Nemko Test Report: 10230RUS2

Applicant: Sirit Corporation
1321 Valwood Parkway
Carrollton, TX 75006

Equipment Under Test: (E.U.T.) ID5100

In Accordance With: **FCC Part 90, Subpart I**
Base Station Transmitter

Tested By: Nemko USA Inc.
802 N. Kealy
Lewisville, Texas 75057-3136

TESTED BY: _____ **DATE:** **18 January 2008**
David Light, Senior Wireless Engineer

APPROVED BY: _____ **DATE:** **25 January 200**
Mike Cantwell, Frontline Manager

Total Number of Pages: 28

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Section 1. Summary of Test Results

Manufacturer: Sirit Corporation

Model No.: ID5100

Serial No.: None

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 90, Subpart I.

☒ New Submission ☐ Production Unit

☐ Class II Permissive Change ☒ Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE. NONE
See “Summary of Test Data”.

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Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	90.205	30 Watts ERP	Complies
Audio Frequency Response	TIA EIA-603.3.2.6	N/A	N/A
Audio Low-Pass Filter Response	TIA EIA-603.3.2.6	N/A	N/A
Modulation Limiting	TIA EIA-603.3.2.6	N/A	N/A
Occupied Bandwidth	90.210	Plots	Complies
Spurious Emissions at Antenna Terminals	90.210	Plots	Complies
Field Strength of Spurious Emissions	90.210	-25 dBm	Complies
Frequency Stability	90.213	NA	NA
Transient Frequency Behavior	90.214	N/A	N/A

Footnotes For N/A's:

(1) Since the E.U.T. does not contain modulation circuitry modulation testing was not performed.
(2) Since the E.U.T. is not a keyed carrier system, Transient Frequency Behavior was not performed.
(3) The radio does not support audio modulation.
(4) Fixed non-multilateration transmitters with an authorized bandwidth that is more than 40 kHz from the band edge are not subject to frequency stability restrictions. The device however was measured to show compliance to Part 2 requirements.

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Section 2. General Equipment Specification

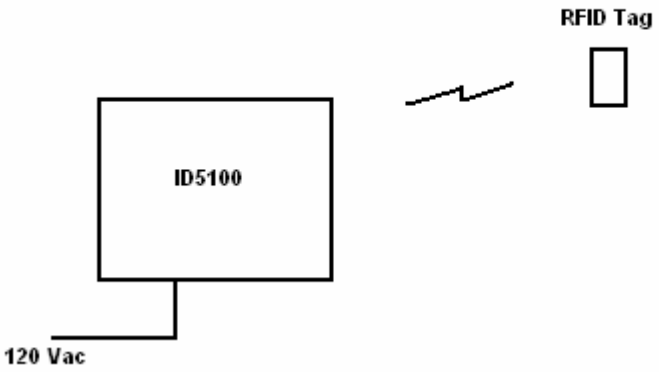
Transmitter

Supply Voltage Input:	120 Vac
Frequency Range:	902 to 928 MHz
Tunable Bands:	910.95 to 920.45 MHz
Type(s) of Modulation:	**F3E (Voice)** ☐ **F1D** ☐ **F2D** ☐ **D7W (QAM)** ☐ **Other (K1D)** ☒
Output Impedance:	50 ohms
RF Power Output (rated):	3.5 W Peak conducted
Channel Spacing(s):	250 kHz
Operator Selection of Operating Frequency:	Software controlled
Power Output Adjustment Capability:	Software controlled

Description of EUT

ID5100 is a 900 MHz RFID reader. The IDentity 5100 is equipped with two RFID antenna ports: One port dedicated to the integrated patch antenna and the second is for an optional external antenna. The 2 TX/RX ports are multiplexed, i.e. only one port is active at any given time. Conducted output power is user-adjustable up to 3.5 Watts maximum for FCC Part 90 Licensed operation, but is further restricted to a 1 watt maximum output for FCC Part 15 operation. In addition to flexibility in power level, the transmitter has been optimized to handle the demanding requirements of dense reader modes. These optimizations include the use of phase reversal keying and substantial filtering to reduce out-of-band emissions to well below industry standards.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 90.205
TESTED BY: David Light	DATE: 15 January 2008

Test Results: Complies.

Measurement Data:

Frequency (MHz)	Measured Power (dBm)	Measured Power (Watts)
910.95	35.5	3.5
915.45	35.5	3.5
920.45	34.4	2.8

Test Equipment Used: 1036 -1065-1604-1082

Test Conditions:

Temperature $22^{O}C$

Relative Humidity 45%

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 90.210
TESTED BY: David Light	DATE: 15 January 2008

Test Results: Complies.

Test Data: See attached graph(s).

Test Equipment Used: 1036 -1065-1604-1082

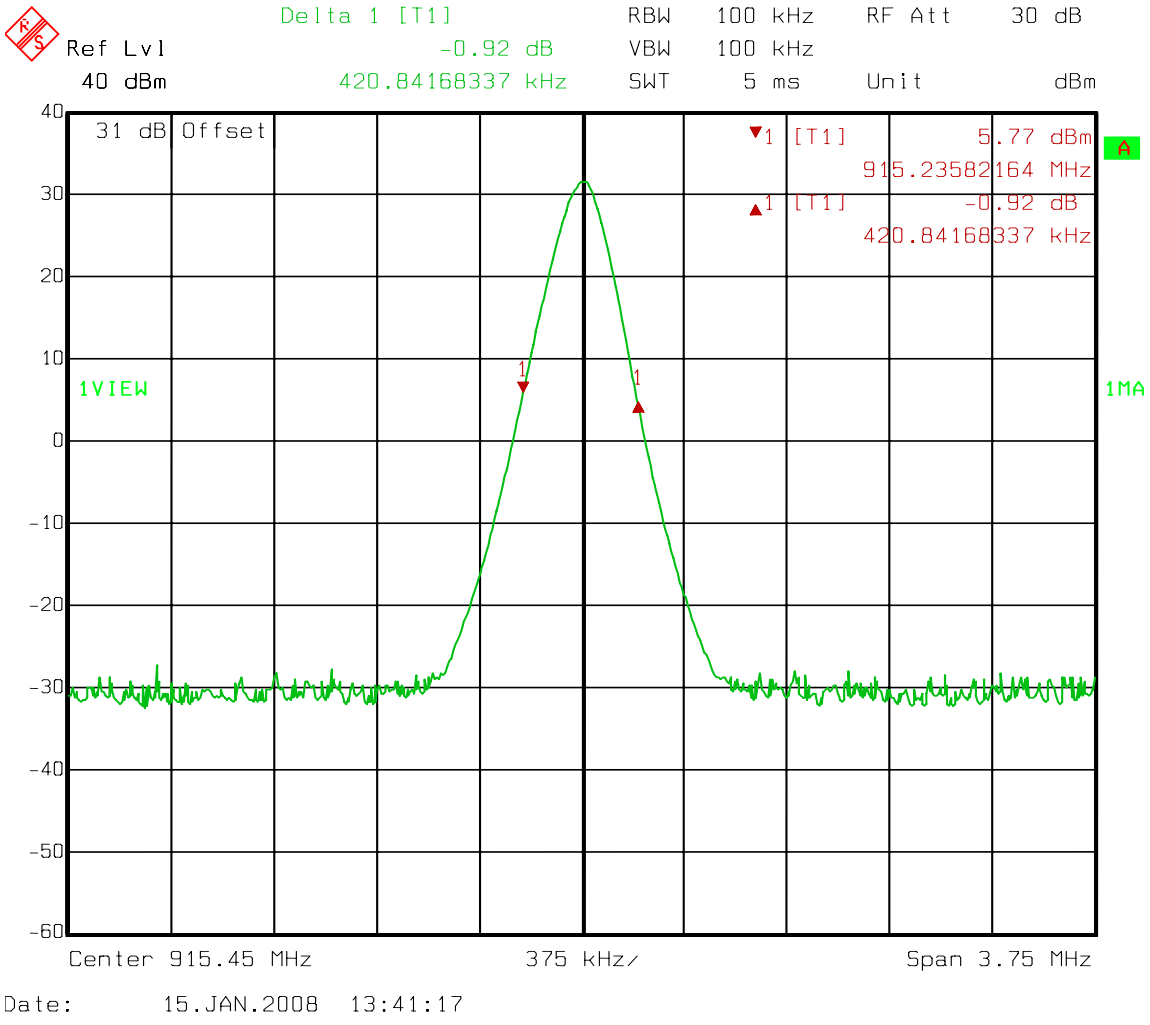
Test Conditions:

Temperature $22^{O}C$

Relative Humidity 45%

Test Data – Occupied Bandwidth

26 dB Bandwidth



Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 90.210
TESTED BY: David Light	DATE: 15 January 2008

Test Results: Complies.

Test Data: See attached graph(s).

Test Equipment Used: 1036 -1065-1604-1082

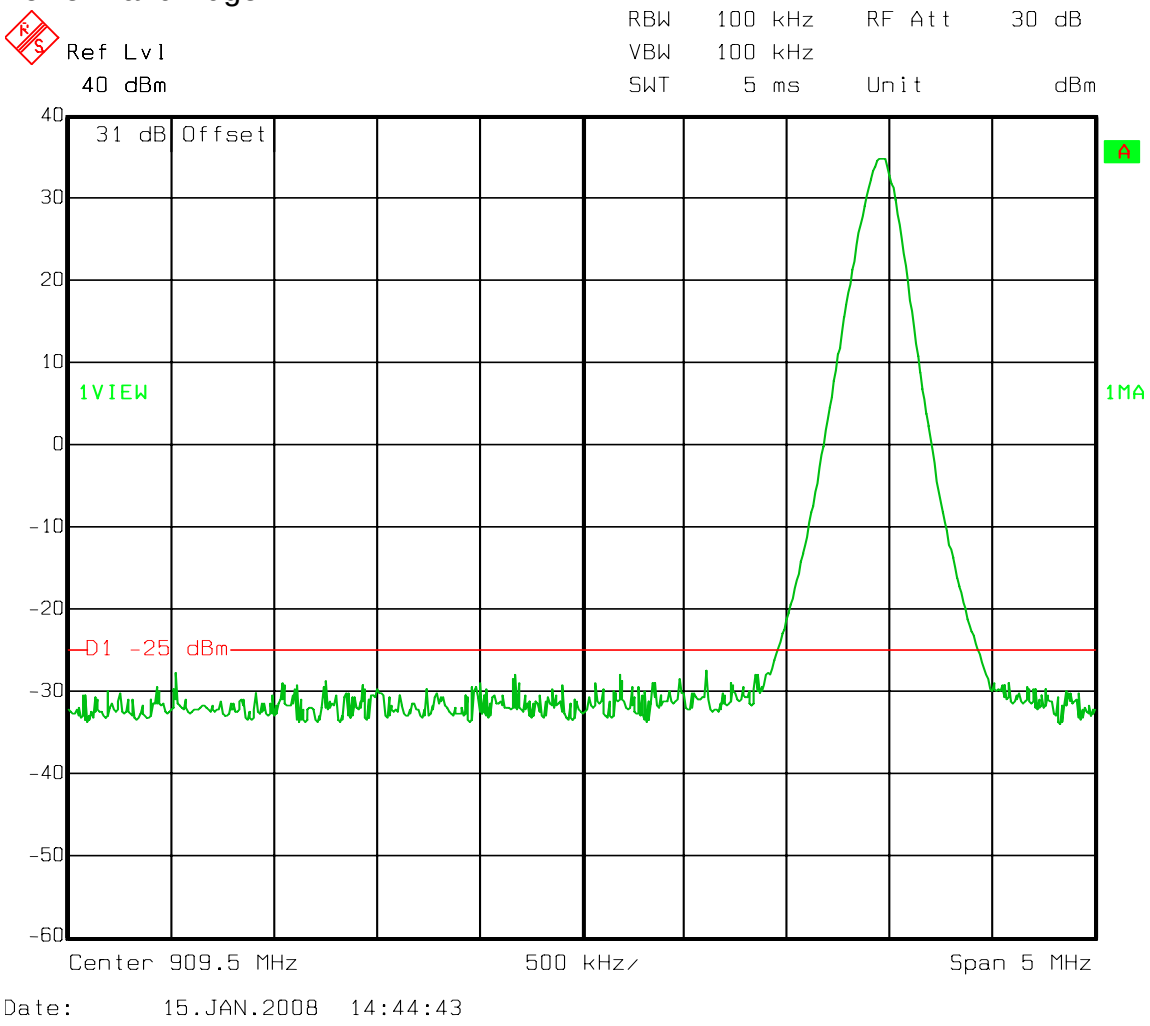
Test Conditions:

Temperature $22^{O}C$

Relative Humidity 45%

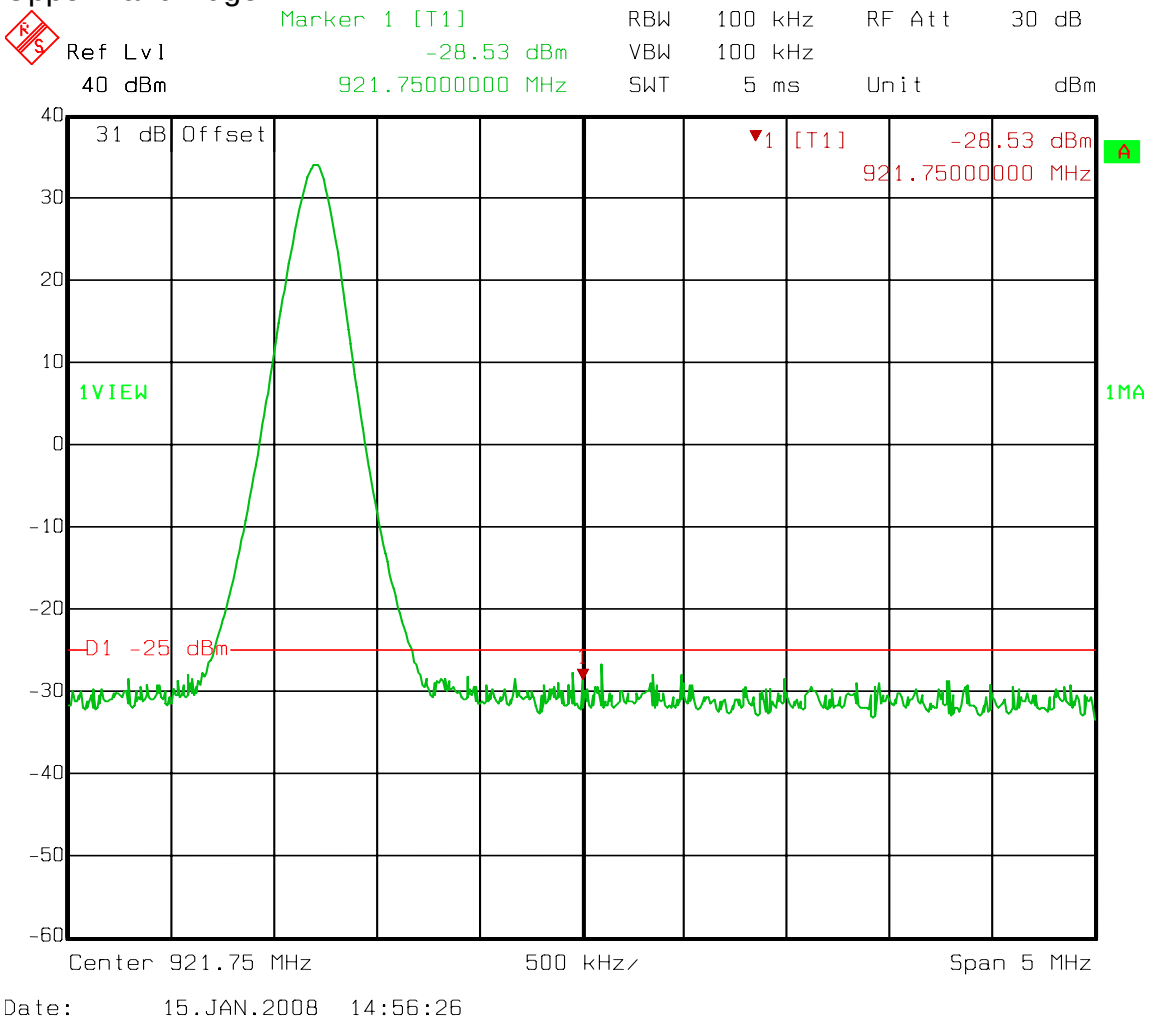
Test Data – Spurious Emissions at Antenna Terminals

Mask K(3)(ii)
Lowest Channel
Lower Band Edge



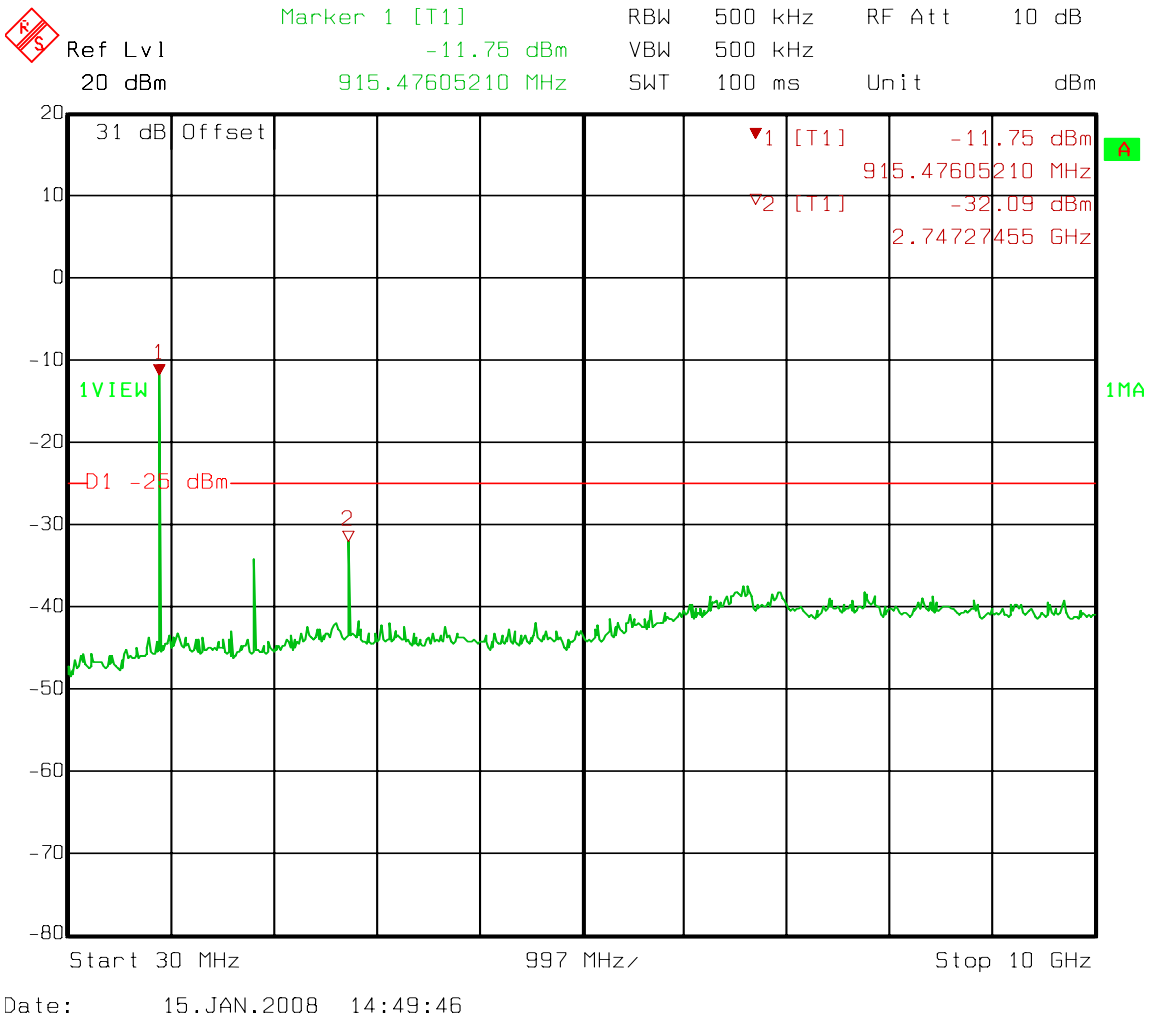
Test Data – Spurious Emissions at Antenna Terminals

Mask K(3)(ii)
Highest Channel
Upper Band Edge



Test Data – Spurious Emissions at Antenna Terminals

Mask K(3)(ii)



Marker 1 indicates carrier (notched). Marker 2 indicates highest spurious emission level.

Section 6. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 90.210
TESTED BY: David Light	DATE: 16 January 2008

Test Results: Complies.

Test Data: There were no emissions within 20 dB of the specification limit of -25 dBm (55 + 10 log(P) dB) ERP therefore no data is presented.

Note: Limit applied was 90.210 Mask K(3)(ii).

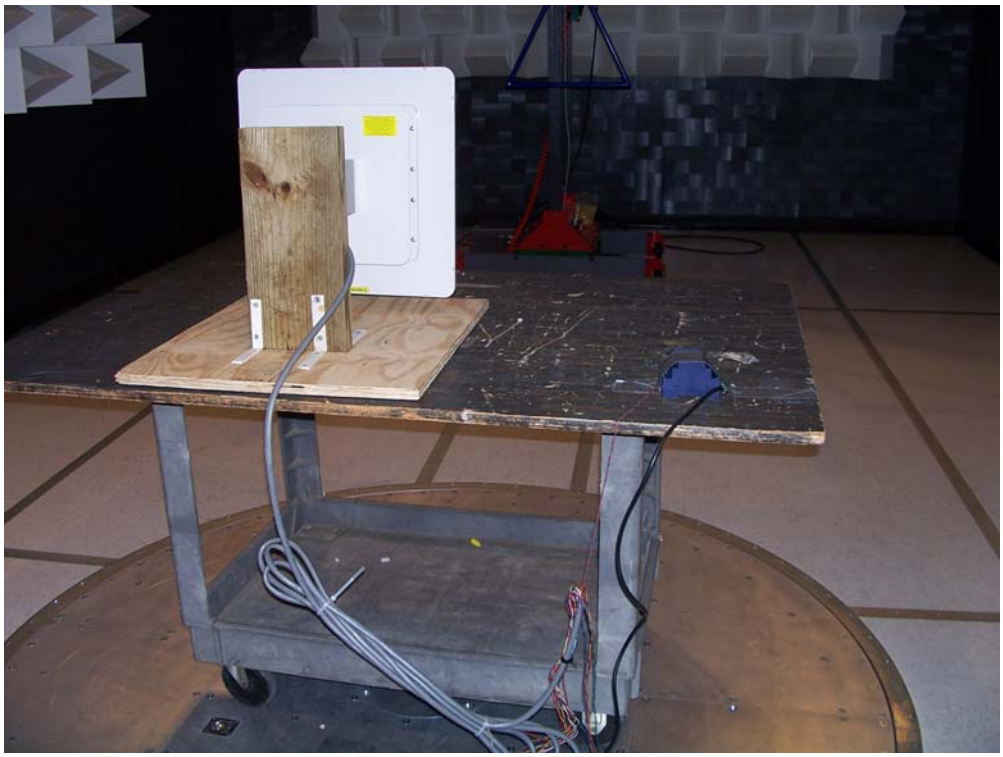
Test Equipment Used: 759-760-993-1484-1485-791-1016

Test Conditions:

Temperature $22^{O}C$

Relative Humidity 45%

Photographs of Test Setup



Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 90.213
TESTED BY: David Light	DATE: 17 January 2008

Test Results: Complies.

Measurement Data: See attached table.

Test Equipment Used: 1036 -1065-1604-1082-283-619

Test Conditions:

Temperature $22^{O}C$

Relative Humidity 45%

Test Data – Frequency Stability

Frequency Stability

Page 1 of 1

Job No.: 10230 Date: 1/17/2008
Specification: 90.213 Temperature(°C): 20
Tested By: David Light Relative Humidity(%) 30
E.U.T.: 900 MHz Reader
Configuration: Tx center band
Sample Number: 1

Test Equipment Used

Antenna:
Pre-Amp:
Filter:
Receiver: 1036
Attenuator #1 1065
Attenuator #2: 1604

Thermometer 619
Cable #1: 1082
Cable #2:

Measurement Uncertainty: $1x10^{-17}$ppm

Standard Test Frequency 915.467000 MHz

Temp (°C)	Measured Frequency (MHz)		Test Voltage	Freqeuncy Error (Hz)	Limit (+/-Hz)	Error (ppm)	Comment
20	915.467000		120	0	NA	0	
20	915.467000		102.0	0	NA	0.0	
20	915.467000		138.0	0	NA	0.0	
50	915.467480		120	480	NA	0.5	
40	915.467000		120	0	NA	0.0	
30	915.466120		120	-880	NA	-1.0	
10	915.466960		120.0	-40	NA	0.0	
0	915.466680		120.0	-320	NA	-0.3	
-10	915.466480		120.0	-520	NA	-0.6	
-20	915.466120		120	-880	NA	-1.0	
-30	915.465480		120	-1520	NA	-1.7	

Notes:

Section 8. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1659	Spectrum Analyzer	Rhode & Schwarz FSP	973353	01/24/07	01/24/09
1188	LISN	EMCO 3825/2	1214	06/20/07	06/19/08
674	LIMITER	HP 11947A	3107A02200	CBU	NA
1120	CABLE	Nemko USA, Inc. 0	N/A	09/19/17	09/19/08
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	05/26/06	05/26/08
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1065	ATTENUATOR	NARDA 776B-10	NONE	CBU	N/A
1604	ATTENUATOR	NARDA 776B-20	NONE	N/A	N/A
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	03/30/07	03/29/08
760	Antenna biconical	Electro Metrics MFC-25	477	01/19/07	01/19/08
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/31/07	08/30/08
1484	Cable	Storm PR90-010-072	N/A	05/02/07	05/01/08
1485	Cable	Storm PR90-010-216	N/A	05/02/07	05/01/08
791	PREAMP, 25dB	Nemko USA, Inc. LNA25	398	05/01/07	04/30/08
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/01/07	04/30/08
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	CNR	NA
619	THERMOMETER	FLUKE 51	4520028	03/01/07	02/29/08

ANNEX A - TEST METHODOLOGIES

NAME OF TEST: RF Power Output	**PARA. NO.:** 90.205

Minimum Standard: Para. No. 90.205(l). *902–928 MHz.* LMS systems operating pursuant to subpart M of this part in the 902–927.25 MHz band will be authorized a maximum of 30 watts ERP. LMS equipment operating in the 927.25–928 MHz band will be authorized a maximum of 300 watts ERP

Method Of Measurement:

Detachable Antenna:
The peak power at antenna terminals is measured using an in-line peak power meter or spectrum analyzer set with sufficient RBW.. Power output is measured with the maximum rated input level.

Integral Antenna:
If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts
E = the maximum measured field strength in V/m
R = the measurement range (3 meters)
G = the numeric gain of the transmit antenna in relation to an isotropic radiator

NAME OF TEST: Spurious Emissions at Antenna Terminals **PARA. NO.: 90.210**

Test Method: RBW: 1% of emission bandwidth in the 0 - 1 GHz range.

1 MHz at frequencies above 1 GHz.

VBW: $\Rightarrow$ RBW

The spectrum is searched up to 10 times the fundamental frequency.

NAME OF TEST: Occupied Bandwidth **PARA. NO.: 90.210**

Minimum Standard: Para. No. 90.210, see table 1 below for applicable mask.

Table 1

Frequency Band (MHz)	Mask for equipment with Low Pass Filter	Mask for equipment without Low Pass Filter
Below 25	A or B	A or C
25 - 50	B	C
72 - 76	B	C
150 - 174	B, D or E	C, D or E
150 Paging only	B	C
220 - 222	F	F
421 - 512	B, D or E	C, D or E
450 paging only	B	H
806 - 821/ 851 - 866	B	G
821 - 824/ 866 - 869	B	H
896 - 901/ 935 - 940	I	J
902 - 928	K	K
929 - 930	B	G
Above 940	B	C
All other bands	B	C

NAME OF TEST: Field Strength of Spurious **PARA. NO.: 90.210**

Minimum Standard: Para. No. 90.210, see table 1 for applicable mask.

Calculation of Field Strength Limit

An example of attenuation requirement of 50 + 10 Log P is equivalent to -20 dBm (1 x 10^{-5} Watts) at the antenna terminal. We determine the field strength limit by using the plane wave relation.

$GP/4\pi R^2 = E^2/120\pi$

For emissions $\leq$ 1 GHz:

G = 1.64 (Dipole Gain)
P = 10^{-5} Watts (Maximum spurious output power)
R = 3m (Measurement Distance)

$$E = \frac{\sqrt{30GP}}{R} = \mathrm{E} = \frac{\sqrt{30 \text{ x } 1.64 \text{ x } 10^{-5}}}{3} = 0.00739 \text{ V / m} = 77.4 \text{ dB}\mu\text{V / m}$$

For emissions > 1 GHz:

G = 1 (Isotropic Gain)
P = 1 x 10^{-5} Watts (Maximum spurious output power)
R = 3m (Measurement Distance)

$$E = 77.4 - 20Log\sqrt{1.64} = 75.2dB\mu V / m@3m$$

MASK	Spurious Limit	FS Limit Below 1 GHz	FS Limit Above 1 GHz
A,B,C,G,H,I	-13dBm	84.4 dBμV/m@3m	82.2 dBμV/m@3m
D,J	-20dBm	77.4 dBμV/m@3m	75.2 dBμV/m@3m
E,F,K	-25dBm	72.4 dBμV/m@3m	70.2 dBμV/m@3m

NAME OF TEST: Frequency Stability **PARA. NO.: 90.213**

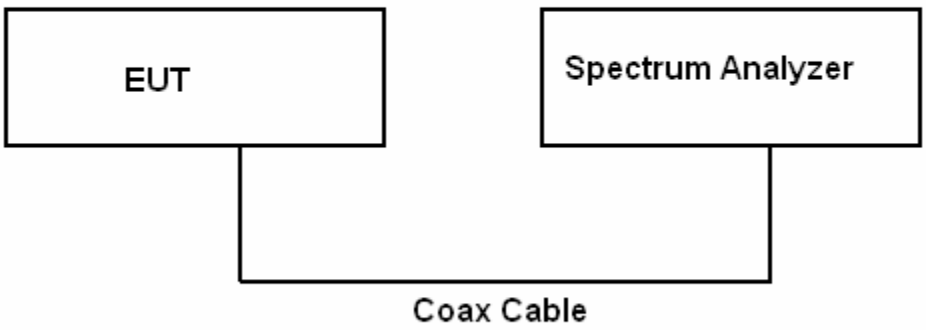
Minimum Standard: Para. No. 990.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

Table 2

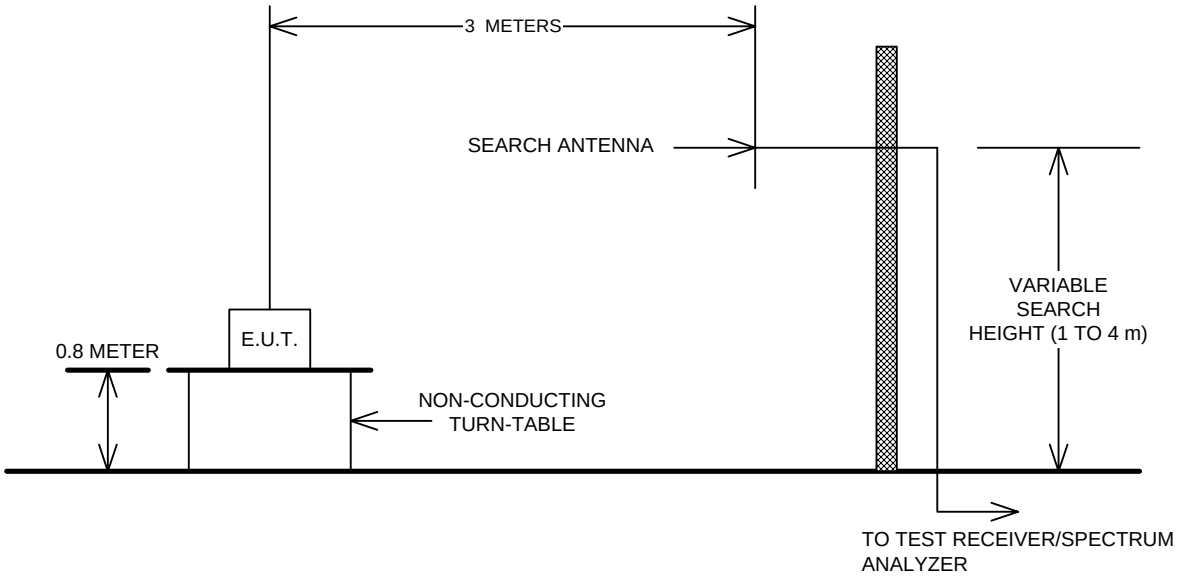
Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations	
		> 2 Watts o/p pwr	< 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0	1.5	1.5
869 - 901	0.1	1.5	1.5
902 - 928	2.5	2.5	2.5
929 - 930	1.5	-	-
935 - 940	0.1	1.5	1.5
1427 - 1435	300	300	300
Above 2450	-	-	-

ANNEX B - TEST DIAGRAMS

R.F. Power Output
Occupied Bandwidth
Spurious Emissions



Para. No. 2.993 - Field Strength of Spurious Radiation



Frequency Stability