849 NW State Road 45
Newberry FL 32669 USA
352-472-5500
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TEST REPORT
Radio Characteristics

STANDARD(S):
EN 301 025-2 V1.4.1
EN 301 025-3 V1.4.1
EN 300 698-2 V1.2.1
EN 300 698-3 V1.2.1

Applicant	NAVICO AUCKLAND LTD
Address	3-5 OMEGA STREET ALBANY 0632 AUCKLAND New Zealand
Model Number	RS90
Product Description	BASE STATION VHF MARINE RADIO w DSC, ATIS, and a AIS DECODER.
Date Sample Received	January/21/2014
Date Tested	January/22/2014
Tested By	Mario de Aranzeta/ Joe Scoglio
Approved By	Mario de Aranzeta
Number of Pages	72
Report Issue Date	February 13, 2014
Report Number	N\NAVICO AUCKLAND_RAY\120DUT14\120DUT14TestReport.docx
Test Results	☒ PASS ☐ FAIL

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INTRODUCTION

This report contains the result of tests performed by:

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

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THE RESULTS IN THIS REPORT PERTAIN TO ONLY THE SPECIFIC ITEM TESTED.

Quality Manager
Gretchen Greene

Ordering party:

Company name:	NAVICO AUCKLAND LTD
Address:	3-5 OMEGA STREET
	ALBANY 0632
	AUCKLAND New Zealand

PRODUCT

A sample of the following product was submitted for testing:

BASE STATION VHF MARINE RADIO WITH DSC, ATIS, AND AN AIS DECODER.
Model: RS90 WITH HS90 HANDSET.
Power Output: 23 Watts
With provisions for up to 4 wired handsets, 4 external speakers, and 4 wireless handsets using the 2.4 GHz band

RS90 Top View

Product documentation

For production of this report the following product documentation was used:

Description:	Date:	Identification
Leaflet	January 22nd, 2014	Leaflet (RS90)
Owner's Manual	January 22nd, 2014	RS90
Service Manual		
Parts List	January 22nd , 2014	RS90
Schematic Diagrams	January 22nd, 2014	RS90
PCB Layouts	January 22nd, 2012	RS90

The above-mentioned documentation will be filed at Timco Engineering, Inc. for a period of 10 years following the issue of this report.

Observations and comments

The equipment has been type examined according to EN 301 025-1.
The applicant's objective is to use the equipment on inland waterways as well; the obtained operational and technical measurement results present satisfactory justification in order to conclude that the equipment shall comply with EN 300 698-1;

Summary

The product is intended for use in the following application area:

MARINE COMMUNICATIONS EQUIPMENT

The sample was tested according to the following specifications:

EN 301 025-1 V1.5.1 (test procedures only)
EN 301 025-2 V1.4.1
EN 301 025-3 V1.4.1

With exception of the items mentioned in Observations, the equipment also complies with the following specification:

EN 62238 Ed. 1.0 March 2003

Based on the test results and equipment compliance with the above-mentioned specifications, compliance to the following specifications can be justified:

EN 300 698-1 V1.4.1 (test procedures only)
EN 300 698-2 V1.2.1
EN 300 698-3 V1.2.1

Conclusion

The sample of the product showed **NO NON-COMPLIANCES** to the specifications stated "Summary" of this report.

The results of the type tests as stated in this report, are exclusively applicable to the product item as identified in this report. Timco Engineering, Inc. does not accept any responsibility for the results stated in this report, with respect to the properties of product items not involved in these tests.

This report comprises of a main module and 1 module with test results and other information. All pages have been numbered consecutively and bear the Timco Engineering, Inc. logo, the report number and sub-numbers. The total number of pages in this report is 72.

All tests are performed by:

Name: Mario de Aranzeta
Function: Engineer

Review of test methods and report by:

Name: Mario de Aranzeta
Function: Engineer/ Lab Supervisor/ Manager
Signature:

LIST OF MEASUREMENTS

The list of measured parameters called for in EN 301 025-1 V1.5.1 and actually performed is given below and on following page:

CLAUSE	GENERAL AND OPERATIONAL REQUIREMENTS	PERFORMED
1	Scope	Yes
2	Normative references	Yes
3	Definitions and abbreviations	Yes
4	General and operational requirements	Yes
4.1	General	Yes
4.2	Composition	Yes
4.3	Construction	Yes
4.4	Controls and indicators	Yes
4.5	Facilities for coding and decoding of DSC	Yes
4.5.1	Call functions	Yes
4.5.2	Manual calls	Yes
4.5.3	Distress calls	Yes
4.5.4	All ships calls	Yes
4.5.5	Incoming calls	Yes
4.6	DSC display	Yes
4.7	Handset and loudspeaker	Yes
4.8	Safety precautions	Yes
4.9	Labelling	Yes
4.10	Warm up	Yes

CLAUSE	TECHNICAL REQUIREMENTS	PERFORMED
5.1	Switching time	Yes
5.2	Class of emission and modulation characteristics	Yes
5.3	Facilities for DSC transmission and reception	Yes
5.3.1	General	Yes
5.3.2	Decoding	Yes
5.3.3	Free channel transmission	Yes
5.3.4	Automatic acknowledgement	Yes
5.3.5	Automatic re-transmission of distress calls	Yes
5.4	Ships identity – MMSI and Group MMSI	Yes
5.5	Entry of position information	Yes
5.6	Alarm circuits	Yes
5.6.1	Distress and urgency	Yes
5.6.2	Other categories	Yes
5.6.3	Acoustic alarms	Yes
5.6.4	Cancellation of alarms	Yes
5.7	Facilities for automatic identification	Yes
5.8	Multiple watch facilities	Yes
5.8.1	General	Yes
5.8.2	Scanning provisions	Yes
5.8.3	Scanning characteristics	Yes

LIST OF MEASUREMENTS

The list of measured parameters called for in EN 301 025-1 V1.5.1 and actually performed is given below:

CLAUSE	ENVIRONMENTAL TESTS	PERFORMED
7.1	Introduction	
7.2	Procedure	
7.3	Performance check	Yes
7.4	Vibration	Yes
7.5	Temperature tests	Yes
7.5.2	Dry heat	Yes
7.5.3	Damp heat	Yes
7.5.4	Low temperature	Yes

TEST FORM

LIST OF MEASUREMENTS

The list of measured parameters called for in EN 30 025-1 V1.5.1 and actually performed is given below and on page following:

CLAUSE	TRANSMITTER	PERFORMED
8.1	Frequency error	Yes
8.2	Carrier power	Yes
8.3	Frequency deviation	Yes
8.3.2	Maximum permissible frequency deviation	Yes
8.3.3	Reduction of frequency deviation at modulation frequencies above 3 kHz	Yes
8.4	Sensitivity of the modulator, including microphone	Yes
8.5	Audio-frequency response	Yes
8.6	Audio-frequency harmonic distortion of the emission	Yes
8.7	Adjacent channel power	Yes
8.8	Conducted spurious emissions conveyed to antenna	Yes
8.9	Cabinet radiation	Yes
8.10	Transient frequency behavior of the transmitter	Yes
8.11	Residual modulation of the transmitter	Yes
8.12	Frequency error (demodulated DSC signal)	Yes
8.13	Modulation index for DSC	Yes
8.14	Modulation rate for DSC	Yes

CLAUSE	RECEIVER	PERFORMED
9.1	Harmonic distortion and rated AF-output power	Yes
9.2	Audio frequency response	Yes
9.3	Maximum usable sensitivity	Yes
9.4	Co-channel rejection	Yes
9.5	Adjacent channel selectivity	Yes
9.6	Spurious response rejection	Yes
9.7	Intermodulation response	Yes
9.8	Blocking or desensitization	Yes
9.9	Spurious emissions	Yes
9.10	Radiated spurious emissions	Yes
9.11	Receiver noise and hum level	Yes
9.12	Squelch operation	Yes
9.13	Squelch hysteresis	Yes

CLAUSE	RECEIVER FOR DSC DECODER	PERFORMED
10.1	Maximum usable sensitivity	Yes
10.2	Co-channel rejection	Yes
10.3	Adjacent channel selectivity	Yes
10.4	Spurious response and blocking immunity	Yes
10.5	Intermodulation response	Yes
10.6	Dynamic range	Yes
10.7	Conducted spurious emissions	Yes
10.8	Radiated spurious emissions	Yes

CLAUSE	ATIS (EN 300 698-1 V1.4.1)	PERFORMED
B.2.2	ATIS ENCODER FREQUENCY ERROR (B.2.2)	Yes
B.2.3	ATIS ENCODER MODULATION INDEX (B.2.3)	Yes
B.2.4	ATIS ENCODER MODULATION RATE (B.2.4)	Yes
B.2.5	ATIS FORMAT (B.2.5)	Yes
4.4.8	ATIS PROGRAMMING (4.4.8)	Yes

1. SCOPE

2. NORMATIVE REFERENCES

3. DEFINITIONS AND ABBREVIATIONS

4. GENERAL AND OPERATIONAL REQUIREMENTS

4.1 GENERAL	Satisfactory
- Manufacturer's declaration of compliance with clause 4	Yes
- Provision of relevant documentation to prove compliance	Yes

4.2 COMPOSITION

- Equipment includes as minimum:	
VHF radiotelephone; receiver; dedicated ch 70 WKR; DSC-en/decoder	Yes

4.3 CONSTRUCTION

- Good engineering practice in respect to mechanical and electrical construction	Yes
- Equipment suitable for use on board vessels	Yes
- Number of controls suitable for simple and satisfactory operation	Yes
- Size of controls enable easy performance	Yes
- Detailed operating instructions provided	Yes
- Capable of operating on:	
Single-frequency channels with manual control (Simplex)	Yes
Two-frequency channels with manual control (Simplex)	Yes
- Operation on all channels of Appendix 18 of the R.R.	Yes
- Blocking of channels 75 and 76	Yes
- Unblocking of blocked channels impossible	Yes
- Additional channels (if granted)	Yes
- Use of channel 70 only possible for DSC (**ch 70 listen possible)**	Yes
- Use of channels (if granted)	Yes
- Transmission inhibited while any frequency synthesizer is out of lock	Yes
- Transmission inhibited during channel switching operations	Yes

4.4 CONTROLS AND INDICATORS

	Satisfactory
- Controls impairing technical characteristics not accessible by user	Yes
- Priority and indication of control units	n.a.
- Following mandatory controls or functions are provided	
- Distress button	Yes
- Call	Yes
- Cancel = **ESC**	Yes
- Enter (Accept) (OK) = **ENT**	Yes
- Easy means of entering MMSI/position or numeric keypad	Yes
- Alpha-numeric display	Yes
- On/off switch for the entire installation with a visual indication that Installation is in operation RF power amplifier is directly connected to DC power input	Yes
- A manual non-locking push-to-talk switch	Yes
- A transmit activation indication	Yes
- A switch for reducing the transmitter output power to no more than 1 Watt with visual indication of low power selection	Yes
- A volume control to adjust the AF output power	Yes
- A squelch control	Yes
- Control for dimming equipment illumination to zero (except distress indicator)	Yes
- Controls for multiple watch facility (Dual Watch and Scan)	Yes
- Channel designator as in Appendix 18 of the R.R.	Yes
- Channel designator legible irrespective of the external lighting conditions	Yes
- Selection of channel 16 by distinctive marked key	Yes
- Initial selection of channel 16 automatically selects high power	Yes

4.5 FACILITIES FOR CODING AND DECODING OF DSC

4.5.1 CALL FUNCTIONS

	Satisfactory
- Quick and precise entering of a call by operator	Yes
- Call function permits selection of:	
Individual call; (call to specific MMSI)	Yes
All ships call urgency	Yes
All ships call safety	Yes
Retrieving stored received calls	Yes
Housekeeping functions of equipment	Yes
- Manual or directory-individual call can be selected	Yes
- Directory has facility for 10 entries with programmable MMSI	Yes

4.5.2 MANUAL CALLS

- Manual call facility permits entry of MMSI	Yes
- If calling coast station, operator is requested no further information	Yes
- If calling ship, operator is requested to input channel number	Yes
- Equipment assists operator by suggesting suitable inter-ship channel	Yes

4.5.3 DISTRESS CALLS

- Transmission of distress call only by dedicated distress button	Yes
- Distress button is clearly identified	Yes
- Distress-button is protected with spring loaded cover	Yes
- Distress alert initiation requires independent actions	Yes
- If distress alert is initiated, visual indication and acoustic alarm	
Is activated	Yes
- Time delay of $\geq$ 3 s between initiation and activation	Yes
- Possibility of selecting nature of distress prior to initiation	Yes
- Default of nature of distress is undesignated distress	Yes
- Initiation of distress call has priority over any other operation	Yes
- Equipment selects channel 70 with max. power automatically	Yes
- Facility provided to discontinue transmission of distress call	Yes
- Distress call is transmitted 5 times in succession with no interval	Yes
- Each call of 5 successive calls includes dot pattern	Yes
- After distress call equipment switches to channel 16 with max. power	
Automatically	Yes

4.5.4 ALL SHIPS CALL

	Satisfactory
- Transmission of all ships urgency-safety calls only by deliberate action	Yes

4.5.5 INCOMING CALLS

- Facility to convert incoming calls to visual form in plain language (incoming calls with relevant address)	Yes
- Facility to store at least 10 DSC calls until read manually	Yes
- Radiotelephone automatically switches to channel identified in Incoming call	Yes
- In case of distress call radiotelephone switches to channel 16 and Selects maximum power automatically	Yes

4.6 DSC DISPLAY

- Display shows functions currently available	Yes
- Operator is prompted if incorrect operation is attempted	Yes
- If equipment not in use for normal communication, display shows Last entered position or GPS position information	Yes
- Visual indication of user programmable information of content of call	Yes
- Manual correction of user programmable information of content of call	Yes
- Indication of unread incoming messages in memory	Yes
- Indication that distress alert is in automatic retransmit mode	Yes

4.7 HANDSET AND LOUDSPEAKER

- Provision of a:	
Telephone handset	n.a.
Or	
Microphone	Yes
Integral loudspeaker	Yes
And/or	
Socket for an external loudspeaker	Yes
- Acoustic alarm is also relayed to external loudspeaker(s)	Yes
- Muting in simplex operation	Yes

4.8 SAFETY PRECAUTIONS

	Satisfactory
- Protection against the effects of excessive current and overvoltage **excessive current; fuse**	Yes
- Protection against damage due to transient voltage (**filter)**	Yes
- Protection against damage due to reversal of power supply polarity **(fuse and reverse diode)**	Yes
- Earthing **(equipment has no floating power supply)**	Yes
- Protection against accidental access of voltages greater than 50 Volts	Yes
- Protection against damage due to open-circuited antenna terminals	Yes
- Protection against damage due to short-circuited antenna terminals	Yes
- DC path from the antenna terminals to the chassis: 10k ohm limit: ≤ 100k ohm	Yes
- Memory not erased during power supply interruptions up to 60 seconds	Yes

4.9 LABELLING

- Controls, instruments, indicators and terminals	Yes
- Details of power supply	Yes
- Identification of manufacturer, type designation, serial number	Yes
- Compass safety distance	n.p

4.10 WARM UP

- After switched on, equipment is operational within 5 sec	Yes

5. TECHNICAL REQUIREMENTS

	Satisfactory
5.1 SWITCHING TIME	
- Channel switching time: 4 sec limit ≤ 5 sec	Yes
- Time to change from: TX to RX condition: 0.100 sec	Yes
RX to TX condition: 0.220 sec limit: ≤ 0.3 sec	Yes
5.2 CLASS OF EMISSION AND MODULATION CHARACTERICS	
- Class of emission G3E for speech	Yes
- Class of emission G2B for DSC	Yes
- 25 kHz channel separation	Yes
5.3.1 GENERAL	
- Facility to code and transmit DSC on channel 70	Yes
- Facility to decode and converse received calls to visual form in plain Language	Yes
- Configuration of equipment:	
Independent DSC unit for connection to associated telephone	n.a
Mechanically and electrically integrated with radio equipment	Yes
- With either configuration automatic channel switching by DSC is Possible	Yes
- Channel 70 watchkeeping receiver of DSC part is continuously in Operation	Yes
- During transmitter usage watchkeeping receiver may be muted	Yes
5.3.2 DECODING	
- Decoding utilizes parity, diversity and error check as Rec. ITU-R M.493 – (13)	Yes

5.3.3 FREE CHANNEL TRANSMISSION

	Satisfactory
- Automatic delay of transmission until channel 70 is free	Yes
- No delay of transmission of distress call if channel 70 is not free	Yes
5.3.4 AUTOMATIC ACKNOWLEDGEMENT	
- No provision of sending automatic acknowledgement	Yes
5.3.5 AUTOMATIC RETRANSMISSION OF DISTRESS CALLS	
- Re-transmission of distress call after random delay 3.5 – 4.5 min	Yes
- Automatic continuation until acknowledgement received of discontinued Manually	Yes
- Distress call re-attempt by manual intervention at any time	Yes

5.4 SHIPS IDENTITY – MMSI AND GROUP MMSI

- Permanent storage of MMSI-number and automatic insertion in call	Yes
- Impossible to change MMSI-number with operator controls	Yes
- Impossible to transmit DSC call until MMSI-number has been stored	Yes
- Storing of operator programmable group MMSI-numbers	Yes
- Equipment recognizes call directed to group MMSI-numbers	Yes
- Programming group MMSI with 8 digits only; leading 0 is inserted Automatically	Yes

5.5 ENTRY OF POSITION INFORMATION

- Provision for manual entry of position with valid time	Yes
- Provision for automatic entry and encoding of position and time	Yes
- Above facilities confirm with IEC 61162.1	Yes
- No connection of, or failure within external circuits disables DSC Equipment	Yes
- Failure of datastream initiates error message on display	Yes
- If failure, operator is prompted for manual entry of position and Time every 4 hours	Yes
- If position not updated for 23.5 hours, position and time is set to Default (99.99 999.99 88.88)	Yes

5.6 ALARM CIRCUITS

Satisfactory

5.6.1 DISTRESS AND URGENCY

- Provision of specific acoustic and visual alarm activated by format Specifier distress or category distress or urgency — Yes
- Alarm circuits cannot be disabled — Yes

5.6.2 OTHER CATEGORIES

- Provision of acoustic and visual alarm activated on receipt of calls of Categories other than distress and urgency — Yes
- Acoustic alarm circuits cannot be disabled — Yes

5.6.3 ACOUSTIC ALARMS

- Acoustic power of alarm is ≥ 80 dB(A) at 1m distance — Yes
  Measured value: 92 dB(A)

5.6.4 CANCELLATION OF ALARMS

- Provision of manual cancellation of alarms — Yes
- Automatic cancellation takes place after 2 minutes — Yes

5.7 FACILITIES FOR AUTOMATIC IDENTIFICATION

- If facility for automatic identification to Rec. ITU-R M.825-1 is provided:
  Operator not permitted to originate this type of call — n.a.
  Equipment capable of responding to request of identification — n.a.

5.8 MULTIPLE WATCH FACILITIES

5.8.1 GENERAL

- Provision of multiple watch on traffic channels — Yes
- DSC operation takes precedence — Yes
- No scanning is possible on channel 70 — Yes

TRANSMITTER FREQUENCY ERROR (8.1)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (8.1.2)

Limits: The frequency error shall be within ±1,5 kHz.
ETSI EN 301 025-1 V1.5.1 (8.1.3)

Test Data:

Measured frequency is shown in the following table:

Nominal Frequency: **156.800000 MHz**

	+25 Deg C	**-15 Deg C**	**+55 Deg C**	
10.8 Volts	156.800005 MHz	156.799990 MHz	156.800000 MHz	Lo
	156.800000 MHz	156.799990 MHz	156.799999 MHz	Hi
12 Volts	156.800005 MHz	156.799990 MHz	156.800000 MHz	Lo
	156.800004 MHz	156.799990 MHz	156.799994 MHz	Hi
15.6 Volts	156.800002 MHz	156.799990 MHz	156.799998 MHz	Lo
	156.800000 MHz	156.799986 MHz	156.799992 MHz	Hi

Conclusion: **The results meet the specified requirements .**

TRANSMITTER ADJACENT CHANNEL POWER (8.7)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (8.7.2)

a) The transmitter shall be operated at the carrier power determined in clause 8.2 under normal test conditions. The output of the transmitter shall be linked to the input of the "receiver" by a connecting device such that the impedance presented to the transmitter is 50 Ω and the level at the "receiver" input is appropriate.

b) With the transmitter unmodulated, the tuning of the "receiver" shall be adjusted so that a maximum response is obtained. This is the 0 dB response point. The "receiver" attenuator setting and the reading of the meter shall be recorded. The measurement may be made with the transmitter modulated with normal test modulation, in which case this fact shall be recorded with the test results.

c) The tuning of the "receiver" shall be adjusted away from the carrier so that the "receiver" -6 dB response nearest to the transmitter carrier frequency is located at a displacement from the nominal carrier frequency of 17 kHz for 25 kHz channels or 8,25 kHz for 12,5 kHz channels.

d) The transmitter shall be modulated with 1,25 kHz at a level which is 20 dB higher than that required to produce ±3 kHz deviation for 25 kHz channels or ±1,5 kHz deviation for 12,5 kHz channels.

e) The "receiver" variable attenuator shall be adjusted to obtain the same meter reading as in step b) or a known relation to it.

f) The ratio of adjacent channel power to carrier power is the difference between the attenuator settings in steps b) and e), corrected for any differences in the reading of the meter.

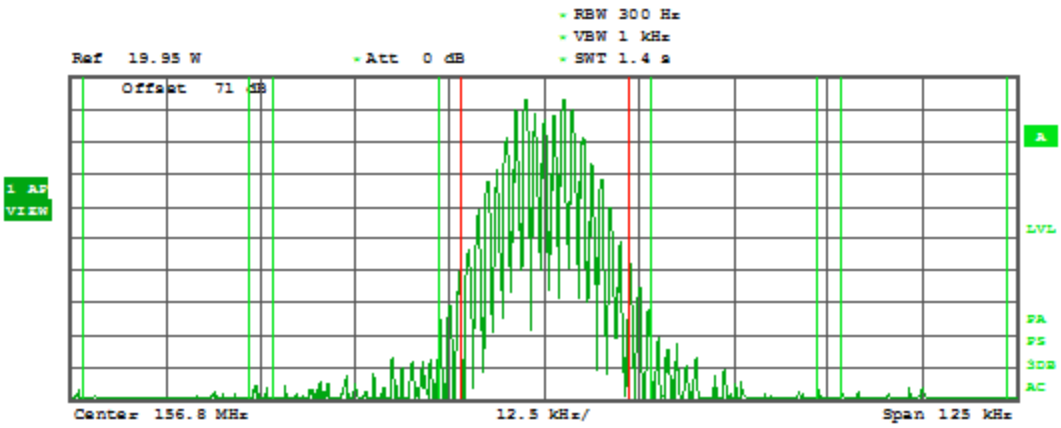
g) The measurement shall be repeated with the "receiver" tuned to the other side of the carrier.

Limits: The adjacent channel power shall not exceed a value of:

- 25 kHz channel: 70 dB below the carrier power of the transmitter without any need to be below 0.2 µW.

ETSI EN 301 025-1 V1.5.1 (8.7.3)

Test Data:



Tx Channel			
Bandwidth	22 kHz	Power	17.310 W
Adjacent Channel			
Bandwidth	22 kHz	Lower	-77.77 dB
Spacing	25 kHz	Upper	-74.44 dB
Alternate Channel			
Bandwidth	22 kHz	Lower	-85.12 dB
Spacing	50 kHz	Upper	-84.56 dB

Conclusion: **The results meet the specified requirements .**

TRANSMITTER CONDUCTED SPURIOUS EMISSIONS CONVEYED TO THE ANTENNA (8.8)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (8.8.2)

Limits: The power of any conducted spurious emission on any discrete frequency shall not exceed 0.25 µW (-36 dBm).

ETSI EN 301 025-1 V1.5.1 (8.8.3)

Test Data: Tuned TX frequency: 156.8000 MHz

Freq. MHz	dBm
156.8	
313.6	-53.7
470.4	-57.9
627.2	-39.9
784	-49.2
940.8	-56.7
1097.6	-70.5
1254.4	-73.7
1411.2	-72.1
1568	-72.7

Conclusion: **The results meet the specified requirements.**

TX CABINET RADIATION AND CONDUCTED SPURIOUS EMISSIONS OTHER THAN THOSE CONVEYED TO THE ANTENNA (8.9)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (8.9.2)

Limits: When the transmitter is in stand-by the cabinet radiation and spurious emissions shall not exceed 2 nW.
When the transmitter is in operation the cabinet radiation and spurious emissions shall not exceed 0,25 µW (-36 dBm).
ETSI EN 301 025-1 V1.5.1 (8.9.3)

Test Data:

The transceiver does not have a standby mode.

Mode: Operating.

Emission Frequency MHz	Ant. Polarity	ERP (dBm)		Emission Frequency MHz	Ant. Polarity	ERP (dBm)
156.8				157.40		
313.6	H	-66.3		314.80	V	-68.1
470.4	V	-62.9		472.20	H	-66.4
627.2	H	-46.3		629.70	H	-44.3
784	V	-56.2		787.10	V	-56.7
940.8	V	-58.4		944.50	V	-58.8
1097.6	V	-55.8		1101.90	V	-55.9
1254.4	V	-53.1		1259.40	V	-53.2
1411.2	H	-54.3		1416.80	H	-54.2
1568	V	-54.2		1574.20	V	-54.1

Conclusion: **The results meet the specified requirements**

TRANSIENT FREQUENCY BEHAVIOUR OF THE TRANSMITTER (8.10)

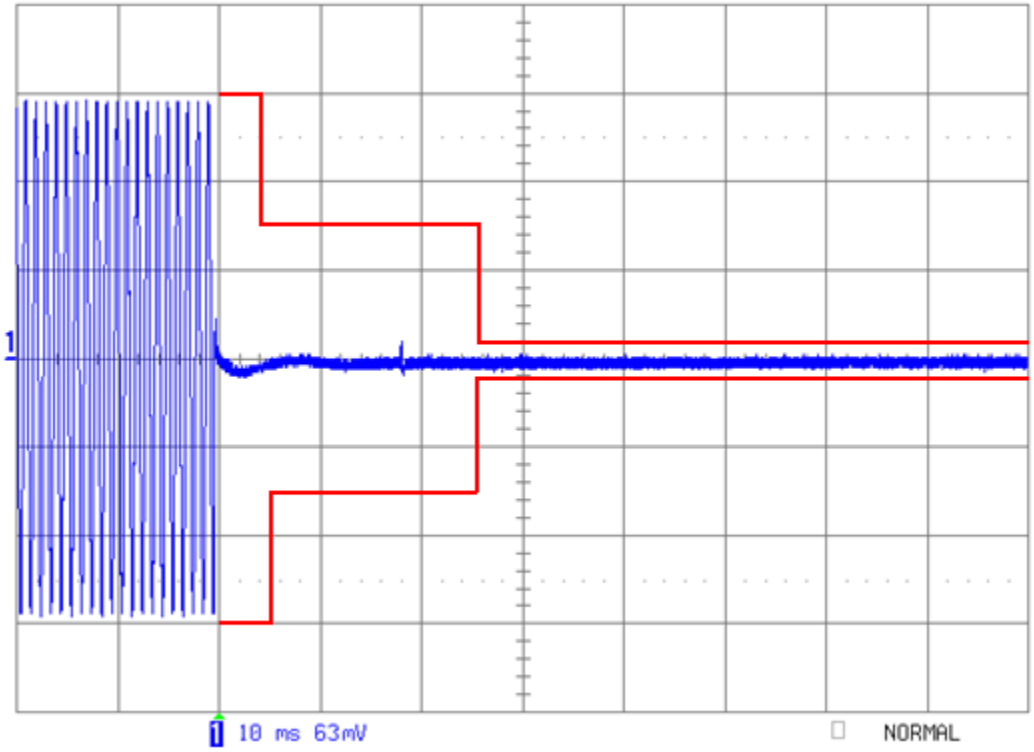
Method of Measurement - ETSI EN 301 025-1 V1.5.1 (8.10.2)

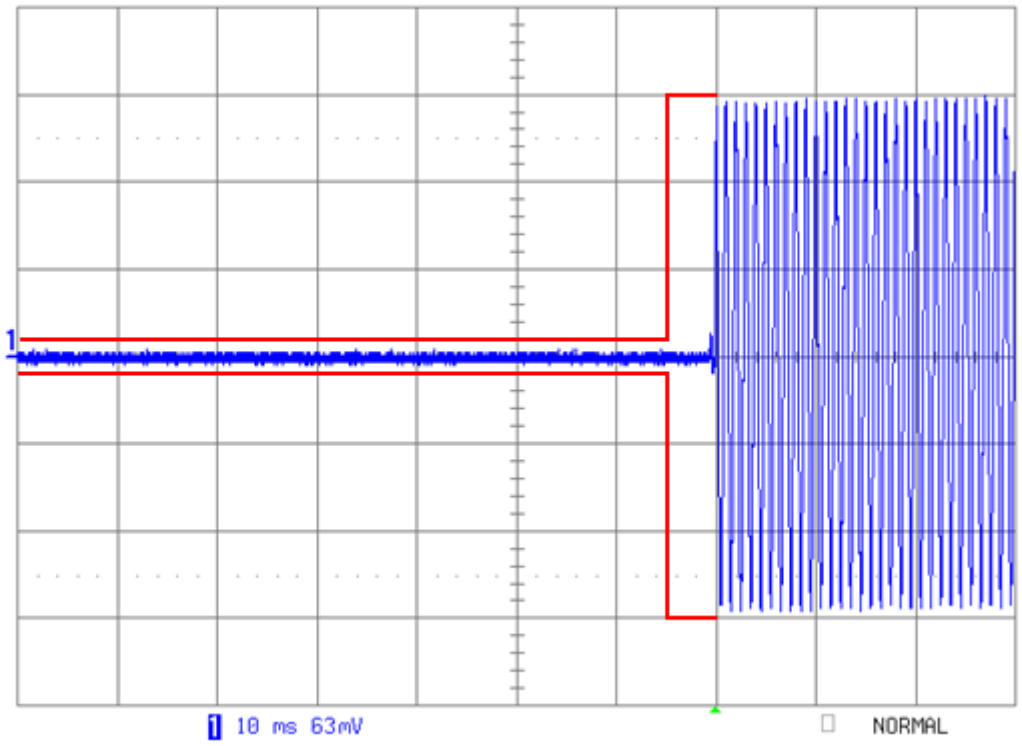
Limits: During the periods of time t_1 and t_3 the frequency difference shall not exceed ±25 kHz. The frequency difference after the end of t_2 shall be within the limit of the frequency error given in clause 8.1.
During the period of time t_2 the frequency difference shall not exceed ±12,5 kHz.
Before the start of t_3 the frequency difference shall be within the limit of the frequency error given in clause 8.1.

t1 = 5ms,
t2 = 20 ms,
t3 = 5ms

ETSI EN 301 025-1 V1.5.1 (8.10.3)

Test Data:





Conclusion: **The results meet the specified requirements**

TRANSMITTER CARRIER POWER (8.2)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (8.2.2)

Limits:

8.2.3.1 Normal test conditions

With the output power switch set at maximum, the carrier power shall remain between 6 W and 25 W and be within ±1.5 dB of the rated output power under normal test conditions. The output power shall never however exceed 25 W.

With the output power switch set at minimum the carrier power shall remain between 0,1 W and 1 W.

The maximum continuous transmission time shall be between 5 min and 6 min.

8.2.3.2 Extreme test conditions

With the output power switch set at maximum, the carrier power shall remain between 6 W and 25 W and be within +2 dB, -3 dB of the rated output power under extreme conditions. The output power shall never however exceed 25 W.

With the output power switch set at minimum the carrier power shall remain between 0,1 W and 1 W.

The maximum continuous transmission time shall be between 5 min and 6 min.

ETSI EN 301 025-1 V1.5.1 (8.2.3)

Test Data:

CH 16:-Watts

	+25 Deg C	-15 Deg C	+55 Deg C	
10.8 Volts	0.81	0.83	0.78	Lo
	21.8	22.0	21.6	Hi
12 Volts	0.81	0.83	0.78	Lo
	21.9	22.1	21.7	Hi
15.6 Volts	0.81	0.84	0.79	Lo
	22.0	22.3	21.9	Hi

CH 1:

	+25 Deg C	
12 Volts	23.5	Hi
	0.84	Lo

CH 88:

	+25 Deg C	
12 Volts	22.9	Hi
	0.82	Lo

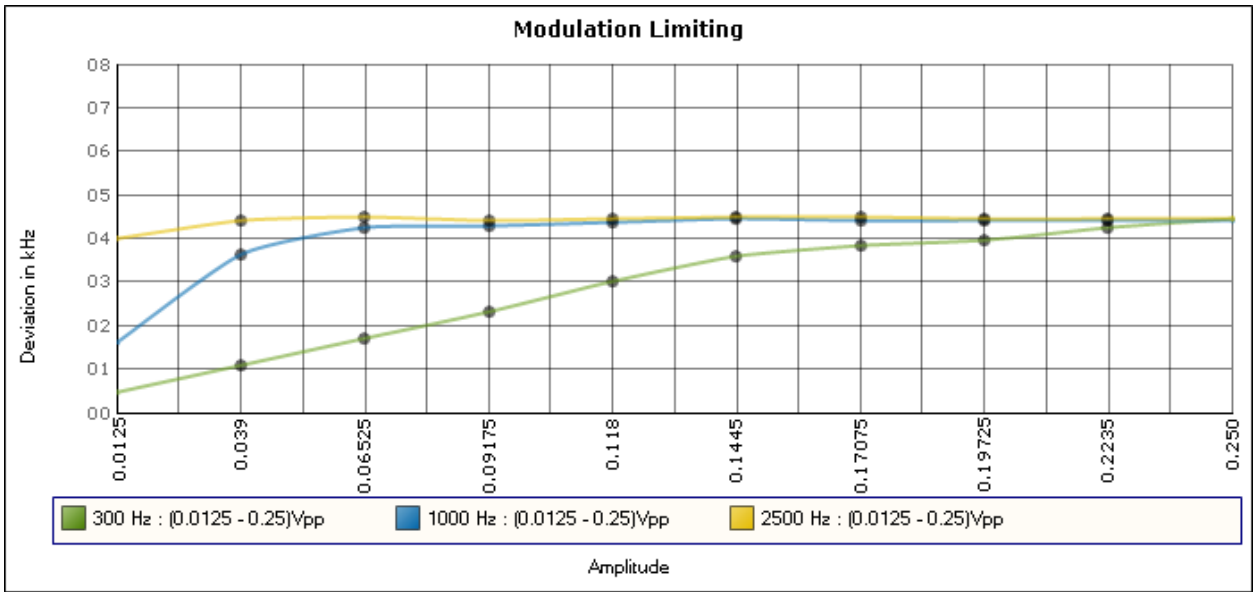
Conclusion: **The results meet the specified requirements**

TRANSMITTER FREQUENCY DEVIATION (8.3.2)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (8.3.2.1)

Limits: The maximum permissible frequency deviation shall be:
25 kHz channels: 5 kHz.
ETSI EN 301 025-1 V1.5.1 (8.3.2.2)

Test Data:



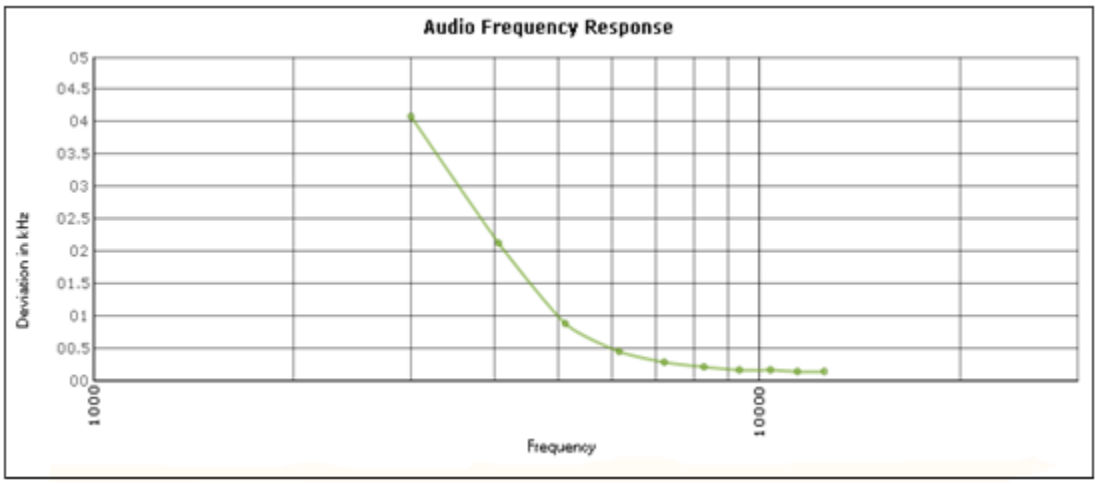
Conclusion: **The results meet the specified requirements**

TRANSMITTER FREQUENCY DEVIATION (8.3.3)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (8.3.3.1)

Limits: The frequency deviation at modulation frequencies between 3,0 kHz (for equipment operating with 25 kHz channel separations) or 2,55 kHz (for equipment operating with 12,5 kHz channel separation) and 6,0 kHz shall not exceed the frequency deviation at a modulation frequency of 3,0 kHz/2,55 kHz. At 6,0 kHz the deviation shall be not more than 30,0 % of the maximum permissible frequency deviation.
The frequency deviation at modulation frequencies between 6,0 kHz and a frequency equal to the channel separation for which the equipment is intended shall not exceed that given by a linear representation of the frequency deviation (dB) relative to the modulation frequency, starting at the 6,0 kHz limit and having a slope of -14,0 dB per octave.
ETSI EN 301 025-1 V1.5.1 (8.3.3.2)

Test Data:



Conclusion: **The results meet the specified requirements**

SENSITIVITY OF THE MODULATOR, INCLUDING MICROPHONE (8.4)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (8.4.2)

An acoustic signal with a frequency of 1 kHz and sound level of 94 dB(A) shall be applied to the microphone. The resulting deviation shall be measured.

Limits: The resulting frequency deviation shall be between ±1,5 kHz and ±3 kHz.

ETSI EN 301 025-1 V1.5.1 (8.3.3)

Test Data: 1 kHz test tone: 2.08 kHz deviation.

Conclusion: **The results meet the specified requirements**

SENSITIVITY OF THE MODULATOR, INCLUDING MICROPHONE (8.5)

Method of Measurement - ETSI EN 300 698-1 V1.4.1 (8.5.2)

An acoustic signal with a frequency of 1 kHz shall be applied to the microphone, and adjusted in level to produce a frequency deviation of ±3 kHz. The microphone shall be replaced by a sound level meter and the acoustic level measured.

Limits: The sound level applied to the microphone shall be 94dBA ±3 dB.

ETSI EN 300 698-1 V1.4.1 (8.5.3)

Test Data: Sound Level applied: 96dBA

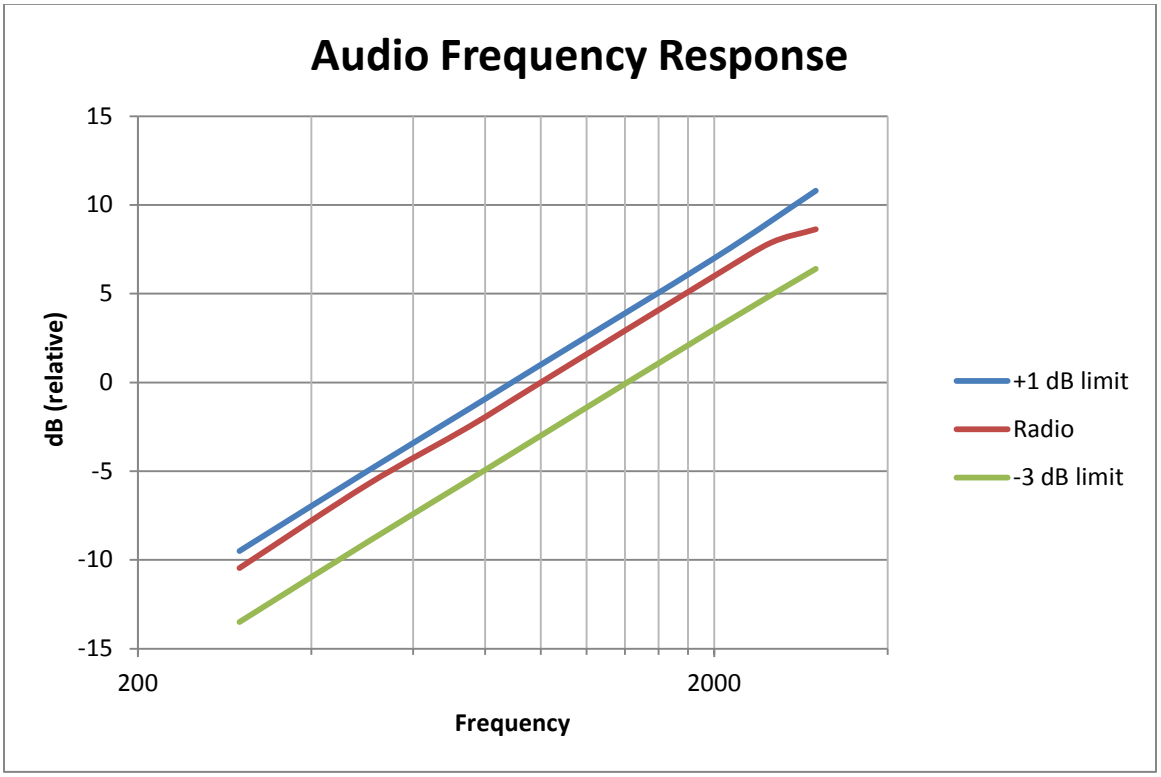
Conclusion: **The results meet the specified requirements**

AUDIO FREQUENCY RESPONSE (8.5) (TX)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (8.5.2)

Limits: The audio frequency response shall be within +1 dB and -3 dB of a 6 dB/octave line passing through the reference point (see figure 2). The upper limit frequency shall be 2,55 kHz for 12,5 kHz channels.
ETSI EN 301 025-1 V1.5.1 (8.10.3)

Test Data:



Conclusion: **The results meet the specified requirements**

AUDIO FREQUENCY HARMONIC DISTORTION OF EMISSION (8.6)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (8.6.2)

The RF signal produced by the transmitter shall be applied via an appropriate coupling device to a linear demodulator with a de-emphasis network of 6 dB per octave. This test shall be carried out on a 25 kHz channel with the output power switch at both maximum and minimum.

Under normal test conditions (see clause 6.13) the RF signal shall be modulated successively at frequencies of 300 Hz, 500 Hz and 1 kHz with a constant modulation index of 3.

Under extreme test conditions (see clauses 6.14.1 and 6.14.2 applied simultaneously), the measurements shall be carried out at 1 kHz with a frequency deviation of ±3 kHz.

Limits: The harmonic distortion shall not exceed 10 %..
ETSI EN 301 025-1 V1.5.1 (8.6.3)

Test Data:

	25 C	12 V
	Hi Power	Low Power
1000 Hz	1.8	1.7
300 Hz	7.7	5.7
500 Hz	4.5	3.6

1kHz	**+25 Deg C**	**-15 Deg C**	**+55 Deg C**	
10.8 Volts	1.2	1.2	1.1	Lo
	1.7	1.7	1.3	Hi
15.6 Volts	1.2	1.2	1.1	Lo
	1.7	1.7	1.3	Hi

Conclusion: **The results meet the specified requirements**

RESIDUAL MODULATION OF THE TRANSMITTER (8.11)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (8.11.2)

The normal test modulation defined in clause 6.4 shall be applied to the transmitter. The high frequency signal produced by the transmitter shall be applied, via an appropriate coupling device, to a linear demodulator with a de-emphasis network of 6 dB per octave. The time constant of this de-emphasis network shall be at least 750 µs. Precautions shall be taken to avoid the effects of emphasizing the low audio frequencies produced by internal noise. The signal shall be measured at the demodulator output using an r.m.s. voltmeter. The modulation shall then be switched off and the level of the residual audio frequency signal at the output shall be measured again.

Limits: The residual modulation shall not exceed -40 dB on either 12,5 kHz or 25 kHz channels.
ETSI EN 301 025-1 V1.5.1 (8.11.3)

Test Data:
Transceiver has only 25 kHz channels
Without modulation : -30dBV
With modulation : 15dBV
Residual modulation ratio : -45 dB

Conclusion: **The results meet the specified requirements**

DSC FREQUENCY ERROR (8.12)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (8.12.2)

Limits: The measured Frequency from the Demodulator at any time for the B-state shall be within 2100 Hz +/- 10 Hz and for the Y state within 1300 Hz +/- 10 Hz ETSI EN 301 025-1 V1.5.1 (8.12.3)

Test Data:

Measured frequency from the demodulator is shown in the following table:

	+25 Deg C	-15 Deg C	+55 Deg C	
12 Volts	1300.0	1300.0	1299.9	Y
	2100.0	2100.0	2099.9	B
10.8 Volts	1300.0	1300.0	1299.9	Y
	2100.0	2100.0	2099.9	B
15.6 Volts	1300.0	1300.0	1299.9	Y
	2100.0	2100.0	2099.9	B

Conclusion: **The results meet the specified requirements**

MODULATION INDEX FOR DSC (8.13)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (8.13.2)

Limits: The modulation index shall be 2.0 +/- 10% (i.e. 1.8 to 2.2)
ETSI EN 301 025-1 V1.5.1 (8.13.3)

Test Data: Measured Deviation (Y Tone) = 2.847 kHz
Measured Deviation (B Tone) = 4.600 kHz

$m_Y = \frac{Frequency\ Deviation}{Modulating\ Frequency} = \frac{2847}{1300} = 2.19$

$m_B = \frac{Frequency\ Deviation}{Modulating\ Frequency} = \frac{4600}{2100} = 2.19$

Conclusion: The results meet the specified requirements

MODULATION RATE FOR DSC (8.14)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (8.14.2)

The transmitter shall be set to transmit continuous dot pattern.

The RF output terminal of the transmitter, suitably attenuated, shall be connected via a linear FM demodulator to a calibrated FSK demodulator. The output of the FSK demodulator shall be limited in bandwidth by a low pass filter with a cut-off frequency of 1 kHz and a slope of 12 dB/octave.

The frequency of the output shall be measured.

Limits:	The frequency shall be 600 Hz +/- 30 ppm corresponding to a modulation rate of 1200 baud. *(i.e. between 599.982 Hz and 600.018 Hz)* ETSI EN 301 025-1 V1.5.1 (8.14.3)
Test Data:	Measured Frequency = 600.010 Hz
Conclusion:	The results meet the specified requirements

ATIS ENCODER FREQUENCY ERROR (B.2.2)

Method of Measurement - ETSI EN 300 698-1 V1.4.1 (B.2.2.2)

Limits: ETSI EN 300 698-1 V1.4.1 (B.2.2.3)
The measured frequency from the demodulator at any time for the B-state shall be within 2100 Hz +/- 10 Hz and for the Y state within 1300 Hz +/- 10 Hz.

Test Data:

Measured frequency from the demodulator is shown in the following table:

	-15 Deg C	+25 Deg C	+55 Deg C	
12 Volts	1300.0	1300.0	1299.9	Y
	2100.0	2100.0	2099.9	B
10.8 Volts	1300.0	1300.0	1299.9	Y
	2100.0	2100.0	2099.9	B
15.6 Volts	1300.0	1300.0	1299.9	Y
	2100.0	2100.0	2099.9	B

Conclusion: **The results meet the specified requirements.**

ATIS ENCODER MODULATION INDEX (B.2.3)

Method of Measurement - ETSI EN 300 698-1 V1.4.1 (B.2.3.2)

Limits: ETSI EN 300 698-1 V1.4.1 (B.2.3.3)
The modulation index shall be 1.0 +/- 10% (i.e. 0.9 to 1.1)

Test Data: Measured Deviation (Y Tone) = 1346 Hz
Measured Deviation (B Tone) = 2106 Hz

$$m_Y = \frac{Frequency\ Deviation}{Modulating\ Frequency} = (1416/1300) = 1.09$$

$$m_B = \frac{Frequency\ Deviation}{Modulating\ Frequency} = (2300/2100) = 1.09$$

Conclusion: **The results meet the specified requirements.**

ATIS ENCODER MODULATION RATE (B.2.4)

Method of Measurement - ETSI EN 300 698-1 V1.4.1 (B.2.4.2)

The transmitter shall be set to transmit continuous dot pattern.

The RF output terminal of the transmitter, suitably attenuated, shall be connected via a linear FM demodulator to a calibrated FSK demodulator. The output of the FSK demodulator shall be limited in bandwidth by a low pass filter with a cut-off frequency of 1 kHz and a slope of 12 dB/octave.

The frequency of the output shall be measured.

Limits:	ETSI EN 300 698-1 V1.4.1 (B.2.4.3) The frequency shall be 600 Hz +/- 60 ppm corresponding to a modulation rate of 1200 baud. *(i.e. between 599.964 Hz and 600.036 Hz)*
Test Data:	Measured Frequency = 600.010 Hz
Conclusion:	**The results meet the specified requirements .**

ATIS FORMAT (B.2.5)

Method of Measurement - ETSI EN 300 698-1 V1.4.1 (B.2.5)

Limits: The ATIS signal shall be analyzed with the calibrated apparatus for correct configuration of the signal format, including time diversity. The decoded ATIS protocol shall conform to the programmed ATIS data in the equipment under test.
ETSI EN 300 698-1 V1.4.1 (B.2.5)

Test Data: Decoded signal information:-

```
ATIS from 9000000007

Call Id:            1000562
Time:               000101 01:12:37
Carrier:            ch70
Station:            Test Station         100%   0

Format:             ATIS
From:               9000000007
End Of Sequence:    EOS

Raw DSC Symbols:
121 121 90 00 00 00 07 127 91

FEC:
125 111 125 110 125 109 125 108 125 107 125 106 121 105 121 104 090 121 000
121 000 090 000 000 007 000 127 000 091 007 127 127 127 091

FEC+Parity:
  27D 26F 27D 16E 27D 16D 27D 36C 27D 16B 27D 36A 179 369 179 0E8 35A 179
   380 179 380 35A 380 380 087 380 07F 380 15B 087 07F 07F 07F 15B
```

CALCULATIONS AND CONVERSIONS – ATIS FORMAT

Conversion of radio call sign into ATIS identification:

1) 9000000007
2) 90 00 00 00 07

Calculation of ECC:

121	Y B B Y Y Y Y	--Vertical even parity ; B=0 ; Y=1;
90	B Y B Y Y B Y	
00	B B B B B B B	
00	B B B B B B B	
00	B B B B B B B	
07	Y Y Y B B B B	
127	Y Y Y Y Y Y Y	

	Y Y B Y Y B Y	-> **91**

Received ATIS signal sequence:-

	DX	RX	
Phasing Sequence	125		**Phasing Sequence**
		111	
	125		
		110	
	125		
		109	
	125		
		108	
	125		
		107	
	125		
Format Specifier		106	
	121		
		105	
	121		
		104	
Identification	90		**Format Specifier**
		121	
	00		
		121	
	00		
		90	**Identification**
	00		
		00	
	07		
End of Sequence		00	
	127		
		00	
Error Check	91		
End Of Sequence		07	
	127		**End Of Sequence**
		127	
	127		
		91	**Error Check**

Conclusion: **Correct configuration of the signal format, including time diversity is observed. The calculated error check character matches the received error check character. The result meets the requirement.**

ATIS PROGRAMMING (4.4.8)

Method of Measurement - ETSI EN 300 698-3 V1.2.1 (5.3.2.8)

Limits: ETSI EN 300 698-3 V1.5.1 (4.4.8.2)
It shall not be possible for the operator to disconnect or to change the programming of the ATIS facility.

Test Data: The radio identification is stored in a non-volatile memory and the end user is not allowed to edit the saved ATIS ID data.

Conclusion: **The results meet the specified requirements**

RECEIVER AUDIO FREQUENCY RESPONSE (9.2)

Method of Measurement - EN 301 025-1 V1.5.1 (9.2.2)

A test signal of +60 dBµV (e.m.f.), at a carrier frequency equal to the nominal frequency of the receiver and modulated with normal test modulation (see clause 6.4) shall be applied to the receiver antenna port under the conditions specified in clause 6.1.

The receiver's audio frequency power control shall be set so as to produce a power level equal to 50 % of the rated output power (see clause 9.1). This setting shall remain unchanged during the test.

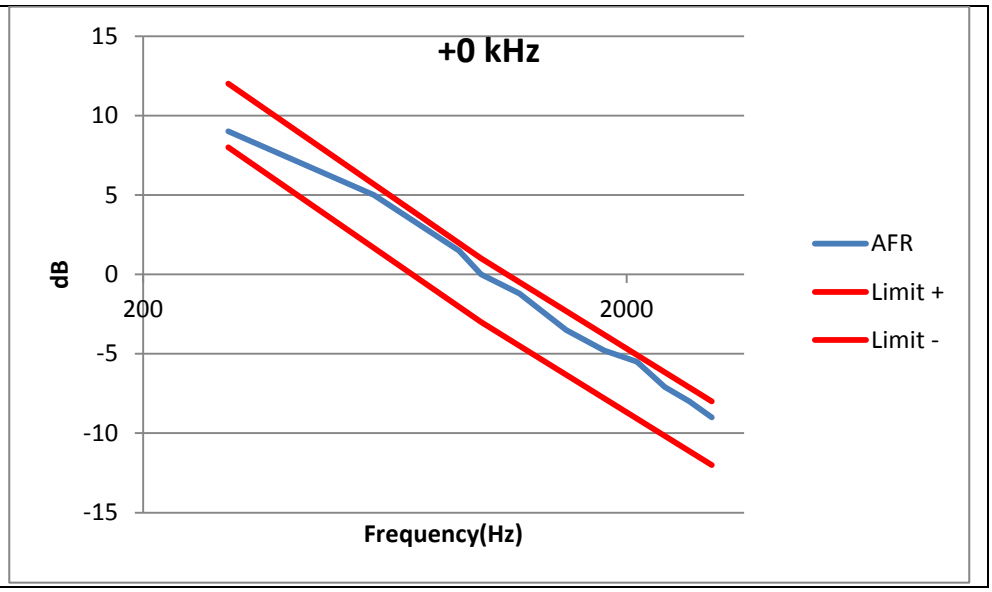
The frequency deviation shall then be reduced to ±1 kHz and the audio output is the reference point in figure 5 (1 kHz corresponds to 0 dB).
The frequency deviation shall remain constant while the modulation frequency is varied between 300 Hz and 3 kHz and the output level shall then be measured.

The measurement shall be repeated with a test signal at frequencies 1,5 kHz above and below the nominal frequency of the receiver.

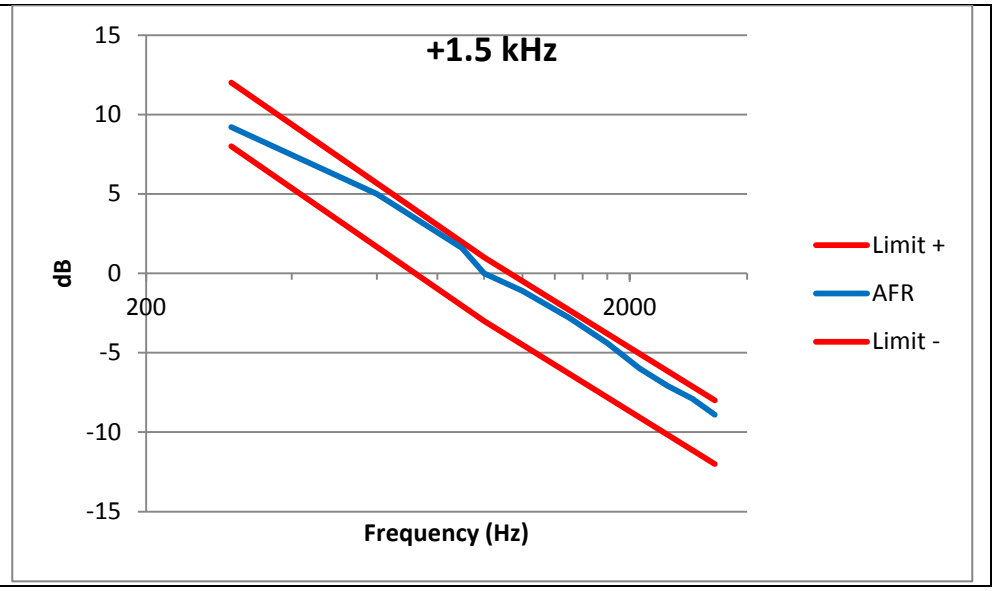
Limits: The audio frequency response shall not deviate by more than +1 dB or -3 dB from a characteristic giving the output level as a function of the audio frequency, decreasing by 6 dB per octave and passing through the measured point at 1 kHz
EN 301 025-1 V1.5.1 (9.2.3)

Test Data:

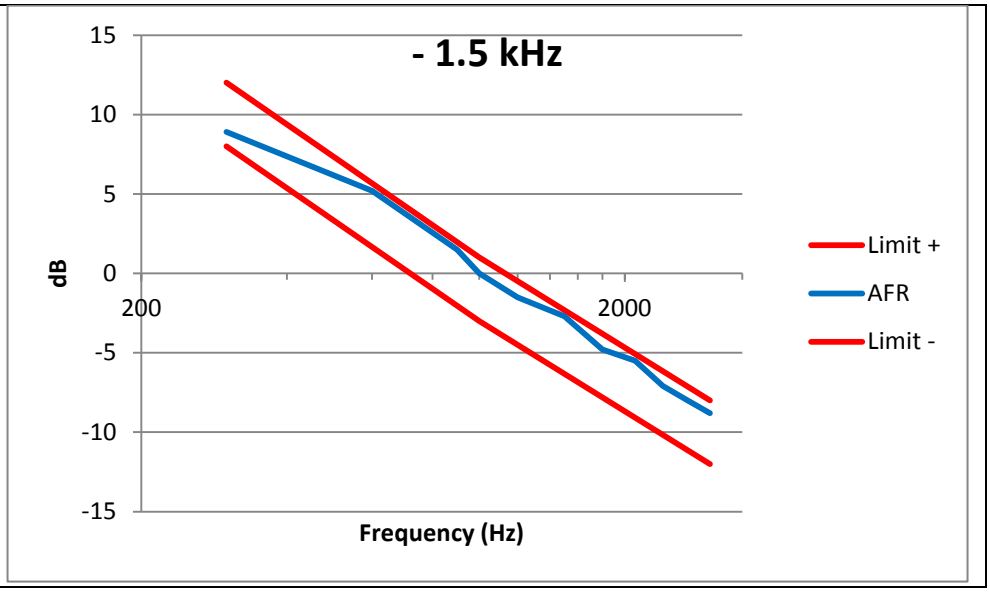
Freq	AFR
	dB
300	9
600	5
900	1.5
1000	0
1200	-1.2
1500	-3.5
1800	-4.8
2100	-5.5
2400	-7.1
2700	-8
3000	-9



Freq	AFR
	dB
300	9.2
600	5
900	1.6
1000	0
1200	-1.1
1500	-2.8
1800	-4.4
2100	-6
2400	-7.1
2700	-7.9
3000	-8.9



Freq	AFR
	dB
300	8.9
600	5.2
900	1.5
1000	0
1200	-1.5
1500	-2.7
1800	-4.8
2100	-5.5
2400	-7.1
2700	-8
3000	-8.8



Conclusion: **The results meet the specified requirements**

RECEIVER MAXIMUM USABLE SENSITIVITY (9.3)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (9.3.2)

A test signal at a carrier frequency equal to the nominal frequency of the receiver, modulated by the normal test modulation (see clause 6.4) shall be applied to the receiver input. An audio frequency load and a measuring instrument for measuring SINAD ratio (through a psophometric network as specified in clause 9.3.1) shall be connected to the receiver output terminals.

The level of the test signal shall be adjusted until a SINAD ratio of 20 dB is obtained, using the psophometric network and with the receiver's audio-frequency power control adjusted to produce 50 % of the rated output power. Under these conditions, the level of the test signal at the input is the value of the maximum usable sensitivity.

The measurements shall be made under normal test conditions (see clause 6.13) and under extreme test conditions (see clauses 6.14.1 and 6.14.2 applied simultaneously).

A receiver output power variation of ±3 dB relative to 50 % of the rated output power may be allowed for sensitivity measurements under extreme test conditions.

Limits: The maximum usable sensitivity for either 25 kHz or 12,5 kHz channels shall not exceed +6 dBµV (e.m.f.) under normal test conditions and +12 dBµV (e.m.f.) under extreme test conditions. ETSI EN 301 025-1 V1.5.1 (9.3.3)

Test Data:

@ +25 C, 12 V : Measured sensitivity : -2 dBµV *emf*
@ -15 C, -10.8V/12V/ 15.6V: -1.5 dBµV *emf*
@+55 C, -10.8V/12V/15.6V: 0 dBµV *emf*

Conclusion: **The results meet the specified requirements**

RECEIVER CO CHANNEL REJECTION (9.4)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (9.4.2)

The two input signals shall be connected to the receiver via a combining network (see clause 6.1). The wanted signal shall have normal test modulation (see clause 6.4). The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz (for 12.5 kHz channel use 1.5 kHz dev.). Both input signals shall be at the nominal frequency of the receiver under test and the measurement repeated for displacements of the unwanted signal of ±3 kHz (see note).

The wanted input signal shall be set to the value corresponding to the measured maximum usable sensitivity (see clause 9.3). The amplitude of the unwanted input signal shall then be adjusted until the SINAD ratio (psophometrically weighted) at the output of the receiver is reduced to 14 dB.

The co-channel rejection ratio shall be expressed as the ratio in dB of the level of the unwanted signal to the level of the wanted signal at the receiver input for which the specified reduction in SINAD ratio occurs.

Limits: The co-channel rejection ratio, at any frequency of the unwanted signal within the specified range, shall be between:

- -10 dB and 0 dB for 25 kHz channels;
- -12 dB and 0 dB for 12,5 kHz channels.

ETSI EN 301 025-1 V1.5.1 (9.4.3)

Test Data:

Co-Channel Rejection:

@Unwanted signal displacement +0 kHz : -7.5 dB

@Unwanted signal displacement +3 kHz : -7.5 dB

@Unwanted signal displacement -3 kHz : -6.5dB

Conclusion: **The results meet the specified requirements**

RECEIVER ADJACENT CHANNEL SELECTIVITY (9.5)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (9.5.2)

The two input signals shall be applied to the receiver input via a combining network (see clause 6.1). The wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation (see clause 6.4). The unwanted signal shall be modulated by 400 Hz with a deviation of ⍰}3 kHz for 25 kHz channels or ⍰}1,5 kHz for 12,5 kHz channels, and shall be at the frequency of the channel immediately above that of the wanted signal.

The wanted input signal level shall be set to the value corresponding to the maximum usable sensitivity. The amplitude of the unwanted input signal shall then be adjusted until the SINAD ratio at the receiver output, psophometrically weighted, is reduced to 14 dB. The measurement shall be repeated with an unwanted signal at the frequency of the channel below that of the wanted signal.

The adjacent channel selectivity shall be expressed as the lower value of the ratios in dB for the upper and lower adjacent channels of the level of the unwanted signal to the level of the wanted signal.

The measurements shall then be repeated under extreme test conditions (see clauses 6.14.1 and 6.14.2 applied simultaneously) with the wanted signal set to the value corresponding to the maximum usable sensitivity under these conditions.

Limits: 25 kHz channels: the adjacent channel selectivity shall be not less than 70 dB under normal test conditions and not less than 60 dB under extreme test conditions.
ETSI EN 301 025-1 V1.5.1 (9.5.3)

Test Data: Nominal/wanted channel frequency : 156.800 MHz

	+25 Deg C	-15 Deg C	+55 Deg C	
10.8 Volts	82	83	81	Lo
	80	80	80	Up
12 Volts	82	82	81	Lo
	80	80	80	Up
15.6 Volts	82	82	81	Lo
	80	80	80	Up

Conclusion: **The results meet the specified requirements**

MAXIMUM USABLE SENSITIVITY FOR DSC RECEIVER (10.1)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (10.1.2)

DSC standard test signal (see clause 6.9) containing DSC calls shall be applied to the receiver input. The input level shall be 0 dBµV under normal test conditions (see clause 6.13) and +6 dBµV under extreme test conditions (see clauses 6.14.1 and 6.14.2 applied simultaneously).

The measurement shall be repeated under normal test conditions at the nominal carrier frequency ±1,5 kHz.

The bit error ratio in the decoder output shall be determined as described in clause 6.10.

Limits: The bit error ratio shall be equal to or less than 10^{-2}.
ETSI EN 301 025-1 V1.5.1 (10.1.3)

Test Data:

	+25 Deg C	**-15 Deg C**	**+55 Deg C**	
10.8 Volts	$< 10^{-2}$	$< 10^{-2}$	$< 10^{-2}$	Lo
	$< 10^{-2}$	$< 10^{-2}$	$< 10^{-2}$	Nom
	$< 10^{-2}$	$< 10^{-2}$	$< 10^{-2}$	Up
12 Volts	$< 10^{-2}$	$< 10^{-2}$	$< 10^{-2}$	Lo
	$< 10^{-2}$	$< 10^{-2}$	$< 10^{-2}$	Nom
	$< 10^{-2}$	$< 10^{-2}$	$< 10^{-2}$	Up
15.6 Volts	$< 10^{-2}$	$< 10^{-2}$	$< 10^{-2}$	Lo
	$< 10^{-2}$	$< 10^{-2}$	$< 10^{-2}$	Nom
	$< 10^{-2}$	$< 10^{-2}$	$< 10^{-2}$	Up

Conclusion: **The results meet the specified requirements**

DSC RECEIVER ADJACENT CHANNEL SELECTIVITY (10.3)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (10.3.2)

The two input signals shall be connected to the receiver input terminal via a combining network (see clause 6.1).

The wanted signal shall be the DSC standard test signal (see clause 6.9) containing DSC calls. The level of the wanted signal shall be +3 dBµV under normal test conditions and +9 dBµV under extreme test conditions.

The unwanted signal shall be modulated to 400 Hz with a deviation of ±3 kHz. The unwanted signal shall be tuned to the center frequency of the upper adjacent channel. The input level of the unwanted signal shall be 73 dBµV under normal test conditions and 63 dBµV under extreme test conditions.

The bit error ratio in the decoder output shall be determined as described in clause 6.10.

The measurement shall be repeated with the unwanted signal tuned to the center frequency of the lower adjacent channel.

The measurement shall be carried out under normal test conditions (see clause 6.13) and under extreme test conditions (see clauses 6.14.1 and 6.14.2 applied simultaneously).

Limits: The bit error ratio shall be equal to or less than 10^{-2}.
ETSI EN 301 025-1 V1.5.1 (10.3.3)

Test Data:

	+25 Deg C	-15 Deg C	+55 Deg C	
10.8 Volts	$< 10^{-2}$	$< 10^{-2}$	$< 10^{-2}$	Lo
	$< 10^{-2}$	$< 10^{-2}$	$< 10^{-2}$	Up
12 Volts	$< 10^{-2}$	$< 10^{-2}$	$< 10^{-2}$	Lo
	$< 10^{-2}$	$< 10^{-2}$	$< 10^{-2}$	Up
15.6 Volts	$< 10^{-2}$	$< 10^{-2}$	$< 10^{-2}$	Lo
	$< 10^{-2}$	$< 10^{-2}$	$< 10^{-2}$	Up

Conclusion: **The results meet the specified requirements**

CO-CHANNEL REJECTION FOR DSC RECEIVER (10.2)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (10.2.2)

The two input signals shall be connected to the receiver input terminal via a combining network (see clause 6.1). The wanted signal shall be the DSC standard test signal (see clause 6.9) containing DSC calls. The level of the wanted signal shall be +3 dBµV. The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz. Both input signals shall be at the nominal frequency of the receiver under test and the measurement shall be repeated for displacements of the unwanted signal of up to ±3 kHz.

The input level of the unwanted signal shall be -5 dBµV.

The bit error ratio in the decoder output shall be determined as described in clause 6.10.

Limits: The bit error ratio shall be equal to or less than 10^{-2}.
ETSI EN 301 025-1 V1.5.1 (10.2.3)

Test Data: The measured BER was $< 10^{-2}$

Conclusion: **The results meet the specified requirements**

RECEIVER SPURIOUS RESPONSE REJECTION (9.6)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (9.6.2)

Two input signals shall be applied to the receiver input via a combining network (see clause 6.1). The wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation (see clause 6.4).

The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz.

The wanted input signal level shall be set to the value corresponding to the maximum usable sensitivity. The amplitude of the unwanted input signal shall be adjusted to an e.m.f. of +86 dBµV. The frequency shall then be swept over the frequency range from 100 kHz to 2 000 MHz.

At any frequency at which a response is obtained, the input level shall be adjusted until the SINAD ratio psophometrically weighted, is reduced to 14 dB.

The spurious response rejection ratio shall be expressed as the ratio in dB between the unwanted signal and the wanted signal at the receiver input when the specified reduction in the SINAD ratio is obtained.

Limits: At any frequency separated from the nominal frequency of the receiver by more than 25 kHz, the spurious response rejection ratio shall be not less than 70 dB.
ETSI EN 301 025-1 V1.5.1 (9.6.3)

Test Data: The Spurious Response Rejection was greater than 70 dB on all frequencies.

Conclusion: **The results meet the specified requirements**

RECEIVER INTERMODULATION RESPONSE (9.7)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (9.7.2)

Three signal generators, A, B and C shall be connected to the receiver via a combining network (see clause 6.1). The wanted signal, represented by signal generator A shall be at the nominal frequency of the receiver and shall have normal test modulation (see clause 6.4). The unwanted signal from signal generator B shall be unmodulated and adjusted to the frequency 50 kHz above (or below) the nominal frequency of the receiver. The second unwanted signal from signal generator C shall be modulated by 400 Hz with a deviation of ±3 kHz, and adjusted to a frequency 100 kHz above (or below) the nominal frequency of the receiver.

The wanted input signal shall be set to a value corresponding to the maximum usable sensitivity. The amplitude of the two unwanted signals shall be maintained equal and shall be adjusted until the SINAD ratio at the receiver output, psophometrically weighted, is reduced to 14 dB. The frequency of signal generator B shall be adjusted slightly to produce the maximum degradation of the SINAD ratio. The level of the two unwanted test signals shall be readjusted to restore the SINAD radio of 14 dB. The intermodulation response ratio shall be expressed as the ratio in dB between the two unwanted signals and the wanted signal at the receiver input, when the specified reduction in the SINAD ratio is obtained.

Limits: The intermodulation response ratio shall be greater than 68 dB.
ETSI EN 301 025-1 V1.5.1 (9.7.3)

Test Data: A = wanted, 156.8 MHz , normal test modulation
B = unwanted CW, 50 kHz above/below wanted channel
C = unwanted modulated (400 Hz/3kHz) above/below wanted channel

	Intermod Response Ratio
B(+50 KHz),C(+100KHz)	73
B(-50 KHz),C(-100KHz)	72

Conclusion: **The results meet the specified requirements**

DSC RECEIVER INTERMODULATION RESPONSE (10.5)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (10.5.2)

The three input signals shall be connected to the receiver input terminal via a combining network (see clause 6.1).

The wanted signal represented by signal generator A shall be at the nominal frequency of the receiver and shall be the DSC standard test signal (see clause 6.9) containing DSC calls. The level of the wanted signal shall be +3 dBµV.

The unwanted signals shall be applied, both at the same level. The unwanted signal from signal generator B shall be unmodulated and adjusted to a frequency 50 kHz above (or below) the nominal frequency of the receiver. The second unwanted signal from signal generator C shall be modulated by 400 Hz with a deviation of ±3 kHz and adjusted to a frequency 100 kHz above (or below) the nominal frequency of the receiver.

The input level of the unwanted signals shall be 68 dBµV.

The bit error ratio in the decoder output shall be determined as described in clause 6.10.

Limits: The bit error ratio shall be equal to or less than 10^{-2}.
ETSI EN 301 025-1 V1.5.1 (10.5.3)

Test Data: A = wanted, 156.8 MHz , normal test modulation
B = unwanted CW, 50 kHz above/below wanted channel
C = unwanted modulated (400 Hz/3kHz) above/below wanted channel

	Bit Error Ratio
B(+50 KHz),C(+100KHz)	$< 10^{-2}$
B(-50 KHz),C(-100KHz)	$< 10^{-2}$

Conclusion: **The results meet the specified requirements**

SPURIOUS RESPONSE AND BLOCKING FOR DSC RECEIVER (10.4)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (10.4.2)

The two input signals shall be connected to the receiver input terminal via a combining network (see clause 6.1). The wanted signal shall be the DSC standard test signal (see clause 6.9) containing DSC calls. The level of the wanted signal shall be +3 dBµV.

For the spurious response test the unwanted signal shall be unmodulated. The frequency shall be varied over the range 9 kHz to 2 GHz with the exception of the channel of the wanted signal and its adjacent channels. The unwanted signal level shall be 73 dBµV. Where spurious response occurs, the bit error ratio shall be determined.

For the blocking test the unwanted signal shall be unmodulated. The frequency shall be varied between -10 MHz and -1 MHz and also between +1 MHz and +10 MHz relative to the nominal frequency of the wanted signal. The unwanted signal shall be at a level of 93 dBµV. Where blocking occurs, the bit error ratio shall be determined.

The bit error ratio in the decoder output shall be determined as described in clause 6.10.

Limits: The bit error ratio shall be equal to or less than 10^{-2}.
ETSI EN 301 025-1 V1.5.1 (10.4.3)

Test Data: The measured BER was $< 10^{-2}$ for all frequencies for the spurious response test and the blocking test.

Conclusion: **The results meet the specified requirements**

RECEIVER BLOCKING OR DESENSITIZATION (9.8)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (9.8.2)

Two input signals shall be applied to the receiver via a combining network (see clause 6.1). The modulated wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation (see clause 6.4). Initially the unwanted signal shall be switched off and the wanted signal set to the value corresponding to the maximum usable sensitivity.

The output power of the wanted signal shall be adjusted, where possible, to 50 % of the rated output power and in the case of stepped volume controls, to the first step that provides an output power of at least 50 % of the rated output power. The unwanted signal shall be unmodulated and the frequency shall be swept between +1 MHz and +10 MHz, and also between -1 MHz and -10 MHz, relative to the nominal frequency of the receiver. For practical reasons the measurements will be carried out at frequency offsets of the unwanted signal at approximately 1 MHz, 2 MHz, 5 MHz and 10 MHz.

The input level of the unwanted signal, at all frequencies in the specified ranges, shall be so adjusted that the unwanted signal causes:

a) a reduction of 3 dB in the output level of the wanted signal; or

b) a reduction to 14 dB of the SINAD ratio at the receiver output using a psophometric telephone filtering network such as described in ITU-T Recommendation O.41 [2] whichever occurs first. This level shall be noted.

Limits: The blocking level for any frequency within the specified ranges, shall be not less than 90 dBµV (e.m.f.), except at frequencies on which spurious responses are found (see clause 9.6).
ETSI EN 301 025-1 V1.5.1 (9.8.3)

Test Data:

Unwanted freq. Displacement MHz	Blocking Level $dB\mu V_{emf}$
-1	91.5
-2	94.5
-5	97.5
-10	97.5
+2	91.5
+5	95.5
+10	98.5

Conclusion: **The results meet the specified requirements**

RECEIVER SPURIOUS EMISSIONS AT THE ANTENNA (9.9)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (9.9.2)

Limits: The power of any spurious emission shall not exceed 2 nW at any frequency in the range between 9 kHz and 2 GHz.
ETSI EN 301 025-1 V1.5.1 (9.9.3)

Test Data: ALL emissions between 9 kHz and 2 kHz less than 2 nW. or -57 dBm

Frequency		
MHz		dBm
7.7		-68.8
12.1		-72.1
13.9		-70.4
15.6		-71
18.4		-73.5
23.5		-76.5
31.4		-76.9
123.3		-81.9
135.4		-75.7
138.6		-86.3
246.3		-94.6
492.7		-91.6
561		-93.1
615.9		-93.8
1122.1		-93.5
1683.3		-92.8
1823.6		-88.4

Conclusion: **The results meet the specified requirements**

RECEIVER CABINET RADIATED SPURIOUS EMISSIONS (9.10)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (9.10.2)

Limits: The power of any spurious radiation shall not exceed 2 nW (-57dBm) at any frequency in the range between 30 MHz and 2 GHz.
ETSI EN 301 025-1 V1.5.1 (9.10.3)

Test Data: Test on channel 16.

Emission Frequency MHz	Ant. Polarity	ERP dBm
31.90	V	-58.6
61.30	V	-60.4
72.50	V	-70.4
168.10	V	-58.8
239.70	V	-63.0
251.20	V	-65.7
264.10	V	-63.2
311.50	V	-61.5
1692.00	V	-61.2
1395.00	H	-66.2

Test Data: Test on channel 70.

Emission Frequency MHz	Ant. Polarity	ERP dBm
31.90	V	-58.4
60.70	V	-59.5
72.50	V	-68.9
168.10	V	-58.4
239.70	V	-63.1
264.10	V	-61.3
311.50	V	-62.7
360.20	H	-64.8
1485.00	V	-62.7
1927.00	H	-61.9

Conclusion: **The results meet the specified requirements**

HARMONIC DISTORTION AND RATED AUDIO FREQUENCY OUTPUT POWER (9.1)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (9.1.2)

Test signals at levels of +60 dBµV (e.m.f.) and +100 dBµV (e.m.f.), at a carrier frequency equal to the nominal frequency of the receiver and modulated by the normal test modulation (see clause 6.4) shall be applied in succession to the receiver input under the conditions specified in clause 6.1.

For each measurement, the receiver's audio-frequency volume control shall be set so as to obtain, in a resistive load which simulates the receiver's operating load, the rated audio frequency output power (see clause 9.1.1). The value of this load shall be stated by the manufacturer.

Under normal test conditions (see clause 6.13) the test signal shall be modulated successively at 300 Hz, 500 Hz and 1 kHz with a constant modulation index of 3 (ratio between the frequency deviation and the modulation frequency). The harmonic distortion and audio frequency output power shall be measured at all the frequencies specified above.

Limits: The rated audio-frequency output power shall be at least:

- 2 W in a loudspeaker;
- 1 mW in the handset earphone.

The harmonic distortion shall not exceed 10 %.
ETSI EN 301 025-1 V1.5.1 (9.1.3)

Test Data:

The rated speaker load is 4 ohms

+20 C

	signal level = 60 dBuV*emf*	**signal level = 100 dBuV*emf***
1000 Hz	0.42 %	1.1 %
500 Hz	0.9 %	1.6%
300 Hz	1.2 %	1.7 %

-15 C

1000 Hz	**signal level = 60 dBuV*emf***	**signal level = 100 dBuV*emf***
12	0.5 %	1.1 %
10.8 V	0.5 %	1.1 %
15.6 V	0.5 %	1.1 %

+55 C

1000 Hz	**signal level = 60 dBuV*emf***	**signal level = 100 dBuV*emf***
12 V	0.4 %	1.1 %
10.8 V	0.4 %	1.1 %
15.6 V	0.4 %	1.1 %

Conclusion: **The results meet the specified requirements**

RECEIVER RESIDUAL NOISE LEVEL (9.11)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (9.11.2)

A test signal with a level of +30 dBµV (e.m.f.) at a carrier frequency equal to the nominal frequency of the receiver, and modulated by the normal test modulation specified in clause 6.4, shall be applied to the receiver input. An audio frequency load shall be connected to the output terminals of the receiver. The audio frequency power control shall be set so as to produce the rated output power level conforming to clause 9.1.

The output signal shall be measured by a r.m.s. voltmeter having a -6 dB bandwidth of at least 20 kHz. The modulation shall then be switched off and the audio-frequency output level measured again.

Limits: The receiver residual noise level shall not exceed -40 dB.
ETSI EN 301 025-1 V1.5.1 (9.11.3)

Test Data:

Without modulation: -58.8dBV
With modulation: -8.7 dBV
Residual modulation: -50.1 dB

Conclusion: **The results meet the specified requirements**

SQUELCH OPERATION (9.12)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (9.12.2)

a) With the squelch facility switched off, a test signal of +30 dBµV, at a carrier frequency equal to the nominal frequency of the receiver and modulated by the normal test modulation specified in clause 6.4, shall be applied to the input terminals of the receiver. An audio frequency load and a psophometric filtering network (clause 9.3.1) shall be connected to the output terminals of the receiver. The receiver's audio frequency power control shall be set so as to produce the rated output power defined in clause 9.1. The output signal shall be measured with the aid of an r.m.s. voltmeter. The input signal shall then be suppressed, the squelch facility switched on and the audio frequency output level measured again.

b) Equipment with a preset or automatic squelch:
With the squelch facility switched off again, a test signal modulated by the normal test modulation shall be applied to the receiver input at a level of +6 dBµV (e.m.f) and the receiver shall be set to produce at least 50 % of the rated output power. The level of the input signal shall then be reduced and the squelch facility shall be switched on. The input signal shall then be increased until the above-mentioned output power is reached. The SINAD ratio and the input level shall then be measured.

c) Equipment with a user operated continuously variable squelch:
With the squelch facility switched off, a test signal with normal test modulation shall be applied to the receiver input at a level of +6 dBµV (e.m.f), and the receiver shall be set to produce at least 50 % of the rated audio output power. The level of the input signal shall then be reduced and the squelch facility shall be switched on. The squelch shall then be at its maximum position and the level of the input signal increased until the output power returns to at least 50 % of the rated audio output power.

Limits: Under the conditions specified in a) clause 9.12.2, the audio frequency output power shall not exceed -40 dB relative to the rated output power.
Under the conditions specified in b) clause 9.12.2, the input level shall not exceed +6 dBµV (e.m.f.) and the SINAD ratio shall be at least 20 dB.
Under the conditions specified in c) clause 9.12.2, the input signal shall not exceed +6 dBµV (e.m.f.) when the control is set at maximum.
ETSI EN 301 025-1 V1.5.1 (9.12.3)

Test Data:

Case a) SQUELCH OFF = 0.36 dBV
SQUELCH ON = -116 dBV ; Audio level relative to rated o/p power = **-116 dB**

Case b) Not Applicable.

Case c) I/P signal level when squelch is set to maximum: **4.0 dBuV*emf (31 dB SINAD)***

Conclusion: **The results meet the specified requirements**

SQUELCH HYSTERESIS (9.13)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (9.13.2)

If there is any squelch control on the exterior of the equipment it shall be placed in its maximum muted position. With the squelch facility switched on, an unmodulated input signal at a carrier frequency equal to the nominal frequency of the receiver shall be applied to the input of the receiver at a level sufficiently low to avoid opening the squelch. The input signal shall be increased at the level just opening the squelch. This input level shall be recorded. With the squelch still open, the level of the input signal shall be slowly decreased until the squelch mutes the receiver audio output again.

Limits: The squelch hysteresis shall be between 3 dB and 6 dB.
ETSI EN 301 025-1 V1.5.1 (9.13.3)

Test Data:

Level to just open squelch: 3.0 dBuV*emf*
Level to just close Squelch: -2.0 dBuV*emf*

Hysteresis Level : **5.0 dB**

Conclusion: **The results meet the specified requirements**

DYNAMIC RANGE (10.3)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (10.3.2)

A test signal in accordance with the DSC standard test signal (see clause 6.9) containing consecutive DSC calls, shall be applied to the receiver input. The level of the test signal shall alternate between 100 dBµV and 0 dBµV.

The bit error ratio in the decoder output shall be determined as described in clause 6.10.

Limits: The bit error ratio shall be equal to or less than 10^{-2}.
ETSI EN 301 025-1 V1.5.1 (10.3.3)

Test Data:

@ Input Signal level = 100dBuVemf, measured DSC error < 10^{-2}

@ Input Signal level = 0dBuVemf, measured DSC error < 10^{-2}

Conclusion: **The results meet the specified requirements**

VIBRATION TEST (7.4)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (7.4.2)

The equipment shall be subjected to sinusoidal vertical vibration at all frequencies between:

• 5 Hz and 13,2 Hz with an excursion of ±1 mm ± 10 % (7 m/s2 maximum acceleration at 13,2 Hz);

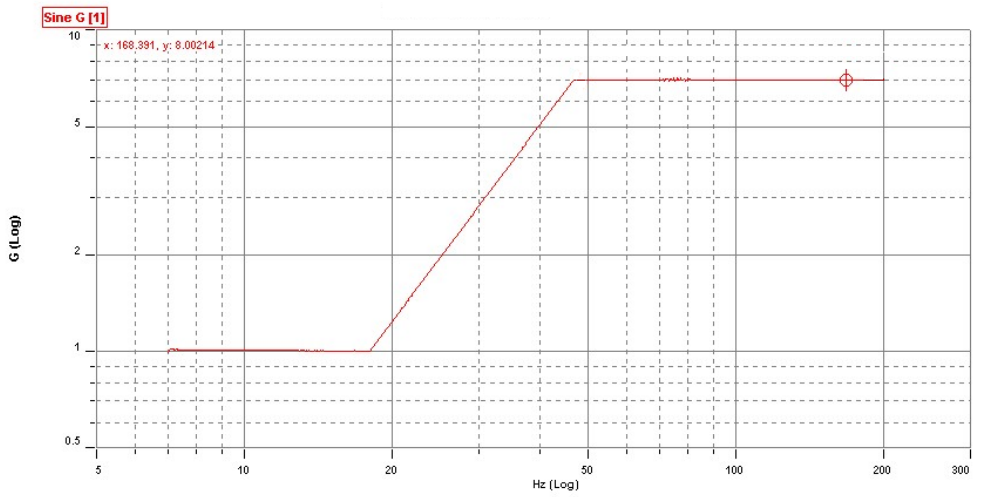
• 13,2 Hz and 100 Hz with a constant maximum acceleration of 7 m/s2.

The frequency sweep rate shall be slow enough to allow the detection of resonances in any part of the equipment.

Limits: The equipment shall meet the requirements of the performance check. There shall be no harmful deterioration of the equipment visible.
ETSI EN 301 025-1 V1.5.1 (7.4.3)

Test Data:

Frequency error:	+10 Hz
Output Power:	22.8W/ 0.88 W
DSC:	DSC error < 10^{-2}
SINAD:	>20dB
Physical integrity:	No visible damage



Conclusion: **The results meet the specified requirements**

DRY HEAT (7.5.2)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (7.5.2.2)

The EUT shall be placed in a chamber at normal room temperature and relative humidity. The EUT and, if appropriate, any climatic control devices with which it is provided shall then be switched on. The temperature shall then be raised to and maintained at +55 °C (±3 °C). At the end of the period of 10 h to 16 h at +55 °C (±3 °C), the EUT shall be subjected to a performance check. The temperature of the chamber shall be maintained at +55 °C (±3 °C) during the whole of the performance check period. At the end of the test, the EUT shall be returned to normal environmental conditions or to those at the start of the next test.

Limits: The equipment shall meet the requirements of the performance check. There shall be no harmful deterioration of the equipment visible.
ETSI EN 301 025-1 V1.5.1 (7.5.2.3)

Test Data:

Frequency Error:	6 Hz
Output Power:	22.4 W /0.81 W
DSC:	DSC error < 10^{-2}
SINAD:	>20dB
Physical integrity:	No visible damage

Conclusion: **The results meet the specified requirements**

DAMP HEAT (7.5.3)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (7.5.3.2)

The EUT shall be placed in a chamber at normal room temperature and relative humidity. The temperature shall then be raised to +40 °C (±2 °C), and the relative humidity raised to 93 % (±3 %) over a period of 3 h ±0,5 h. These conditions shall be maintained for a period of 10 h to 16 h. Any climatic control devices provided in the EUT may be switched on at the conclusion of this period.
The EUT shall be switched on 30 min later, or after such period as agreed with the manufacturer, and shall be kept operational for at least 2 h during which period the EUT shall be subjected to the performance check. The temperature and relative humidity of the chamber shall be maintained as specified during the whole test period. At the end of the test period and with the EUT still in the chamber, the chamber shall be brought to room temperature in not less than 1 h. At the end of the test the EUT shall be returned to normal environmental conditions or to those required at the start of the next test.

Limits: The equipment shall meet the requirements of the performance check. There shall be no harmful deterioration of the equipment visible.
ETSI EN 301 025-1 V1.5.1 (7.5.3.3)

Test Data:

Frequency Error:	4 Hz
Output Power:	22.4 W /0.81 W
DSC:	DSC error < 10^{-2}
SINAD:	>20dB
Physical integrity:	No visible damage

Conclusion: **The results meet the specified requirements**

LOW TEMPERATURE (7.5.4)

Method of Measurement - ETSI EN 301 025-1 V1.5.1 (7.5.4.2)

The EUT shall be placed in a chamber at normal room temperature and relative humidity. The temperature shall then be reduced to, and be maintained at, -15 °C (±3 °C) for a period of 10 h to 16 h. Any climatic control devices provided in the EUT may be switched on at the conclusion of this period. The EUT shall be switched on 30 min later, or after such period as agreed by the manufacturer, and shall be kept operational for at least 2 h during which period the EUT shall be subjected to a performance check. The temperature of the chamber shall be maintained at -15 °C (±3 °C) during the whole of the test period. At the end of the test the EUT shall be returned to normal environmental conditions or to those required at the start of the next test.

Limits: The equipment shall meet the requirements of the performance check. There shall be no harmful deterioration of the equipment visible.
ETSI EN 301 025-1 V1.5.1 (7.5.4.3)

Test Data:

Frequency Error:	10 Hz
Output Power:	20.7 W
DSC:	DSC error < 10^{-2}
SINAD:	>20dB
Physical integrity:	No visible damage

Conclusion: **The results meet the specified requirements**

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	12/31/13	12/31/15
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	01/15/14	01/15/16
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	01/15/14	01/15/16
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	01/15/14	01/15/16
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	01/15/14	01/15/16
Antenna: Biconnical	Eaton	94455-1	1096	05/10/13	05/10/15
Antenna: Double-Ridged Horn/ETS Horn 2	ETS-Lindgren	3117	00041534	10/05/12	10/05/14
Antenna: Log-Periodic	Electro-Metrics	LPA-25	1122	05/09/13	05/09/15
Audio Generator	B&K Precision	3010	8739686	09/11/12	09/11/14
Bi-Directional Coupler	HP	778D	1144A01731	05/06/13	05/06/15
Digital Multimeter	Fluke	77	35053830	08/22/13	08/22/15
EMI Test Receiver	Rhode & Schwarz	ESIB 40	100274	03/13/12	03/16/14
EMI Test Receiver	Rhode & Schwarz	ESU 40	100320	3/21/12	3/21/15
Hygro-Thermometer	Extech	445703	0602	06/20/13	06/20/15
Measuring Tape-20M	Kraftixx	0631-20		05/20/13	05/20/15
Measuring Tape-7.5M	Kraftixx	7.5M PROFI		05/20/13	05/20/15
Modulation Analyzer	HP	8901A	3050A05856	09/26/12	09/26/14
RF Power Meter	Boonton	4531		01/19/13	01/19/15
Sensor	Boonton	51072A	34647	01/19/13	01/19/15
Function Generator	SRS	DS345	38435	06/19/13	06/19/15
RMS Voltmeter	HP	3400A	05856	08/27/13	08/27/15
Modulation analyzer	HP	8903A	2336A03066	8/30/13	8/30/15
Signal generator	HP	8640B	2308A21464	2/23/12	2/23/14
Service monitor	IFR	500A	5182	6/26/13	6/26/15

MEASUREMENT UNCERTAINTIES

Parameter	Uncertainty
Radio Frequency	±1 x 10^{-7}
Conducted RF power variation using a test fixture	±0.75 dB
Radiated RF power (substitution)	±2.0 dB
Maximum frequency deviation: - within 300 Hz to 6 kHz of audio frequency - within 6 kHz to 25 kHz of audio frequency	 ±5 %; ±3 dB
Deviation limitation	±5 %
Adjacent and alternate channel power	±1.5 dB
Sensitivity at 20 dB SINAD	±3 dB
Two-signal measurement, valid up to 4 GHz (using a test fixture)	±4 dB
Two-signal measurement, valid up to 4 GHz (using radiated fields)	±5.0 dB
Three-signal measurement (using a test fixture)	±3 dB
Radiated emission of the transmitter, valid up to 12,75 GHz	±5.0 dB
Radiated emission of receiver, valid up to 12,75 GHz	±5.0 dB
Temperature	±1 °C
Humidity	±10%

The measurement uncertainty figures were calculated in accordance with TR 100 028 [1] and correspond to an expansion factor (coverage factor) k = 1.96 or k = 2 (which provide confidence levels of respectively 95 % and 95.45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)). The values given in the table above are based on such expansion factors.