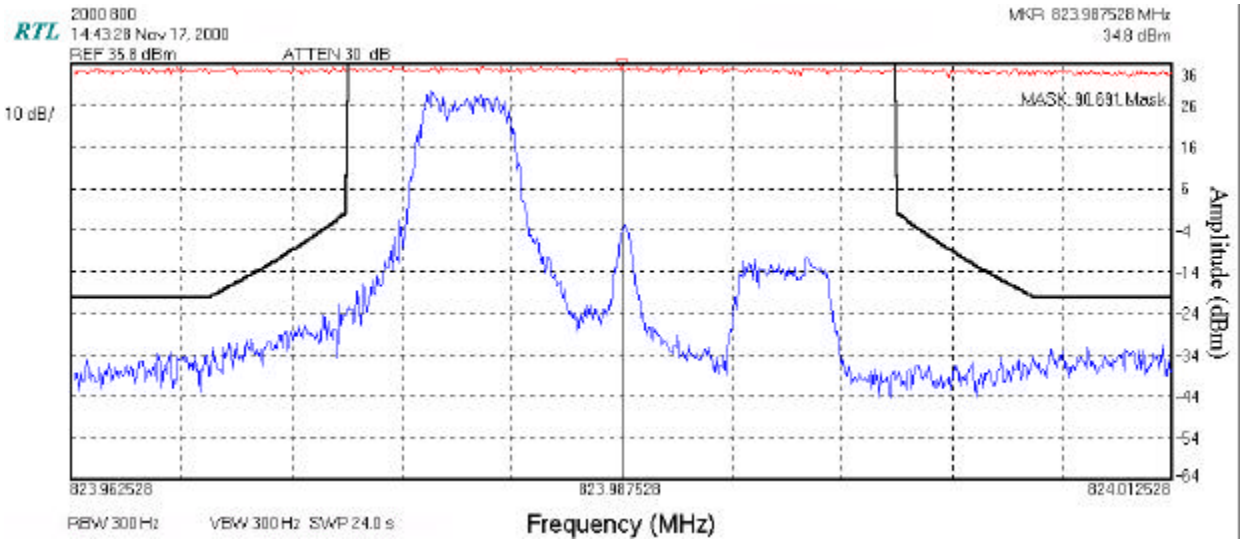
Device with digital modulation: operation to its maximum extent

5.2 Test Data

4 W for 25 kHz Channel Bandwidth: Mask B



4 W for 25 kHz Channel Bandwidth: Mask Part 90.691



5.3 Test Equipment

Spectrum Analyzer HP8564E s/n 3943A01719

6 FCC Rules and Regulation Part 2 §2.1055: Frequency Stability

6.1 Test Procedure

ANSI/TIA/EIA-603-1992, section 2.2.2

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The EUT was evaluated over the temperature range -30°C to +50°C.

The temperature was initially set to -30°C and a period was observed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10 degrees centigrade through the range. A sufficient period of time was observed to stabilize the EUT at each measurement step and the frequency stability was measured within one minute after application of primary power to the transmitter.

Additionally, the power supply voltage of the EUT was varied from 85% to 115% of the nominal voltage of 13.8V

The worst-case test data are shown.

6.2 Test Data

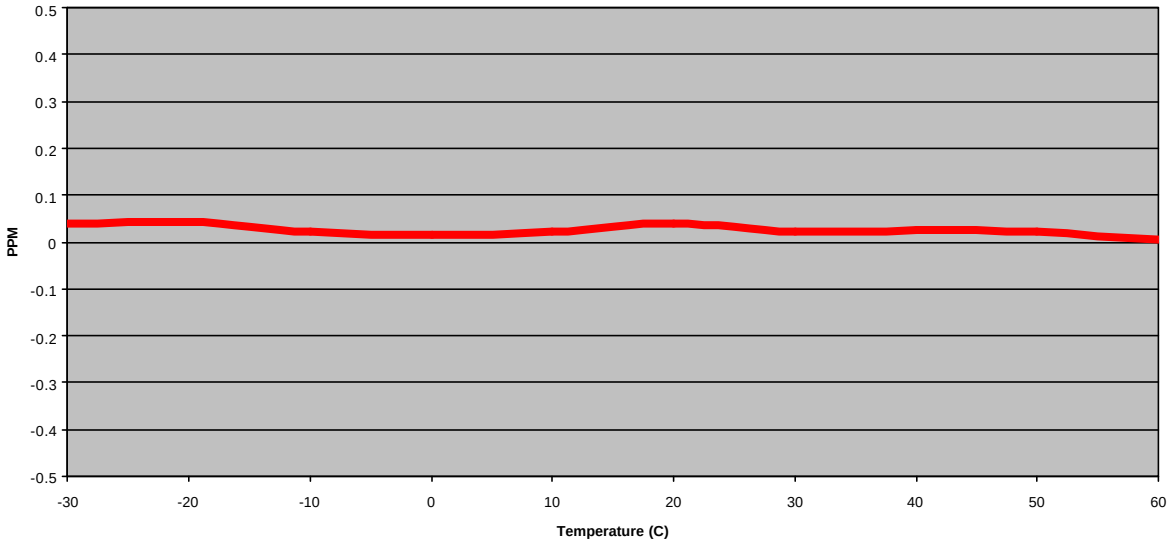
Frequency stability/Frequency variation

Limit is 5 ppm for device with a 25 kHz channel bandwidth

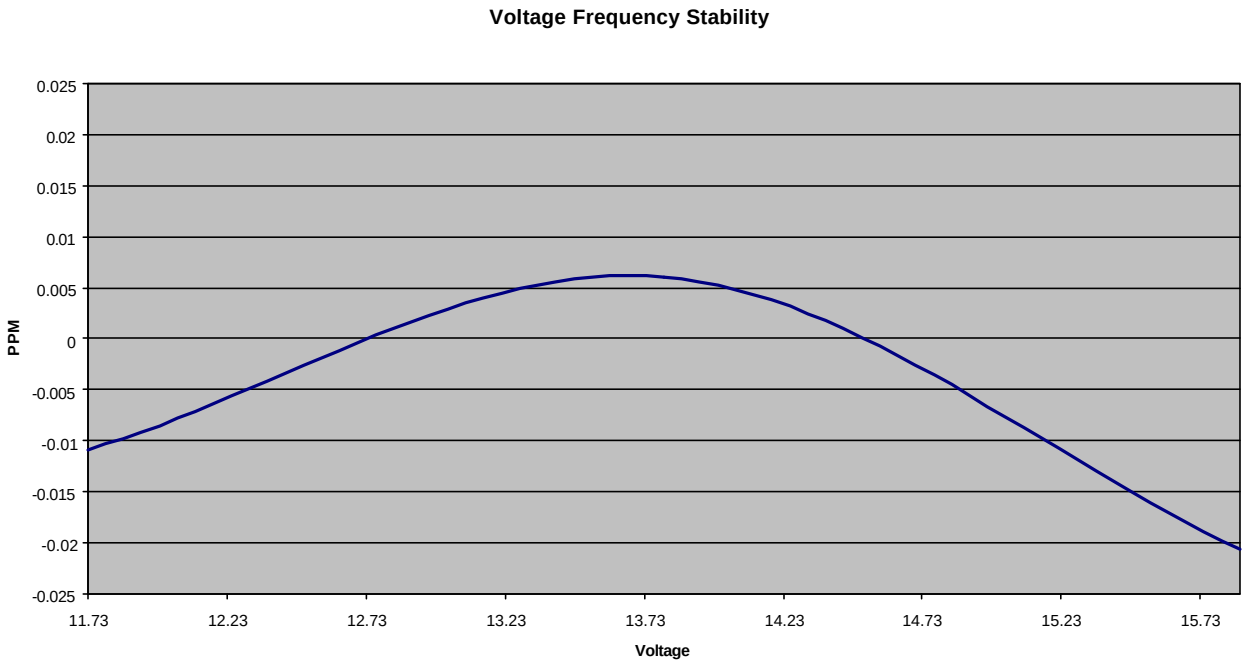
4 Watt s was tested with a 25 kHz channel bandwidth. The worst-case temperature deviation is 0.04 PPM.

Assigned Frequency 823.9875 MHz

Temperature Frequency Stability



Frequency Stability/Voltage Variation



6.3 Test Equipment

Temperature Chamber	Tenney TH65	s/n 11380
Frequency Counter	HP8901A (Frequency Mode)	s/n 2545A04102

7 FCC Rules and Regulations Part 15 §15.109 (a): Radiated Emissions (Class B Limits)

Temperature: 34°F Humidity: 45%									
Emission Frequency (MHz)	**Test Detector**	**Antenna Polarity (H/V)**	**Turntable Azimuth (deg)**	**Antenna Height (m)**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB/m)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**
65.000	Qp	V	20	1.0	49.6	-23.4	26.2	40.0	-13.8
130.000	Qp	H	270	2.3	55.3	-16.0	39.3	43.5	-4.2
138.670	Qp	V	0	1.0	46.0	-16.0	30.0	43.5	-13.5
364.000	Qp	H	225	2.0	53.2	-10.8	42.4	46.0	-3.6
455.000	Qp	H	180	1.8	46.2	-9.2	37.0	46.0	-9.0
941.183	Qp	V	220	1.2	46.1	-2.9	43.2	46.0	-2.8

8 FCC Rules and Regulations Part 15 §15.111 (a): Antenna Power Conduction for Receivers

Frequency (MHz)	**Emission Level (dBm)**	**Limit (dBm) (2nW)**	**Margin (dB)**
0.7623	-96.0	-57.0	-39.0
0.8382	-97.8	-57.0	-40.8
955.8362	-94.7	-57.0	-37.7
1911.6724	-88.3	-57.0	-31.3
2867.5085	-85.0	-57.0	-28.0
3823.3447	-70.5	-57.0	-13.5
4779.1834	-94.3	-57.0	-37.3
6690.8567	-89.5	-57.0	-32.5
7646.6941	-83.7	-57.0	-26.7
8602.5301	-89.3	-57.0	-32.3
10514.2045	-89.0	-57.0	-32.0

9 FCC Rules and Regulations Part 2 §2.202: NECESSARY BANDWIDTH AND EMISSION BANDWIDTH

Type of Emission: W7W

Necessary Bandwidth: (measured at 99% power bandwidth)
Bn = 18.9 kHz

10 Test Configuration Photographs

11 Label Information

12 Product Description

13 Schematics

14 Internal EUT Photographs

15 External EUT Photographs

16 Operator's Manual