



MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
33439 WESTERN AVENUE ! UNION CITY, CALIFORNIA 94587-3201 ! PHONE (510) 489-6300 ! FAX (510) 489-6372

SANYO Electric Co. Ltd.
1-1 Sanyo-cho, Dalto City
Osaka, 574-8534, Japan,

July 25, 2006

Dear Naoyuki Yoden,

Enclosed is the EMC test report for compliance testing of the SANYO Electric Co. Ltd., NPM2000-C310 (700MHZ), tested to the requirements of the FCC Certification rules under Title 47 of the CFR Part 27 Subpart C & H and Part 15 Subpart B for a Class A.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,

MET LABORATORIES, INC.

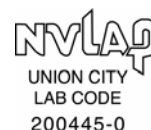
Boonmanus Seelapasay
Documentation Department

Reference: (\SANYO Electric Co. Ltd.\EMCS20193-FCC27)

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Electromagnetic Compatibility Criteria Test Report

For the

**SANYO Electric Co. Ltd.
NPM2000-C310 (700MHZ)**

Tested under

**FCC Certification Rules
Title 47 of the CFR, Part 27 C & H and Part 15 Subpart B for a Class A**

MET Report: EMCS20193-FCC27

July 25, 2006

Prepared For:

**SANYO Electric Co. Ltd.
1-1 Sanyo-cho, Dalto City
Osaka, 574-8534, Japan**

Prepared By:
MET Laboratories, Inc.
4855 Patrick Henry Dr., Building 6
Santa Clara, CA 95054



Electromagnetic Compatibility Criteria Test Report

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**SANYO Electric Co. Ltd.
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Title 47 of the CFR, Part 27 C & H, Part 15 Subpart B for a Class A**

MET Report: EMCS20193-FCC27

Shawn McMillen
Project Engineer, Electromagnetic Compatibility Lab

Boonmanus Seelapasay
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 27 C & H and Part 15 Subpart B of the FCC Rules under normal use and maintenance.

Tony Permsombut,
Manager, Electromagnetic Compatibility Lab



SANYO Electric Co. Ltd.
NPM2000-C310 (700MHZ)

Electromagnetic Compatibility
CFR Title 47 Part 27 Subpart C & H and Part 15 Subpart B

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	July 25, 2006	Initial Issue.



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List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
<i>d</i>	Measurement Distance
dB	Decibels
dB μ A	Decibels above one microamp
dB μ V	Decibels above one microvolt
dB μ A/m	Decibels above one microamp per meter
dB μ V/m	Decibels above one microvolt per meter
DC	Direct Current μ
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
<i>f</i>	Frequency
FCC	Federal Communications Commission
GR-1089-CORE	(GR) General Requirement(s) imposed by the NEBS standard, (CORE) Central Office Recovery Express (AT&T), (1089) specifies various parts of the General Requirements under Bellcore Technical Standard, Requirements for Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunications Equipment
GRP	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	kilohertz
kPa	kilopascal
kV	kilovolt
LISN	Line Impedance Stabilization Network
MHz	Megahertz
μ H	microhenry
μ	microfarad
μ s	microseconds
NEBS	Network Equipment-Building System
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
TWT	Traveling Wave Tube
V/m	Volts per meter
VCP	Vertical Coupling Plane



SANYO Electric Co. Ltd.
NPM2000-C310 (700MHZ)

Electromagnetic Compatibility
Testing Summary
CFR Title 47 Part 27 Subpart C & H and Part 15 Subpart B

1. Testing Summary

Name of Test	FCC Rule Part/Section	Results
RF Power Output	2.1046; 27.50(c)	Compliant
Modulation Characteristics	2.1047	Not Applicable
Occupied Bandwidth	2.1049	Compliant
Spurious Emissions at Antenna Terminals	2.1051; 27.53(f)	Compliant
Radiated Spurious Emissions	2.1053	Compliant
Frequency Stability over Temperature Variations	2.1055; 27.54	Compliant
Conducted Emission, Class A	15.107 (a)	Compliant
Radiated Emission Class A	15.109 (a)	Compliant

Table 1. Summary of Test Results



2. Equipment Configuration

2.1. Overview

MET Laboratories, Inc. was contracted by SANYO Electric Co. Ltd. to perform testing on NPM2000-C310 (700MHZ), under SANYO Electric Co. Ltd. purchase order number 405048.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the SANYO Electric Co. Ltd., NPM2000-C310 (700MHZ).

In accordance with §2.955(a) (3), the following data is presented in support of the verification of the SANYO Electric Co. Ltd., NPM2000-C310 (700MHZ).

SANYO Electric Co. Ltd. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the NPM2000-C310 (700MHZ) has been **permanently** discontinued, as per §2.955(b).

The results obtained relate only to the item(s) tested.

Model(s) Tested:	NPM2000-C310 (700MHZ)			
Model(s) Covered:	NPM2000-C310 (700MHZ)			
EUT Specifications:	Primary Power: -48 VDC			
	FCC ID: AEZNPM-2000-C310			
	Emission Designators:	4M13D7D		
	Peak and Average Output Power:	Freq	Peak Pwr	Avg Pwr
		731MHz	53.97 dBm	42.58 dBm
		737MHz	53.87 dBm	42.67 dBm
	743MHz	53.81 dBm	42.68 dBm	
	Equipment Class:	TNB		
EUT Frequency Ranges:	728-746MHz			
Analysis:	The results obtained relate only to the item(s) tested.			
Environmental Test Conditions:	Temperature: 15-35° C			
	Relative Humidity: 30-60%			
	Barometric Pressure: 860-1060 mbar			
Evaluated by:	Shawn McMillen			
Date(s):	July 25, 2006			



2.2. Test Site

All testing was performed at MET Laboratories, Inc., 4855 Patrick Henry Dr., Building 6, Santa Clara, CA 95054. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a Semi-Anechoic Chamber. In accordance with §2.948(a) (3), a complete site description is contained at MET Laboratories. In accordance with §2.948(d), MET Laboratories has been accredited by the National Voluntary Laboratory Accreditation Program (Lab Code: 100273-0).

2.3. Description of Test Sample

The NPM2000-C310 (700MHZ) Equipment Under Test (EUT), is a Radio Base Station for voice & data broadband.



2.4. Equipment Configuration

The EUT was set up as outlined in Figure 1 . All equipment incorporated as part of the EUT is included in the following list.

Ref. ID	Slot #	Name / Description	Model Number	Part Number	Serial Number	Rev
N/A		Radio Tower	NPM2000-C310 (700MHZ)	N/A	1306170001	N/A
A		Circuit Breaker Panel	N/A	N/A	N/A	N/A
B		Card Chassis	Flex 21	0-09442-00	CC5-22812	N/A
	Mid Plane	N/A	0-09523-00	726012	N/A	
B1 Front	1	Flex Manager	N/A	0-06860-09 0-06549-01	CU4-05395 CU4-05408	N/A
	3	Flex Power-HP	N/A	0-07461-00	CU5-06536	N/A
	5	Flex Power-HP	N/A	0-09418-00	CU6-01351	N/A
	7	Flex Power-HP	N/A	0-09418-00	CU6-01363	N/A
	10	Flex Power	N/A	0-06436-09	CU4-15657	N/A
	11	Flex Power	N/A	0-06436-09	CU3-04995	N/A
	13	Flex Power-HP	N/A	0-09418-00	CU6-01368	N/A
	21	Flex Manager	N/A	0-06860-09 0-06549-01	CU4-12360 CU4-09567	N/A
B2 Front	1	24+2 Ethernet Switch Card (Secondary Side)	N/A	0-04690-15	CU4-14843	N/A
	3	CPU Card	N/A	0-08297-03	0002BB8C09A2	N/A
	4	NPM2 Card (front)	N/A	999372B-200	1205320005	01
	5	CPU Card	N/A	0-09544-05	0002BB8C0E62	N/A
	6	NPM2 Card (front)	N/A	999372B-200	1506080001	02B
	7	CPU Card	N/A	0-09544-05	0002BB8C0E58	N/A
	8	NPM2 Card (front)	N/A	999372B-200	1205320007	01
	10	HDD & Alarm Card	N/A	0-08296-15	CS6-00124	N/A
	11	HDD & Alarm Card	N/A	0-08296-15	CS6-00127	N/A
	13	CPU Card	N/A	0-09544-05	0002BB8C0644	N/A
	14	NPM2 Card (front)	N/A	999372B-200	1205320053	01
	21	24+2 Ethernet Switch Card (Secondary Side)	N/A	0-04690-15	CU4-14863	N/A
B3 Front	Fan 1	Fan Module 1	N/A	0-06356-06	CA4-00621	N/A
	Fan 2	Fan Module 2	N/A	0-06356-06	CA4-00635	N/A
	Fan 3	Fan Module 3	N/A	0-06356-06	CA4-01119	N/A
B1 Back	PSU1	Power Supply 1	N/A	0-06203-02	CA4-01149	N/A
	PSU2	Power Supply 2	N/A	0-06203-02	CA4-01003	N/A
B2 Back	1	24+2 Ethernet Switch Card (Primary Side)	N/A	0-05677-02	CU-13393	N/A



B2 Back	4	NPM2 Rear Transition Module	N/A	999370D-200	HY50050010	01A
	6	NPM2 Rear Transition Module	N/A	999370D-200	HY50050015	01A
	8	NPM2 Rear Transition Module	N/A	999370B-000	200674N-3	01
	14	NPM2 Rear Transition Module	N/A	999370D-200	1306100001	01
	21	24+2 Ethernet Switch Card (Primary Side)	N/A	0-05677-02	CU4-13310	N/A
C	PA1M	Power Amplifier	N/A	RM-700-G1-0A	1406280009	N/A
	PA1D	Power Amplifier	N/A	RM-700-G1-0A	1406280003	N/A
	PA2M	Power Amplifier	N/A	RM-700-G1-0A	1406280007	N/A
	PA2D	Power Amplifier	N/A	RM-1TU-G1	B60451-017	N/A
	PA3M	Power Amplifier	N/A	RM-700-G1-0A	1460280004	N/A
	PA3D	Power Amplifier	N/A	RM-700-G1-0A	1406280005	N/A
	PA4M	Power Amplifier	N/A	RM-700-G1-0A	1406280010	N/A
	PA4D	Power Amplifier	N/A	RM-700-G1-0A	1406280001	N/A

Table 2. Equipment Configuration

2.5. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Ref. ID	Name / Description	Manufacturer	Model Number
D	Terminator	Aeroflex / Weinschel	49-40-43

Table 3. Support Equipment

2.6. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded (Y/N)	Termination Box ID & Port ID
Un-Intentional Emission						
1	-48V DC & RTN	10AWG DC PWR Cord	4	5	No	DC PWR Supply
2	C Back, PA1M,PA1D, PA2M,PA2D, PA3M,PA3D, PD4M,PD4D, Antenna Port	COAX	8	3.3	Yes	D
3	A Back, GND	10AWG	1	1	No	Grounded

Table 4. Ports and Cabling Information

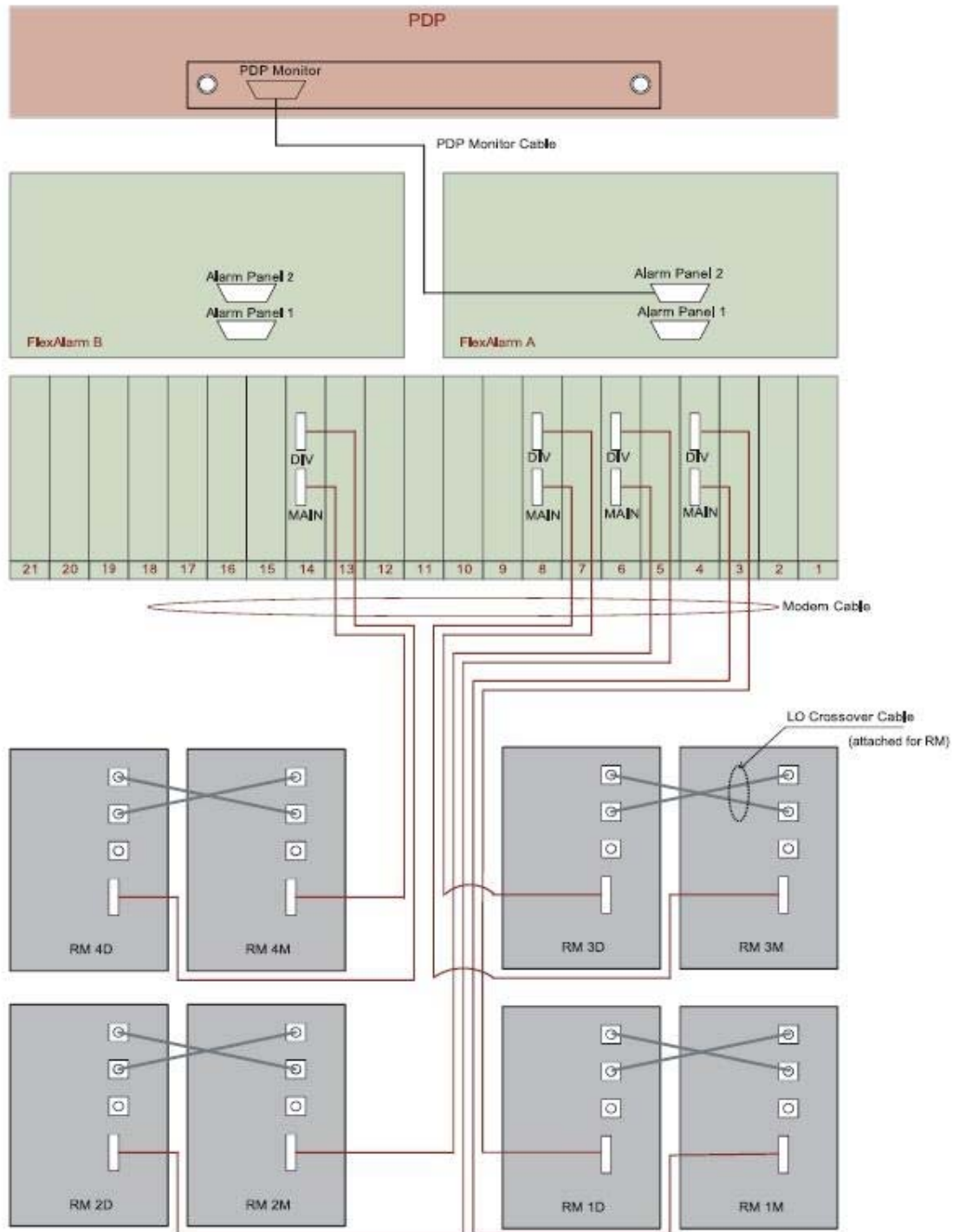


Figure 1: Block Diagram of Test Configuration



2.7. Mode of Operation

The EUT was controlled by a computer connected via Ethernet or USB port.

2.8. Method of Monitoring EUT Operation

Proprietary Software & Data Transmission

2.9. Modifications

2.9.1) Modifications to the EUT

No modifications were made to the EUT.

2.9.2) Modifications to the Test Standard

No modifications were made to the test standard.

2.10 Disposition of EUT

The test sample including all support equipment (if any), submitted to the Electro-Magnetic Compatibility Lab for testing was returned SANYO Electric Co. Ltd. upon completion of testing.



3. Electromagnetic Compatibility Unintentional Radiators

3.1. Radiated Emissions Limits

Test Requirement(s): 15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the Class A limits expressed in Table 5.

15.109 (b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the Class A limits expressed in Table 5.

Frequency (MHz)	Field Strength (dB μ V/m)	
	§15.109 (b), Class A Limit (dB μ V) @ 10m	§15.109 (a), Class B Limit (dB μ V) @ 3m
30 - 88	39.00	40.00
88 - 216	43.50	43.50
216 - 960	46.40	46.00
Above 960	49.50	54.00

Table 5. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)

Test Procedures: The EUT was in its own free-standing cabinet insulated 10cm from the GRP. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 10 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

Test Results: The EUT was found Compliant with the Class A requirement(s) of this section. .

Test Engineer(s): Billy Kwan

Test Date(s): 07/24/06

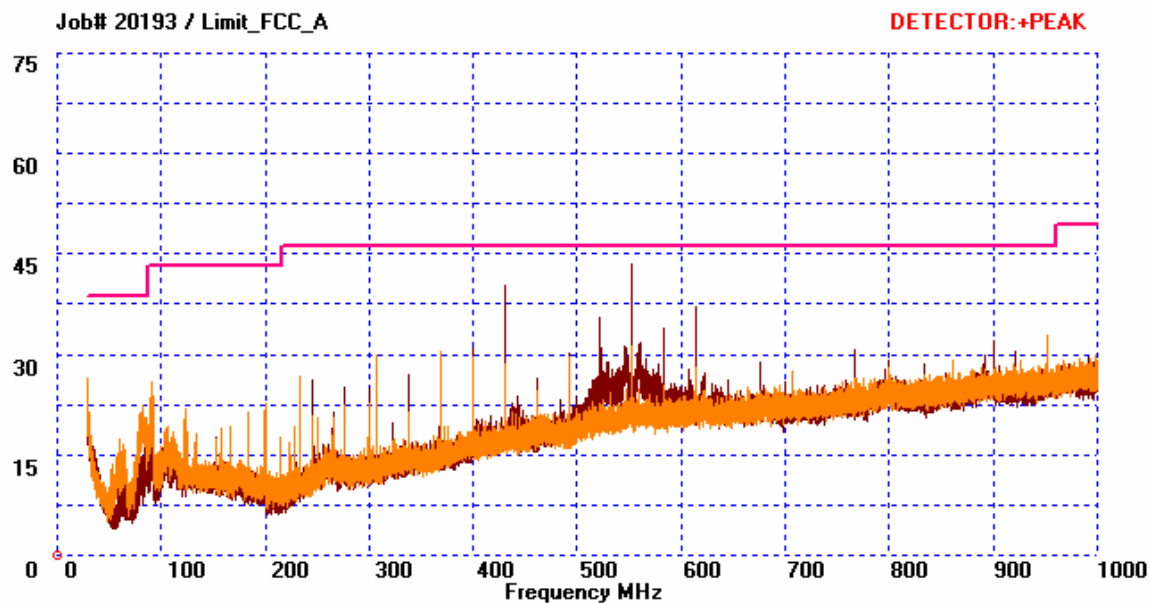


Radiated Emissions Limits Test Results, 30 MHz to 1 GHz, Class A

Frequency (MHz)	Antenna Polarity (H/V)	EUT Azimuth (Degrees)	Antenna Height (m)	Uncorrected Amplitude QP Detector (dBuV)	Antenna Correction Factor (dB/m) (+)	Cable Loss (dB) (+)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
399.36	H	0	2.14	11.59	15.76	3.50	30.85	46.40	-15.55
430.08	H	29	2.37	20.46	16.90	3.65	41.01	46.40	-5.39
522.24	H	32	2.02	13.94	18.35	4.16	36.44	46.40	-9.96
*552.96	H	36	2.28	21.49	18.21	4.33	44.02	46.40	-2.38
614.4	H	48	1.98	13.82	18.58	4.65	37.05	46.40	-9.35
899.84	H	344	1.73	6.67	21.01	5.91	33.58	46.40	-12.82

Table 6. Radiated Emissions Limits Test Results, 30 MHz to 1 GHz, Class A

Note: * - At this frequency, the measured electric-field strength exhibits a margin of compliance that is less than 3 dB below the specification limit. We recommend that every emission measured, have at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process.



Radiated Emissions Limits Test Setup



Radiated Emissions Limits Test Results, 1 GHz to 5 GHz, Class A

Frequency (GHz)	Azimuth (Degrees)	Antenna Polarity (H/V)	Height (m)	Raw Amp. @ 3m(Avg)	P.Amp (dB)	Ant.Cor. Factor (dB/m)	Cable Loss (dB)	Dist.Cor Factor (dB)	EUT Field Strength Final Amp. (dBuV/m)	Limit per FCC pt 15 @ 3m	Delta (dB)
1.033	347	H	1.2	45.4	35.15	24.24	2.16	10.46	26.19	49.5	-23.31
1.3	335	H	1.6	47.3	35.23	24.73	2.35	10.46	28.69	49.5	-20.81
1.567	19	H	2	43.6	35.15	25.54	2.63	10.46	26.17	49.5	-23.33
1.812	10	H	1.8	49.46	35.21	26.67	2.99	10.46	33.45	49.5	-16.05
5	0	H	1	31.5	35.07	33.88	5.34	10.46	25.19	49.5	-24.31
1.3	0	V	1.4	38.3	35.23	24.64	2.35	10.46	19.60	49.5	-29.90
1.567	11	V	1.2	42.8	35.15	25.46	2.63	10.46	25.28	49.5	-24.22
1.72	0	V	1.2	42.8	35.23	26.14	2.85	10.46	26.10	49.5	-23.40
1.843	0	V	1.2	41.6	35.20	26.72	3.04	10.46	25.71	49.5	-23.79
5	0	V	1	31.6	35.07	33.73	5.34	10.46	25.14	49.5	-24.37

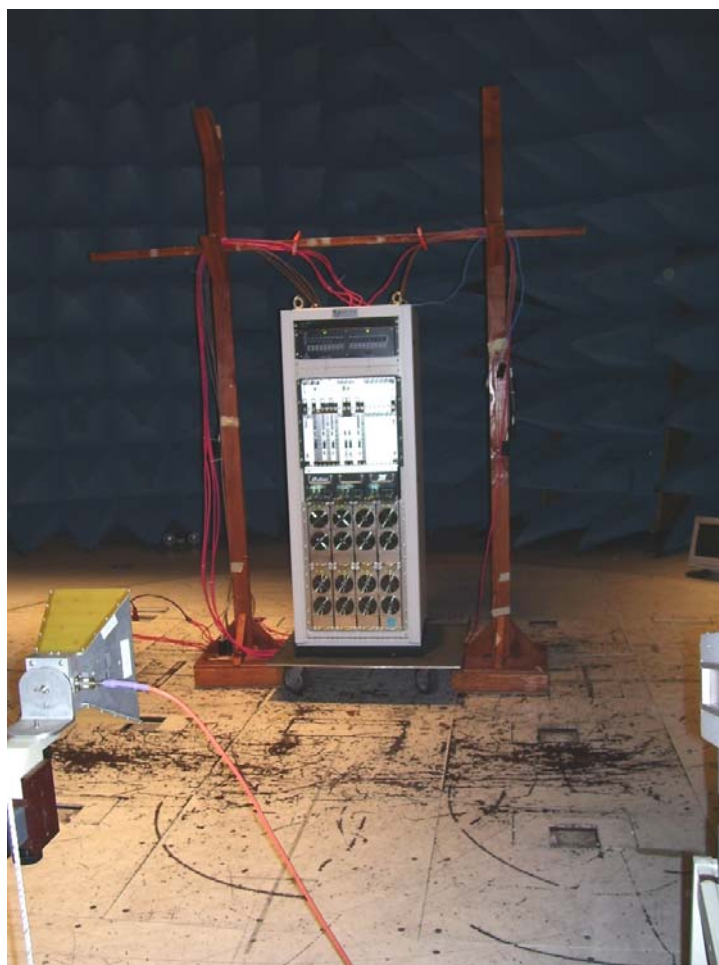
Table 7. Radiated Emissions Limits Test Results, 1 GHz to 5 GHz

Note: The EUT was tested at 3 m. The data has been corrected for comparison with the 10 m limit using the formula: $20\log(3\text{ m}/10\text{ m})$ as expressed in the 'Distance Correction' column.

Radiated Emission Limits Test Setup



Photograph 1. Radiated Emission Limits Test Setup, 30MHz – 1GHz



Photograph 2. Radiated Emission Limits Test Setup, 1GHz – 5GHz



4. Electromagnetic Compatibility Criteria Intentional Radiators

4.1. RF Power Output

Test Requirement(s): §2.1046 and §27.50(c)

Test Procedures: As required by 47 CFR 2.1046, *RF power output measurement* was made at the RF output terminal using a Power Meter with a Power Sensor capable of measuring a modulated carrier.

Test Results: Equipment complies with 47CFR 2.1046 and 27.50(c). The NPM2000-C310 (700MHZ) does not exceed 50,000 Watts peak (ERP) at the carrier frequency.

The following page show measurements of RF Power output which is recorded below:

RF Output Power			
Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm	Measured Average Output Power dBm
Low	731	53.97	42.58
Mid	737	53.87	42.67
High	743	53.81	42.68

Test Engineer(s): Shawn McMillen

Test Date(s): July 25, 2006

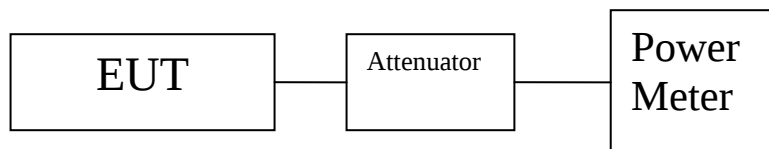


Figure 2. Block Diagram of Maximum Power Output Test Setup



4. Electromagnetic Compatibility Intentional Radiators

4.2. Modulation Characteristics

Test Requirement(s): §2.1047

Test Procedures: As required by 47 CFR 2.1047, Modulation Characteristics measurements were made at the RF output terminals.

Test Results: Not Applicable.

Test Engineer(s): Shawn McMillen

Test Date(s): Not Applicable



4. Electromagnetic Compatibility Intentional Radiators

4.3. Occupied Bandwidth

Test Requirement(s): §2.1049

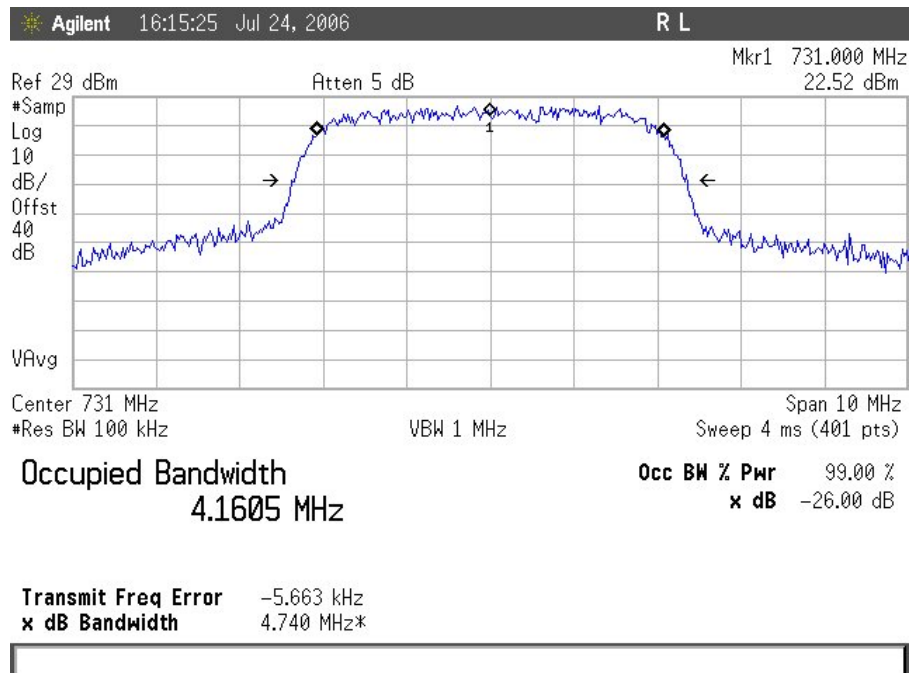
Test Procedures: As required by 47 CFR 2.1049, the occupied bandwidth measurements were made at the RF output terminals using a Spectrum Analyzer.

Test Results: Equipment complies with Section 2.1049. The following pages show measurements of 99% Occupied Bandwidth plots:

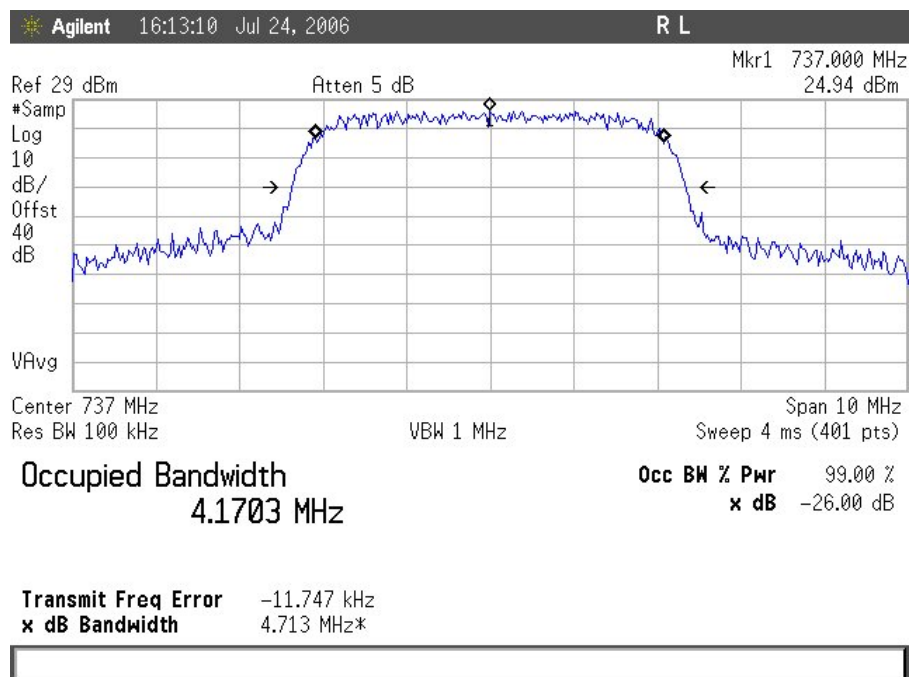
26dB & 99% Occupied Bandwidth			
Carrier Channel	Frequency (MHz)	Measured 26dB Bandwidth (MHz)	Measured 99% Bandwidth (MHz)
Low	731	4.740	4.160
Mid	737	4.713	4.170
High	743	4.725	4.122

Test Engineer(s): Shawn McMillen

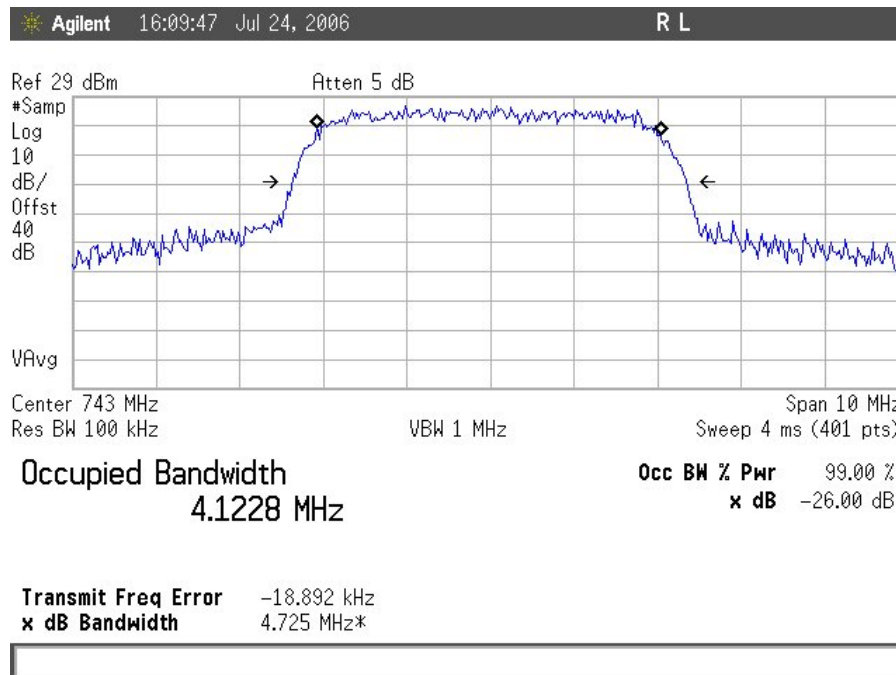
Test Date(s): July 24, 2006



Plot 1. Occupied Bandwidth Low Channel



Plot 2. Occupied Bandwidth Mid Channel



Plot 3. Occupied Bandwidth High Channel



Figure 3. Block Diagram of Occupied Bandwidth Test Setup



4. Electromagnetic Compatibility Intentional Radiators

4.4. Spurious Emissions at Antenna Terminals

Test Requirement(s): §2.1051 and §27.53(f)

Test Procedures: As required by 47 CFR 2.1051, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a Spectrum Analyzer.

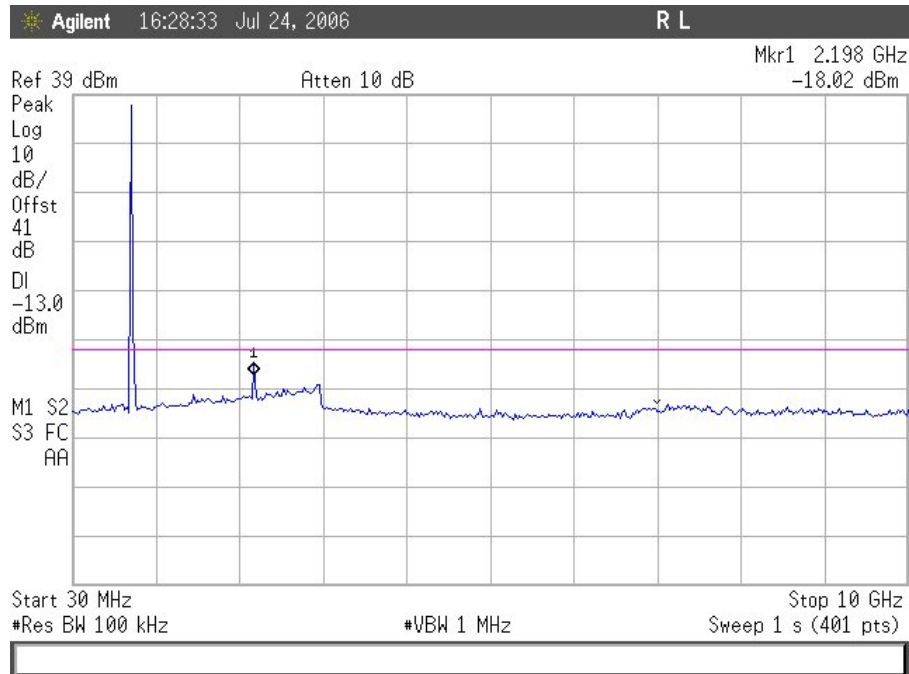
The Spectrum Analyzer was set with a RBW of 100KHz and a VBW of 1MHz. The EUT was set to transmit in the operating frequency range at its maximum rated output power. Frequencies were swept from 30 MHz to the 10th harmonic of the fundamental. Any emission outside the authorized frequency band must be attenuated by $43 + 10\log(P)$ dB where P is the power of the carrier. In the spectrum 100KHz immediately outside the authorized band a 30KHz resolution was employed.

Test Results: Equipment complies with Section 2.1051 and 27.53(f). The following pages show measurements of Spurious Emission plots

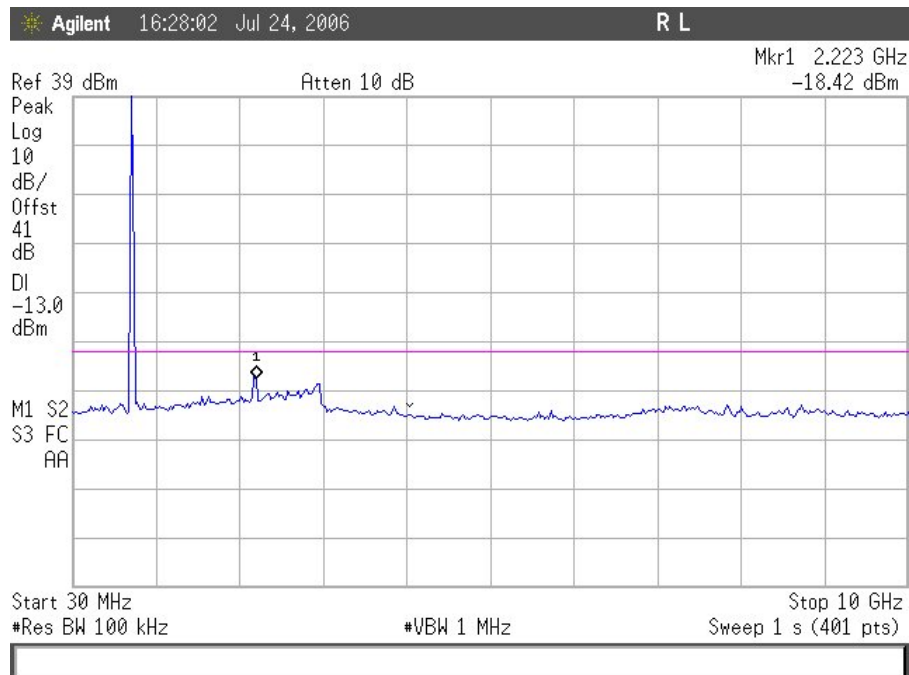
The following analysis and plots are included below to illustrate compliance with the required rule parts.

Test Engineer(s): Shawn McMillen

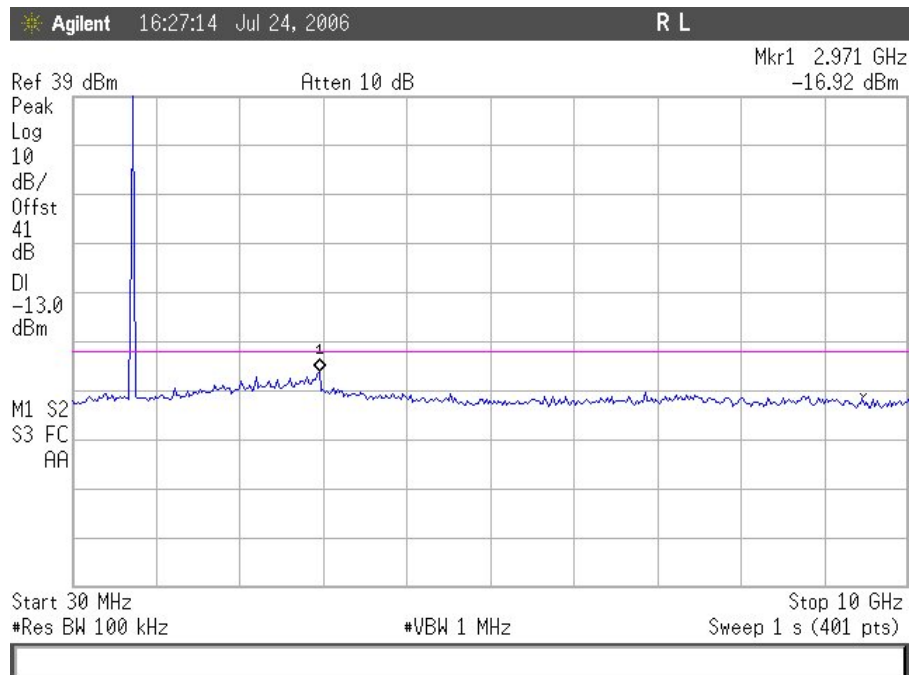
Test Date(s): July 24, 2006



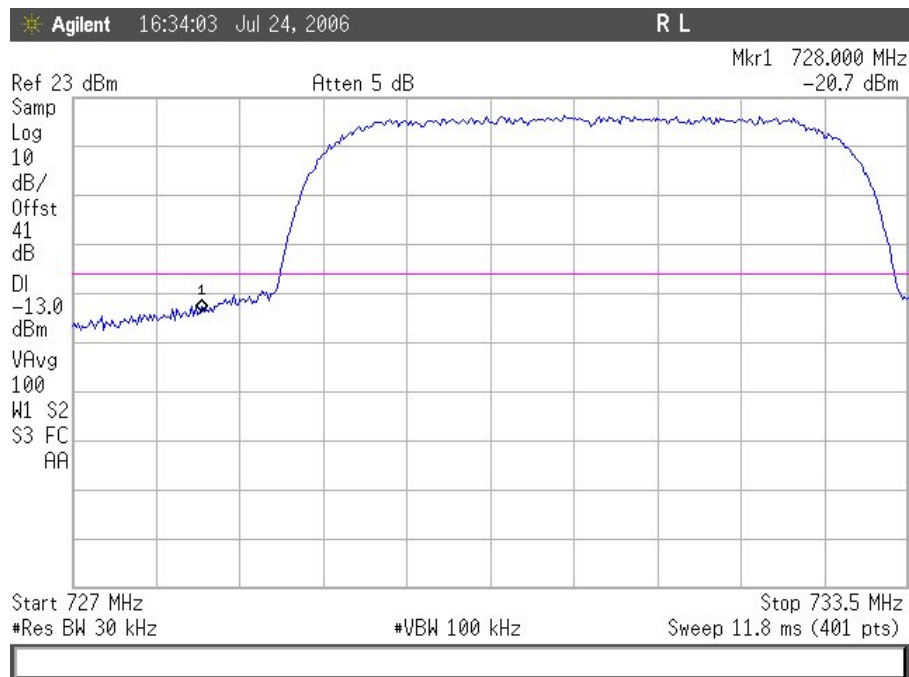
Plot 4: Conducted Spurious Emissions – Low Channel



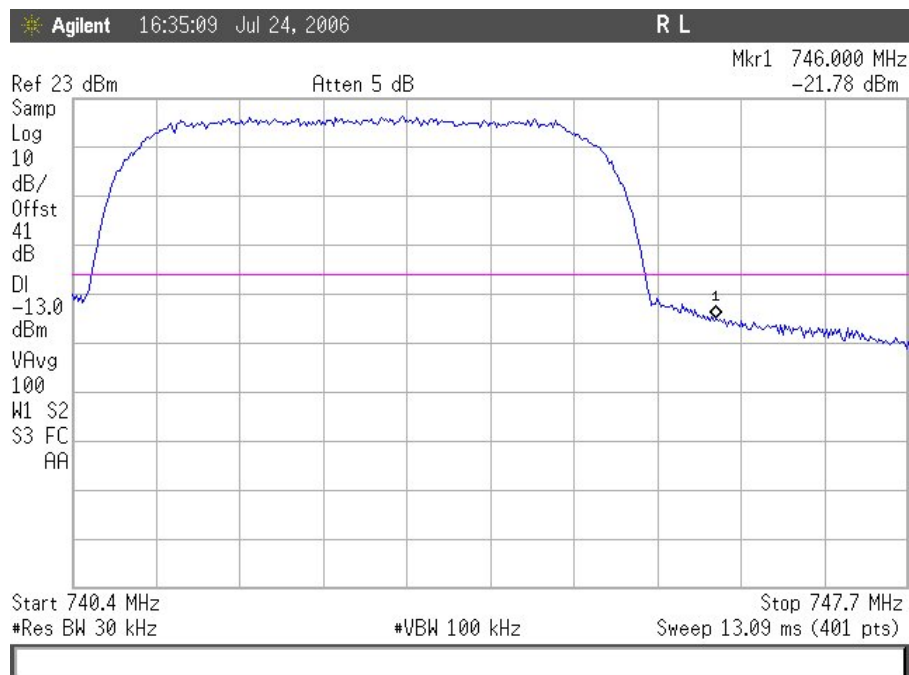
Plot 5: Conducted Spurious Emissions – Mid Channel



Plot 6: Conducted Spurious Emissions – High Channel



Plot 7: Band Edge – Low Channel



Plot 8: Band Edge – High Channel



Figure 4. Block Diagram of Spurious Emissions at Antenna Terminals Test Setup



4. Electromagnetic Compatibility Intentional Radiators

4.5. Radiated Emissions (Substitution Method)

Test Requirement(s): §2.1053

Test Procedures: As required by 47 CFR 2.1053, the *field strengths of radiated spurious emissions* were made in accordance with the procedures of TIA/EIA-603-A-2001 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 10 meter semi-anechoic chamber (equivalent to an Open Area Test Site). The distance between the EUT and the test antenna was 3 meter. The EUT's RF port was connected to a dummy load. The EUT was set to transmit at its designated operating frequency range and at its maximum output power level. The intensities of the radiated emissions were maximized by rotating the turntable 360 degrees and varying the receive antenna from 1 to 4m. Measurements were made with the receive antenna in both horizontal and vertical polarizations.

In order to determine the magnitude of the radiated emissions, a calibrated antenna source was positioned in place of the EUT and fed with a modulated carrier equal to that of the EUT. The effective isotropic radiated power of each emission was determined by adding the forward power to the substitution antenna at the previously recorded amplitude, and adding the gain of the antenna at the given frequency.

The Radiated Spurious Emissions *Limit* is obtained by the following:

Test Results: Equipment complies with Section 2.1055.

Test Engineer(s): Shawn McMillen

Test Date(s): July 25, 2006



Radiated Emissions (Substitution Method) Test Results

Frequency (MHz)	Polarization V/H	Spectrum Analyzer Reading (dBm)	Substitution antenna power input (dBm)	Tx Ant. Gain (dBi)	EIRP (dBm)
1462	H	-43	-47.33	6.3	-41.03
2193	H	-65	-70.77	7.5	-63.27
2924	H	-65	-70.24	7.5	-62.74

$f_o = 731 \text{ MHz}$

Frequency (MHz)	Polarization V/H	Spectrum Analyzer Reading (dBm)	Substitution antenna power input (dBm)	Tx Ant. Gain (dBi)	EIRP (dBm)
1474	H	-45	-49.53	6.3	-43.23
2211	H	-62	-68.47	7.5	-60.97
2948	H	-65	-71.24	7.5	-63.74

$f_o = 737 \text{ MHz}$

Frequency (MHz)	Polarization V/H	Spectrum Analyzer Reading (dBm)	Substitution antenna power input (dBm)	Tx Ant. Gain (dBi)	EIRP (dBm)
1486	H	-52	-56.33	6.3	-50.03
2229	H	-66	-71.77	7.5	-64.27
2972	H	-67	-70.64	7.5	-63.14

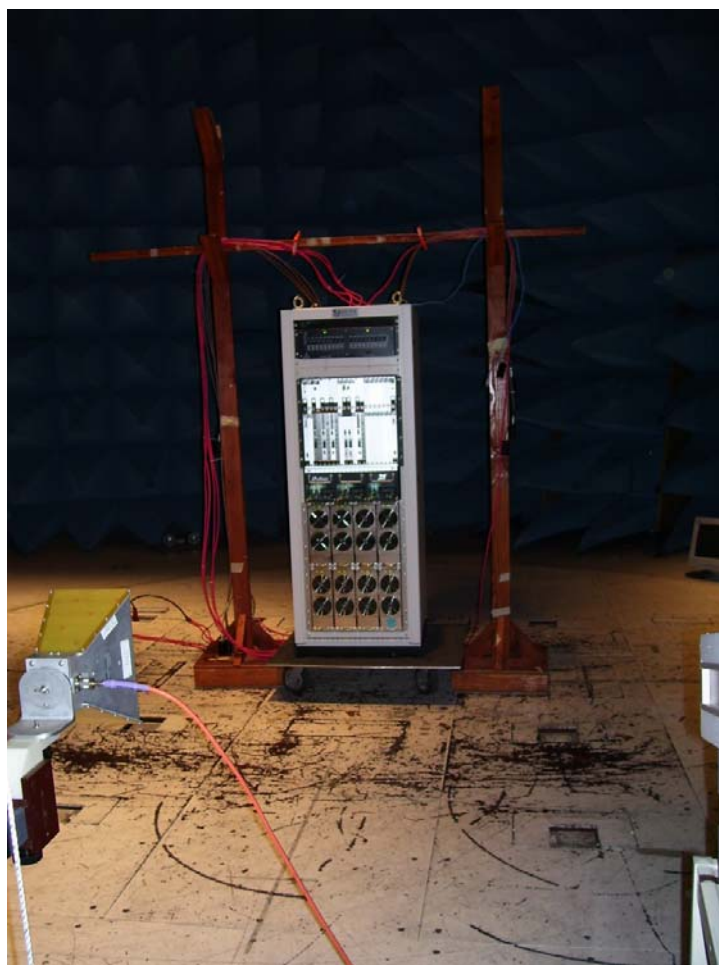
$f_o = 743 \text{ MHz}$

Note: All other emissions were measured at the noise floor of the spectrum analyzer. The polarization of the receive antenna which produced the highest emission was reported.



SANYO Electric Co. Ltd.
NPM2000-C310 (700MHZ)

Electromagnetic Compatibility
Intentional Radiators, Frequency Stability
CFR Title 47 Part 27 Subpart C & H and Part 15 Subpart B



Photograph 3. Radiated Emissions Test Setup



4.6. Frequency Stability

Test Requirement(s): §2.1055 and §27.54. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Results: The radio module frequency stability is determined by a 30.72 MHz oven controlled crystal oscillator (OCXO). The accuracy of this oscillator, considering all factors (initial accuracy, aging, temperature, voltage, stability, etc.) is better than 1 ppm.

The transmit signal has a nominal -20 dB bandwidth (99% power) of 4.6 MHz and the minimum bandwidth of the authorized frequency block is a 5 MHz. This results in a minimum of 0.2 MHz of guard band either side of the modulated signal. The maximum transmit frequency is 743.5 MHz. The maximum frequency tolerance of 1 ppm will result in a 743.5 Hz frequency error, which is well within the 0.2 MHz of guard band.

Test Engineer(s): Shawn McMillen

Test Date(s): July 26, 2006



5. Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1S2034	COUPLER, DIRECTIONAL 1-20 GHz	KRYTAR	101020020	SEE NOTE	
1S2034	COUPLER, DIRECTIONAL 1-20 GHz	KRYTAR	101020020	SEE NOTE	
1S2041	COUPLER, BI DIRECTIONAL COAXIAL	NARDA	N/A	SEE NOTE	
1S2041	COUPLER, BI DIRECTIONAL COAXIAL	NARDA	N/A	SEE NOTE	
1S2121	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	10/14/2005	10/14/2006
1S2128	Harmonic Mixer	Hewlett Packard	11970A	10/07/2003	10/07/2006
1S2129	Harmonic Mixer	Hewlett Packard	11970K	10/07/2003	10/07/2006
1S2184	BILOG ANTENNA	CHASE	CBL6112A	1/12/2006	1/12/2007
1S2198	ANTENNA, HORN	EMCO	3115	7/14/2005	7/14/2006
1S2202	ANTENNA, HORN, 1 METER	EMCO	3116	3/23/2004	3/23/2007
1S2263	CHAMBER, 10 METER	RANTEC	N2-14	8/15/05	8/15/06
1S2421	EMI RECEIVER	ROHDE&SCHWARZ	ESIB 7	2/9/2006	2/9/2007
1S2430	WIDEBAND POWER METER	ANRITSU COMPANY	ML2488A	1/12/2006	1/12/2007
1S2430	WIDEBAND POWER METER	ANRITSU COMPANY	ML2488A	1/12/2006	1/12/2007
1S2432	WIDEBAND POWER SENSOR	ANRITSU COMPANY	MA2491A	1/12/2006	1/12/2007
1S2432	WIDEBAND POWER SENSOR	ANRITSU COMPANY	MA2491A	1/12/2006	1/12/2007
1S2460	Analyzer, Spectrum 9 kHz-40GHz	Agilent	E4407B	6/26/2006	6/26/2007
N/A	HIGH PASS FILTER	MICRO-TRONICS	HPM13146	SEE NOTE	

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.



6. Certification Label & User's Manual Information

6.2. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

- (a) The various types of radio communication transmitting devices described throughout this chapter.
- (b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.
- (c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.
- (d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

- (a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:
 - (1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or
 - (2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.
- (b) The provisions of paragraph (a) of this section do not prohibit conditional sales contracts between manufacturers and wholesalers or retailers where delivery is contingent upon compliance with the applicable equipment authorization and technical requirements, nor do they prohibit agreements between such parties to produce new products, manufactured in accordance with designated specifications.



- (c) Notwithstanding the provisions of paragraphs (a), (b), (d) and (f) of this section, a radio frequency device may be advertised or displayed, e.g., at a trade show or exhibition, prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the advertising contains, and the display is accompanied by, a conspicuous notice worded as follows: This device has not been authorized as required by the rules of the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased, until authorization is obtained.
 - (1) If the product being displayed is a prototype of a product that has been properly authorized and the prototype, itself, is not authorized due to differences between the prototype and the authorized product, the following disclaimer notice may be used in lieu of the notice stated in paragraph (c) introductory text of this section: Prototype. Not for sale.
 - (2) Except as provided elsewhere in this chapter, devices displayed under the provisions of paragraphs (c) introductory text, and (c)(1) of this section may not be activated or operated.
- (d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.



- (e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:
- (i) Compliance testing;
 - (ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;
 - (iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;
 - (iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or
 - (v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.
- (e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.
- (f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.



The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

- (a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.

¹ In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.

- (b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, or the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant, whichever is applicable.

§ 2.907 Certification.

- a. Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.
- (b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

¹In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart C (of Part 15), which deals with intentional radiators.



§ 2.948 Description of measurement facilities.

- (a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.
 - (1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.
 - (i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.
 - (ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.
 - (2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but



6.2. Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

- (a) In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:
 - (1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.
 - (2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.
 - (3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
 - (4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.
 - (5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.