


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: Original Report | Product Type: MARINE FIXED MOUNT DSC VHF RADIO |
| Report Number: RDG161026005-01 | |
| Report Date: 2017-02-14 | |
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The Navico Auckland Limited's product, model number: LINK-6 (FCC ID: RAYVHFERS20, IC: 4697A-VHFERS20) 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 Generated 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 °C |
| 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 $\pm 1.43\text{mm} \pm 10\%$ (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 level are 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 checks 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 °C |
| 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°C | - | 15 | Compliance |
| | Functional Test | 55±1°C | 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 Recommendation M.493-10 regarding message composition and content shall be met.

The generated call shall be analysed 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 °C |
| 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 | 1 st telecommand (symbol No.) | 2 st 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 | $\leq 2s$ |
| Dwell Time (Priority Channel) | $\leq 150ms$ |
| Dwell Time (Additional Channel) | Between 850 ms and 2s |

Test Data

Environmental Conditions

| | |
|--------------------|-----------|
| Temperature: | 23 °C |
| 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 Time(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 °C |
| 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 | |
|-----------------|----------------------------|-----------------|---------|
| Temperature(°C) | Voltage (V _{DC}) | 156.525MHz | |
| | | +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 | | |

Measurement 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 °C |
| 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 | $\leq 0.7\%$ |
| -50/100 kHz | $\leq 0.7\%$ |

Measurement 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 Recommendation M.493.13(5) regarding message composition and content shall be met.

Test Data

Environmental Conditions

| | |
|--------------------|-----------|
| Temperature: | 23 °C |
| 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 | 1 st telecommand (symbol No.) | 2 st 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 been verified 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 °C |
| 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 | $\leq 10^{-2}$ |

Test Data

Environmental Conditions

| | |
|--------------------|-----------|
| Temperature: | 23 °C |
| 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} |

Measurement uncertainty: ± 1.6 dB

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