



849 NW STATE ROAD 45
NEWBERRY, FL 32669 USA
PH: 888.472.2424 OR 352.472.5500
FAX: 352.472.2030
EMAIL: INFO@TIMCOENGR.COM
[HTTP://WWW.TIMCOENGR.COM](http://WWW.TIMCOENGR.COM)

COMPLIANCE TEST REPORT

PER FCC PART 80 / 90 AND IC RSS-188

APPLICANT	Navico Auckland Ltd.
	3-5 Omega Street, Building A Albany 0632 Auckland, New Zealand
FCC ID	FCC ID: RAYBR24
IC CERT.	IC: 4697A-BR24
MODEL NUMBER	BR24
PRODUCT DESCRIPTION	FMCW Radar with Frequency Sweep
DATE SAMPLE RECEIVED	September 17, 2008
DATE TESTED	October 18, 2008
TESTED BY	Nam Nguyen
APPROVED BY	Mario de Aranzeta
TIMCO REPORT NO.	2185AUT8TestReport.pdf
TEST RESULTS	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**



Test Certificate # 0955-01

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ATTESTATIONS

Summary

The device under test does:

- ☒ fulfill the requirements as identified in this test report
☐ not fulfill the requirements as identified in this test report

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

The test results apply only to the unit tested.

All Timco instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025:2005 requirements.



Testing Certificate # 0955-01

I attest that the necessary measurements were made, under my supervision, at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, FL 32669



Authorized Signatory Name:

Mario de Aranzeta C.E.T.
Compliance Engineer/ Lab. Supervisor

Date: December 18, 2008

REPORT SUMMARY

Applicable Standards and Procedures	ANSI/TIA 603-C: 2004, FCC CFR 47 Part 90, Part 80, IC RSS-188, IC RSS-GEN
Related Report/Approval	N/A

TEST SETUP

Test facility	Timco Engineering, Inc. 849 NW State Road 45, Newberry, FL 32669
Test Condition	The DUT was tested in the laboratory in an environment with normal temperature and humidity. The temperature was 26°C with a relative humidity of 50%.
Modifications	None
Test Exercise	The DUT was placed in continuous transmit mode of operation

DUT SPECIFICATION

DUT Description	FMCW Radar with Linear Frequency Sweep
FCC ID	FCC ID: RAYBR24
IC Cert. No.	IC: 4697A-BR24
Model Number	AA010186
Serial Number	N/A
Operating Frequency	9300-9400 GHz
DUT Power Source	<input type="checkbox"/> 110-120Vac/50- 60Hz
	<input checked="" type="checkbox"/> DC Power (13.8 Vdc)
	<input type="checkbox"/> Battery Operated Exclusively
Test Item	<input type="checkbox"/> Prototype
	<input checked="" type="checkbox"/> Pre-Production
	<input type="checkbox"/> Production
Type of Equipment	<input checked="" type="checkbox"/> Fixed
	<input type="checkbox"/> Mobile
	<input type="checkbox"/> Portable
Antenna	narrow beamwidth patch antenna array with 22 dBi of gain
Antenna Connector	permanently attached antenna

EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/20/07	3/19/10
3-Meter OATS	TEI	N/A	N/A	Listed 1/11/06	1/10/09
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	Listed 5/11/07	5/10/10
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 11/30/07	11/30/09
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 11/30/07	11/30/09
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 11/30/07	11/30/09
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 11/30/07	11/30/09
Antenna: Biconnical	Electro-Metrics	BIA-25	1171	CAL 7/18/07	7/18/09
Antenna: Log-Periodic	Electro-Metrics	LPA-25	1122	CAL 12/1/06	12/1/08
Antenna: Double-Ridged Horn	Electro-Metrics	RGA-180	2319	CAL 7/18/07	7/18/09
LISN	Electro-Metrics	ANS-25/2	2604	CAL 10/5/06	10/5/08
Termaline Wattmeter	Bird Electronic Corporation	611	16405	CAL 3/15/07	3/15/09

TEST PROCEDURE

Power Line Conducted Interference: The procedure used was ANSI/TIA 603-C:2004 using a 50uH LISN. Both lines were observed with the DUT transmitting. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

Bandwidth 20 dB: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW) = 1 MHz and the video bandwidth (VBW) = 3 MHz and the span set as shown on plot.

Power Output: The RF power output was measured at the antenna feed point using a peak power meter.

Antenna Conducted Emissions: The RBW = 100 kHz, VBW = 300 kHz and the span set to 10.0 MHz and the spectrum was scanned from 30 MHz to the 10th Harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

Radiation Interference: The test procedure used was ANSI/TIA 603-C:2004 using an Agilent spectrum receiver with pre-selector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

RF POWER OUTPUT

Rule Part No.: Part 2.1046(a), Part 80

Test Requirements:

Method of Measurement: RF power is measured by connecting a 50-ohm, resistive wattmeter to the RF output connector. With a nominal voltage, and the transmitter properly adjusted the RF output measures:

Test Setup Diagram:

Test Data:

OUTPUT POWER: 16. Watts EIRP (calculated)
OUTPUT POWER (Peak): 100 milliwatts

Part 2.1033 (C)(8) DC Input into the final amplifier

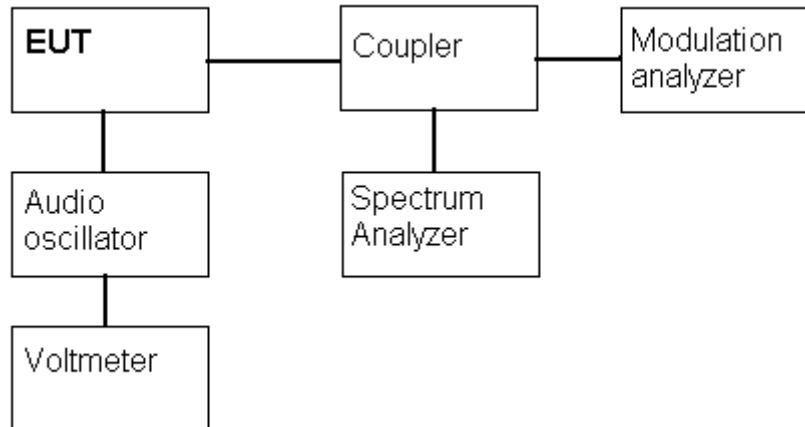
FOR POWER SETTING INPUT POWER: $(13.8V)(0.82A) = 11.32\text{Watts}$

Peak Power Output	100 mW
Average Power Output	26 mW
Antenna Gain	22 dBi
Total Tx time	1.3 ms
Warm up time	0.3ms
Sweep time	1 ms
Pulse rep. rate	5 ms

MODULATION CHARACTERISTICS

Method of Measurement: ANSI/TIA 603-C:2004

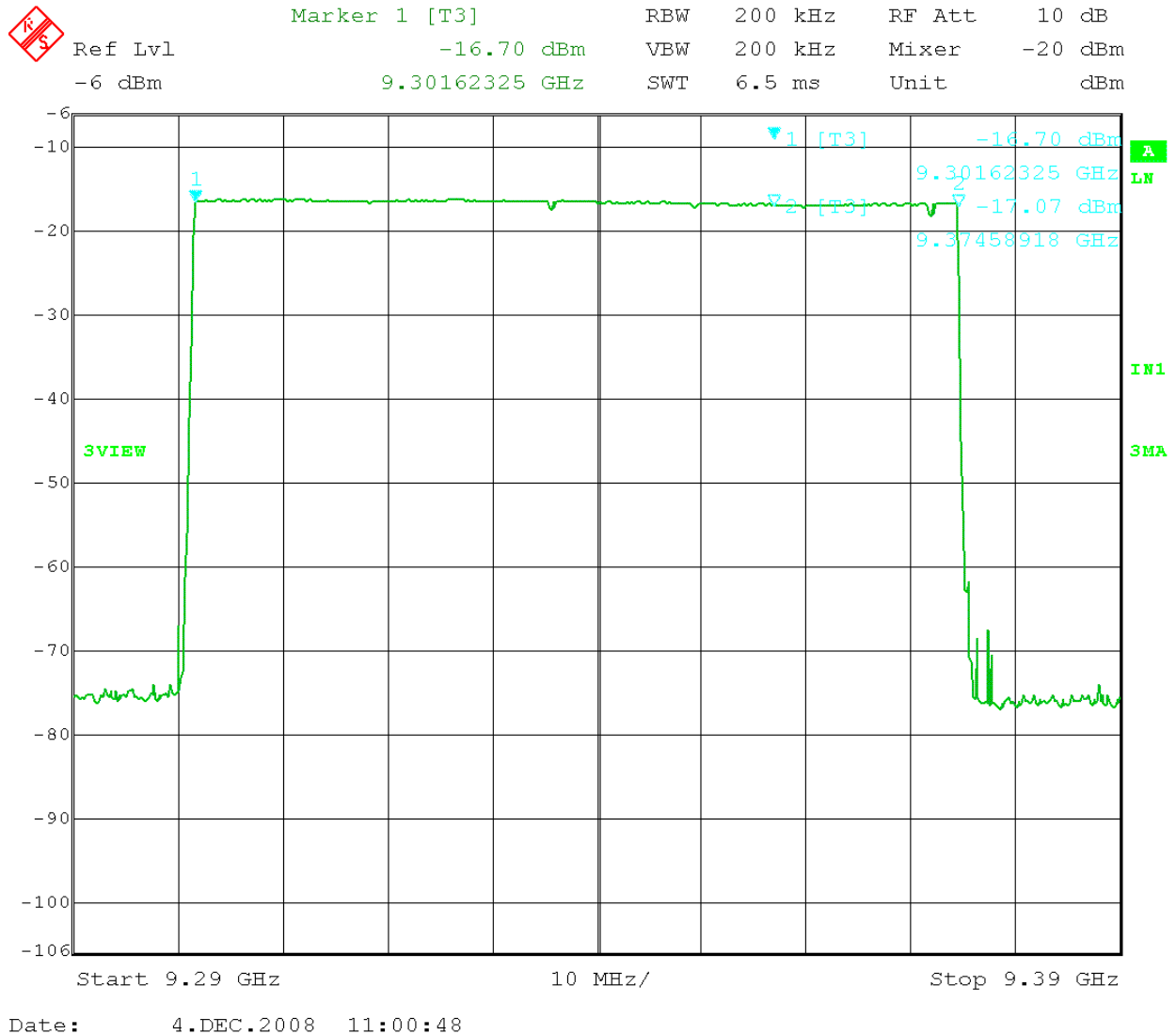
Test Setup Diagram:



Range	Sweep width (MHz)	Used spectrum (MHz)	Possible number of channels
0	65	9320 - 9385	1
1	32.5	9320 - 9385	2
2	16	9320 - 9385	4
3	8	9320 - 9385	8
4	4	9320 - 9385	16
5	2	9320 - 9385	32
6	1	9320 - 9385	64
7	0.5	9320 - 9385	128

possible sweep modes (parameters)

OCCUPIED BANDWIDTH PLOT



The emission mask for this device requires that the emission only need stay in the band.

SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: Part 2.1051(a)

Requirements: $43 + 10\log(\text{mean power})$
 $43 + 10\log(.1) = 33 \text{ dB}$

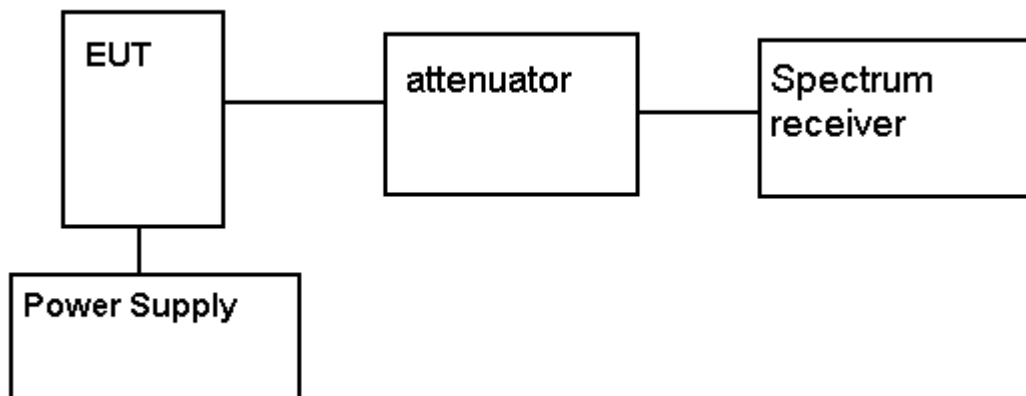
Method of Measurement: The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental or 40 GHz. The measurements were made in accordance with standard ANSI/TIA 603-C:2004.

Test Data:

Permanently attached antenna.

The microwave generating portion of the radar unit is wholly contained in the panel antenna assembly and the antenna is part of the spurious emission limiting structure.

Method of Measuring Conducted Spurious Emissions



METHOD OF MEASUREMENT: The procedure used was TIA/EIA-603-C:2004

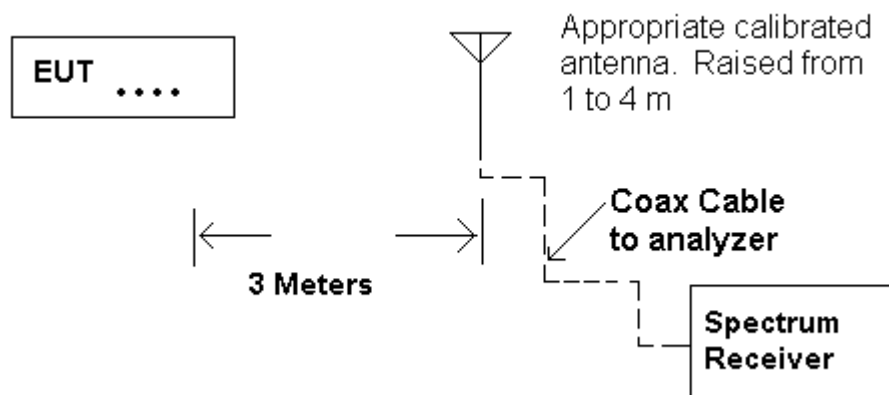
FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: Part 2.1053

Requirements: The FCC limits for radiated emissions are the same as previously stated for the conducted emissions.

Method Of Measurement: The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental or 40 GHz. This test was performed per ANSI/TIA 603-C:2004 using the substitution method.

Test Setup Diagram:



Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBuV/m
9,301.70	9,301.66	79.3	H	6.69	36.48	122.47
9,301.70	18,603.32	28.2	H	3.9	45.2	77.3
9,301.70	27,904.98	NF	H			
9,301.70	37,206.64	NF	H			

NF= Noise floor

Harmonics above 18 GHz were measured using a low noise preamp at the antenna and the measurement distance was reduced to 1 meter.

FREQUENCY STABILITY

Rule Parts. No.: Part 2.1055, Part 80

Requirements: Emission need only remain in the band.

Method of Measurements: ANSI/TIA 603-C: 2004

Test Data:

Assigned Frequency (Ref. Frequency) (MHz)		9301.660822
Temperature (°C)	Frequency (MHz)	Frequency Stability (PPM)
-30	9300.814128	-91.03
-20	9300.914329	-80.25
-10	9301.179861	-51.71
0	9301.405311	-27.47
+10	9301.560621	-10.77
+20	9301.640782	-2.15
+30	9301.650802	-1.08
+40	9301.580661	-8.62
+50	9301.445391	-23.16

Assigned Frequency (Ref. Frequency) (MHz)		
% Battery	Frequency (MHz)	Frequency Stability (PPM)
-15%	9301.685872	2.69
0	9301.660822	0
+15%	9301.695892	3.77