IEC 62238
TEST REPORT

For

Navico Auckland Limited

44 Arrenway Drive, Rosedale, Auckland, New Zealand

Test Model: LINK-6
Multiple Model: LINK-6W, RS20, V20

Report Type:	**Product Type:**
Original Report	MARINE FIXED MOUNT DSC VHF RADIO

Report Number:	RDG161026005-01
Report Date:	2017-02-14
Reviewed By:	Oscar Ye Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road, Kunshan, Jiangsu province, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION **3**
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 3
OBJECTIVE 3
RELATED SUBMITTAL(S)/GRANT(S) 3
TEST METHODOLOGY 3
TEST FACILITY 3
SYSTEM TEST CONFIGURATION **4**
DESCRIPTION OF TEST CONFIGURATION 4
EQUIPMENT MODIFICATIONS 4
SUPPORT EQUIPMENT LIST AND DETAILS 4
SUMMARY OF TEST RESULTS **5**
TEST EQUIPMENT LIST **6**
§7.4 VIBRATION TEST **7**
APPLICABLE STANDARD 7
TEST DATA 7
§7.5 TEMPERATURE TEST **8**
APPLICABLE STANDARD 8
TEST DATA 8
§8.14 TEST OF GENNERATED CALL SEQUENCES **9**
APPLICABLE STANDARD 9
TEST DATA 9
§9.13 MULTIPLE WATCH CHARACTERISTICS **10**
APPLICABLE STANDARD 10
TEST DATA 10
§10.3 DSC RECEIVER ADJACENT CHANNEL SELECTIVITY **11**
APPLICABLE STANDARD 11
TEST DATA 11
§10.5 DSC RECEIVER INTERMODULATION RESPONSE **12**
APPLICABLE STANDARD 12
TEST DATA 12
§10.8 VERIFICATION OF CORRECT DECODING OF VARIOUS TYPES OF DSC CALLS **13**
APPLICABLE STANDARD 13
TEST DATA 13
§10.9 REACTION TO VTS AND AIS CHANNEL MANAGEMENT DSC TRANSMISSIONS **15**
APPLICABLE STANDARD 15
TEST DATA 15
§10.10 SIMULTANEOUS RECEPTION **16**
APPLICABLE STANDARD 16
TEST DATA 16

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Navico Auckland Limited*'s product, model number: LINK-6 *(FCC ID: RAYVHFRS20, IC: 4697A-VHFRS20)* or the "EUT" in this report was a *MARINE FIXED MOUNT DSC VHF RADIO,* which was measured approximately: 16.5 mm (L) x 14.4 mm (W) x 8.7 mm(H), rated with input voltage: DC 13.6V.

Notes: This series products model: LINK-6W (Brand: LOWRANCE), RS20 (Brand: SIMRAD), V20 (Brand: B&G) and LINK-6(Brand: LOWRANCE) are identical; they have the same PCB, Material and function, the difference among them is the appearance, NMEA2K function and brand name. Model LINK-6 was selected for fully testing, the detailed information can be referred to the attached declaration which was stated and guaranteed by the applicant.

Brand:
LOWRANCE: LINK-6, LINK-6W
SIMRAD: RS20
B&G: V20

** All measurement and test data in this report was gathered from production sample serial number: 161026005 (Assigned by BACL, Kunshan). The EUT supplied by the applicant was received on 2016-10-26.*

Objective

This test report is prepared on behalf of *Navico Auckland Limited* in accordance with IEC 62238.

Related Submittal(s)/Grant(s)

No related submittal(s)

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the IEC 62238 First edition 2003-03, Maritime navigation and radiocommunication equipment and systems-VHF radiotelephone equipment incorporating Class "D" Digital Selective Calling (DSC)-Methods of testing and required test results.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Test site at Bay Area Compliance Laboratories Corp. (Kunshan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 06, 2014. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 815570. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a DSC mode in accordance with IEC 62238.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Everfine	DC power supply	WY5015	1109009

SUMMARY OF TEST RESULTS

IEC 62238 Rules	Description of Test	Results
§7.4	Vibration Test	Compliance
§7.5	Temperature Tests	Compliance
§8.14	Test of Gennerated Call Sequences	Compliance
§9.13	Multiple Watch Characteristics	Compliance
§10.3	DSC Receiver Adjacent Channel Selectivity	Compliance
§10.5	DSC Receiver Intermodulation Response	Compliance
§10.8	Verification of Correct Decoding of Various Types of DSC Calls	Compliance
§10.9	Reaction to VTS and AIS Channel Management DSC Transmissions	Compliance
§10.10	Simultaneous Reception	Compliance

Note: a brief summary of the tests carried out in accordance with IEC 62238 standards.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
CMI	Vibration Tester	ACT2000-S06L	N/A	2016-06-03	2017-06-03
ESPEC	Temperature & Humidity Chamber	EL-04KA	N/A	2016-12-14	2017-12-14
HP	Signal Generator	E4421B	US38440505	2016-11-11	2017-11-10
Agilent	MXG X-Series Signal Generators	N5182B	N/A	2016-06-03	2017-06-03
H&P	Modulation Analyzer	8901B	3438A05208	2016-06-03	2017-06-03
Agilent	RF Communication test set	8920A	3325U00859	2016-06-03	2017-06-03
Agilent	Universal Frequency Center	53220A	N/A	2016-10-09	2017-10-08
Aeroflex	Digital Radio Test Set	3920	1000003253	2016-09-06	2017-09-05
Hyetra	DSC Decoder/Encoder	N/A	N/A	NCR	NCR

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

§7.4 VIBRATION TEST

Applicable Standard

The vibration test shall be performed as in IEC 62238, Clause 7.4

Limit:

The requirement of the performance check shall be met.

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	47 %
ATM Pressure:	100.0 kPa

The testing was performed by Ada Yu on 2017-01-20.

Test Levels:

- 2Hz to 5Hz and up to 13.2Hz with and excursion of ±1.43mm ± 10% (9.8m/s^2 maximum acceleration at 13.2Hz)
- Above 13.2Hz and up to 600Hz with a constant acceleration of 1g
- Nominal test voltage = +13.6Vdc

Endurance Test for 2 hour sat each resonant frequency or frequency with a g level ≥ 5 times the drive g level. If no resonant frequencies or frequency with a g level ≥ 5 times the drive g levelare found endurance test shall be performed at 30Hz.

Test Result: Compliance.

§7.5 TEMPERATURE TEST

Applicable Standard

The dry heat cycle shall be performed as in IEC 60945. Tests and performance chechs at extreme power supply conditions shall be performed under the environmental conditions as follow:

Environment	Normal power supply	Extreme power supply
Dry heat	Performance test	Performance check

Limit:

The requirement of the performance check shall be met.

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	47 %
ATM Pressure:	100.0 kPa

The testing was performed by Ada Yu on 2017-01-20.

Test Result: Compliance. Please refer to following table.

Environmental Conditions		Temperature	Voltage (V_{DC})	Test Period(Hour)	Results
Dry Heat	Storage Test	70±1℃	-	15	Compliance
	Functional Test	55±1℃	17.68	15	Compliance
			13.6	15	Compliance
			12.24	15	Compliance

§8.14 TEST OF GENNERATED CALL SEQUENCES

Applicable Standard

According to IEC 62238, Clause 8.14

Limit:

The requirement of ITU-R Recoomendation M.493-10 regarding message composition and content shell be met.

The generated call shall be anlaysed with the calibrated apparatus for correct configuration of the signal format, including time diversity.

It shall be verified that, after transmission of a DSC call, the transmitter re-tunes to the original channel. However, in the case of a distress call, the transmitter shall tune to channel 16 and automatically select the maximum power.

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	47 %
ATM Pressure:	100.0 kPa

The testing was performed by Ada Yu on 2017-01-20.

Test Result: Compliance. Please refer to following table.

Format specifier	Category	1st telecommand (symbol No.)	2st telecommand (symbol No.)
Distress	-	112	132
All Ships	Urgency	112	132
All Ships	Safety	112	132
Individual	Routine	112	132
Group	Routine	112	132

§9.13 MULTIPLE WATCH CHARACTERISTICS

Applicable Standard

According to IEC 62238, Clause 9.13

Limit:

Test Project	Requirement
Scanning Period	⩽2s
Dwell Time (Priority Channel)	⩽150ms
Dwell Time (Additional Channel)	Betweeen 850 ms and 2s

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	47 %
ATM Pressure:	100.0 kPa

The testing was performed by Ada Yu on 2017-01-20.

Test Result: Compliance. Please refer to following table.

Test Conditions		Scanning Tine(s)	Dwell on Priority (ms)	Dwell on Additional (s)
Temperature(°C)	Voltage (V_{DC})			
-15	17.68	1.72	132	1.7
-15	13.6	1.70	127	1.74
-15	12.24	1.70	132	1.75
+25	13.6	1.64	123	1.56
+55	17.68	1.63	120	1.48
+55	13.6	1.64	118	1.48
+55	12.24	1.63	118	1.48

§10.3 DSC RECEIVER ADJACENT CHANNEL SELECTIVITY

Applicable Standard

According to IEC 62238, Clause 10.3

Limit:

The bit error ratio shall be less than 10^{-2}

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	47 %
ATM Pressure:	100.0 kPa

The testing was performed by Ada Yu on 2017-01-20.

Test Result: Compliance. Please refer to following table.

Test Conditions		Bit Error Ratio	
		156.525MHz	
Temperature(°C)	Voltage (V_{DC})	+25 kHz	-25 kHz
-15	17.68	≤0.7%	≤0.7%
-15	13.6		
-15	12.24		
+25	13.6		
+55	17.68		
+55	13.6		
+55	12.24		

Meausrement uncertainty:±1.6 dB

§10.5 DSC RECEIVER INTERMODULATION RESPONSE

Applicable Standard

According to IEC 62238, Clause 10.5

Limit:

The BER shall not exceed 10^{-2}

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	47 %
ATM Pressure:	100.0 kPa

The testing was performed by Ada Yu on 2017-01-20.

Test Result: Compliance. Please refer to following table.

Frequency Increments of Unwanted Signals	**Bit Error Rate**
	156.525 MHz
+50/100 kHz	≤0.7%
-50/100 kHz	≤0.7%

Meausrement uncertainty: ±1.5 dB

§10.8 VERIFICATION OF CORRECT DECODING OF VARIOUS TYPES OF DSC CALLS

Applicable Standard

According to IEC 62238, Clause 10.8

Limit:

The requirement of ITU-R Reconmmendation M.493.13(5) regarding message composition and content shall be met.

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	47 %
ATM Pressure:	100.0 kPa

The testing was performed by Ada Yu on 2017-01-20.

Test Result: Compliance. Please refer to following tables.

Format specifier	Category	1st telecommand (symbol No.)	2st telecommand (symbol No.)
Distress	-	112	126
Individual Distress Relay	-	115	132
All ships Distress Relay	-	115	132
All Ships	Urgency	116	134
All Ships	Safety	110	130
Individual	Routine	122	132
Individual	Safety	120	131
Individual	Urgency	124	131
Group	Routine	118	128

	Confirm (Y or N)
Confirm that the decoded call sequences at the output of the receiver have been examined for correct technical format, including error check characteristics:	Y
Error found:	N
Confirm that the checks have been made to ensure accordance between printer output and display:	Y
Error found:	N
It has beenverified that the equipment is capable of switching to a channel identified in the DSC call:	Y

§10.9 REACTION TO VTS AND AIS CHANNEL MANAGEMENT DSC TRANSMISSIONS

Applicable Standard

According to IEC 62238, Clause 10.8

Limit:

The equipment shall not sound an alarm, display a message (an accurate, informative display is permissible but not required), transmit a message a reponse or suggest a transmitted response, lock up, or require operator intervention.

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	47 %
ATM Pressure:	100.0 kPa

The testing was performed by Ada Yu on 2017-01-20.

Test Result: Compliance. Please refer to following table.

	Confirm (Y or N)
Not sound an alarm	Y
Not display a message (An accurate informative display is permissible but not required)	Y
Not transmit a response	Y
Not suggest a transmitted response	Y
Not lock up	Y
Not require operator intervention	Y

§10.10 SIMULTANEOUS RECEPTION

Applicable Standard

According to IEC 62238, Clause 10.8

Limit:

Test Project	Requirement
SINAD Ratio (dB)	≥20 dB in presence of DSC Signal
Bit Error Rate	$\leqslant 10^{-2}$

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	47 %
ATM Pressure:	100.0 kPa

The testing was performed by Ada Yu on 2017-01-20.

Test Mode: Transmitting

Test Result: Compliance. Please refer to following table.

SINAD (dB) No DSC Signal	SINAD (dB) DSC Signal Applied	Bit Error Rate
35.3	34.5	Less than 10^{-2}

Meausrement uncertainty: ±1.6 dB

******* END OF REPORT *******