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Harmonized European Standard (Telecommunications series)

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
Radio telephone transmitters and receivers for the
maritime mobile service operating in the VHF bands
used on inland waterways;
Part 3: Harmonized EN covering essential requirements
of article 3.3 (e) of the R&TTE Directive**



Reference

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Foreword

This Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the ETSI standards One-step Approval Procedure.

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [i.1] (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations and following the Commission Decision 2000/637/EC of 22 September 2000 [2].

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Directive 1999/5/EC [i.3] of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity ("the R&TTE Directive").

Technical specifications relevant to Directive 1999/5/EC [i.3] are given in annex A.

The present document is part 3 of a multi-part deliverable covering the radio telephone transmitters and receivers for the maritime mobile service operating in the VHF bands used on inland waterways, as identified below:

- Part 1: "Technical characteristics and methods of measurement";
- Part 2: "Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive";
- Part 3: "Harmonized EN covering essential requirements of article 3.3 (e) of the R&TTE Directive".**

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

1 Scope

The present document applies to radio communication equipment on the service categories "Ship-to-ship", "Ship-to-port-authorities" and "On-board-communication", laid down by the "Regional Arrangement concerning the radiotelephone service on Inland waterways in Europe" - Basel, April 2000.

Additional facilities, which may be provided on this equipment, e.g. Digital Selective Calling (DSC), are not covered by the present document and other appropriate standards will apply.

This radio equipment is capable of operating in all or any part of the VHF band 156 MHz to 174 MHz allocated to the maritime mobile service as defined in appendix S18 of the Radio Regulations [i.5]. In addition to those channels defined in appendix S18 of the Radio Regulations [i.5] the equipment may be equipped to operate on one or more additional channels.

The equipment uses phase modulation, G3E (frequency modulation with a pre-emphasis of 6 dB/octave) for speech, and G2B for ATIS signalling with 25 kHz channel spacing.

The present document is intended to cover the provisions of Directive 1999/5/EC [i.3] (R&TTE Directive) article 3.3 (e), which states that radio equipment within the scope of the present document shall be so constructed that: "it supports certain features ensuring access to emergency services".

In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of article 3 of the R&TTE Directive [i.3] will apply to equipment within the scope of the present document.

NOTE: A list of such ENs is included on the web site <http://www.newapproach.org/>.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
 - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
 - for informative references.

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NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

- [1] ETSI EN 300 698-1 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Radio telephone transmitters and receivers for the maritime mobile service operating in the VHF bands used on inland waterways; Part 1: Technical characteristics and methods of measurement".

- [2] Commission Decision 2000/637/EC of 22 September 2000 on the application of Article 3(3)(e) of Directive 1999/5/EC to radio equipment covered by the regional arrangement concerning the radiotelephone service on inland waterways.

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

- [i.1] Council Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.
- [i.2] ETSI TR 100 028: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [i.3] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).
- [i.4] Commission Decision 2004/71/EC of 4 September 2003 on essential requirements relating to marine radio communication equipment which is intended to be used on non-SOLAS vessels and to participate in the Global Maritime Distress and Safety System (GMDSS).
- [i.5] ITU Radio Regulations (2008).

3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ATIS	Automatic Transmitter Identification System
DSC	Digital Selective Calling
e.m.f.	electromotive force
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
r.m.s.	root mean square
SINAD	Signal + Noise + Distortion/Noise + Distortion
VHF	Very High Frequency

4 Technical requirements specifications

4.1 Environmental profile

Tests defined in the present document shall be carried out at representative points within the boundary limits of the declared operational environmental profile which, as a minimum, shall be that specified in the test conditions contained in this HS.

As technical performance varies subject to environmental conditions, tests shall be carried out under a sufficient variety of environmental conditions as specified in this HS to give confidence of compliance for the affected technical requirements. These environmental conditions represent those required by article 2 of EC decision 2004/71/EC [i.4] (which shall also be within the boundary limits of the declared operational environmental profile).

4.2 General, operational and technical requirements

4.2.1 General and operational requirements

4.2.1.1 Composition

The equipment shall, as a minimum, include:

- a VHF radiotelephone transmitter;
- a VHF radiotelephone receiver; and
- an ATIS encoder.

4.2.1.2 Construction

The equipment shall comply with all details included in EN300 698-1 [1], clause 4.1.

4.2.1.3 Controls and indicators

The equipment shall comply with all details included in EN300 698-1 [1], clause 4.2.

4.2.1.4 Handset and loudspeaker

The equipment shall comply with all details included in EN300 698-1 [1], clause 4.3,

4.2.1.5 Safety precautions

The equipment shall comply with all details included in EN300 698-1 [1], clause 4.5.

4.2.1.6 Labelling

The equipment shall comply with all details included in EN300 698-1 [1], clause 4.7.

4.2.1.7 Warm up

The equipment shall comply with all details included in EN300 698-1 [1], clause 4.8.

4.2.2 Technical requirements

4.2.2.1 Switching time

The equipment shall comply with all details included in EN300 698-1 [1], clause 4.4.

4.3 Environmental requirements

4.3.1 Vibration test

4.3.1.1 Definition

This test determines the ability of equipment to withstand vibration without resulting in mechanical weakness or degradation in performance.

4.3.1.2 Requirement

The equipment shall meet the requirements of the performance check.

4.3.1.3 Conformance

Relevant environmental tests as defined within clause 5.3.1 shall be carried out.

4.3.2 Temperature tests

4.3.2.1 Definition

The immunity against the effects of temperature is the ability of the equipment to maintain the specified mechanical and electrical performance after the following tests have been carried out. The maximum rate of raising or reducing the temperature of the chamber in which the equipment is being tested shall be 1 °C/minute.

4.3.2.2 Dry heat

4.3.2.2.1 Definition

This test determines the ability of equipment to be operated at high ambient temperatures and operate through temperature changes.

4.3.2.2.2 Requirement

The equipment shall meet the requirements of the performance check.

4.3.2.2.3 Conformance

Relevant environmental tests as defined within clause 5.3.1 shall be carried out.

4.3.2.3 Damp heat

4.3.2.3.1 Definition

This test determines the ability of equipment to be operated under conditions of high humidity.

4.3.2.3.2 Requirement

The equipment shall meet the requirements of the performance check.

4.3.2.3.3 Conformance

Relevant environmental tests as defined within clause 5.3.1 shall be carried out.

4.3.2.4 Low temperature

4.3.2.4.1 Definition

This test determines the ability of equipment to be operated at low temperatures. It also allows equipment to demonstrate an ability to start up at low ambient temperatures.

4.3.2.4.2 Requirement

The equipment shall meet the requirements of the performance check.

4.3.2.4.3 Conformance

Relevant environmental tests as defined within clause 5.3.1 shall be carried out.

4.4 Conformance requirements

4.4.1 Transmit output power on specific channels

4.4.1.1 Definition

The transmit output power on the specific channels 6, 8, 10, 11, 12, 13, 14, 15, 17, 71, 72, 74, 75, 76 and 77, as defined in appendix 18 of the Radio Regulations [i.5], is defined as the mean power delivered to the artificial antenna during one radio frequency cycle in the absence of modulation.

4.4.1.2 Limit

The transmit output power on the specific channels 6, 8, 10, 11, 12, 13, 14, 15, 17, 71, 72, 74, 75, 76 and 77, as defined in appendix 18 of the Radio Regulations [i.5], shall be automatically limited to a value between 0,5 W and 1W.

4.4.1.3 Conformance

Conformance tests as defined in clause 5.3.2.1 shall be carried out.

4.4.2 Use of channel 70

4.4.2.1 Definition

The use of channel 70 is defined as the exclusive use of this channel for digital selective calling (DSC) for distress, safety and calling purposes.

4.4.2.2 Limit

Use of channel 70 for purposes other than Digital Selective Calling (DSC) shall be prevented.

4.4.2.3 Conformance

Conformance tests as defined in clause 5.3.2.2 shall be carried out.

4.4.3 Sensitivity of the modulator, including microphone

4.4.3.1 Definition

This characteristic expresses the capability of the transmitter to produce sufficient modulation when an audio frequency signal corresponding to the normal mean speech level is applied to the microphone.

4.4.3.2 Limits

The resulting frequency deviation shall be between $\pm 1,5$ kHz and ± 3 kHz.

4.4.3.3 Conformance

Conformance tests as defined in clause 5.3.2.3 shall be carried out.

4.4.4 Audio frequency response

4.4.4.1 Definition

The audio frequency response is the frequency deviation of the transmitter as a function of the modulating frequency.

4.4.4.2 Limit

The audio frequency response shall be within +1 dB and -3 dB of a 6 dB/octave line passing through the reference point as shown in figure 1.

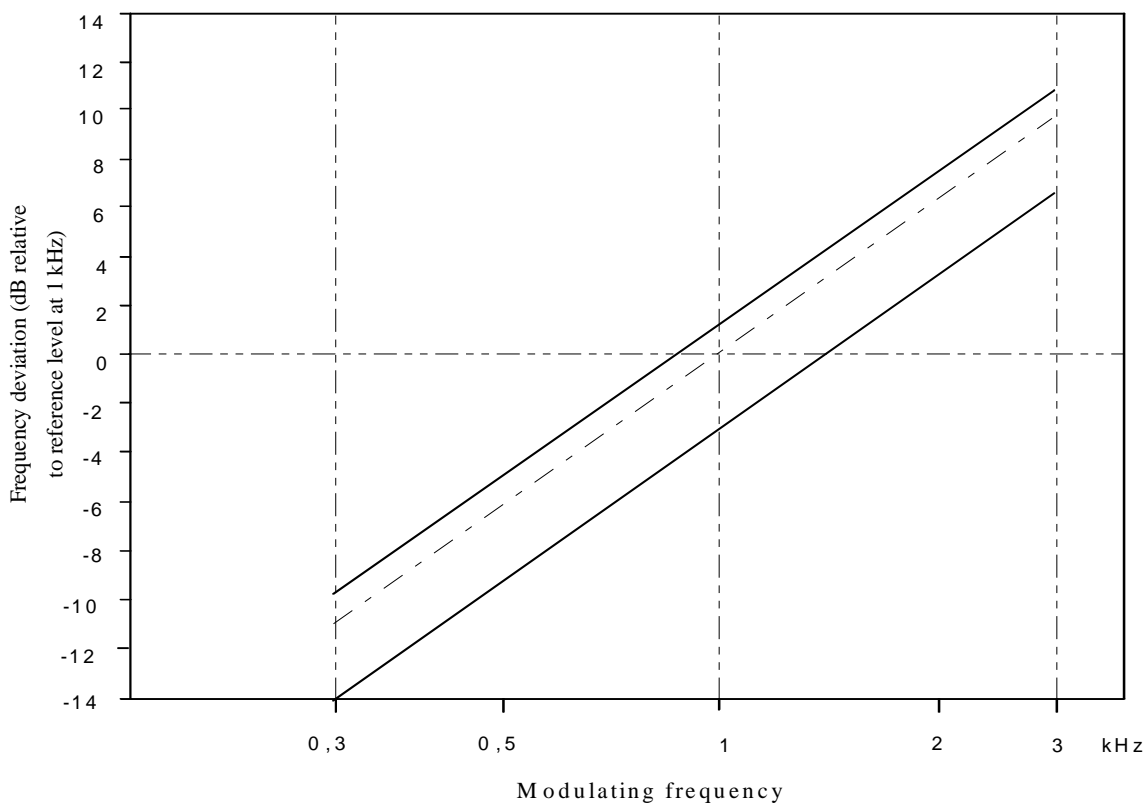


Figure 1: Audio frequency response

4.4.4.3 Conformance

Conformance tests as defined in clause 5.3.2.4 shall be carried out.

4.4.5 Audio frequency harmonic distortion of the emission

4.4.5.1 Definition

The harmonic distortion of the emission modulated by any audio frequency signal is defined as the ratio, expressed as a percentage, of the root mean square (r.m.s.) voltage of all the harmonic components of the fundamental frequency to the total r.m.s. voltage of the signal after linear demodulation.

4.4.5.2 Limits

The harmonic distortion shall not exceed 10 %.

4.4.5.3 Conformance

Conformance tests as defined in clause 5.3.2.5 shall be carried out.

4.4.6 Residual modulation of the transmitter

4.4.6.1 Definition

The residual modulation of the transmitter is the ratio, in dB, of the demodulated RF signal in the absence of wanted modulation, to the demodulated RF signal produced when the normal test modulation is applied.

4.4.6.2 Limit

The residual modulation shall not exceed -40 dB.

4.4.6.3 Conformance

Conformance tests as defined in clause 5.3.2.6 shall be carried out.

4.4.7 ATIS format

4.4.7.1 Definition

The format of the ATIS signal sequence shall be as defined in figure 2.

Dot pattern (see note)	Phasing sequence	Format specifier	Self-identification	End of sequence	Error check character
NOTE: May be omitted.					

Figure 2: ATIS signal sequence

The composition of the ATIS format and signal sequence is given in figures 3 and 4.

Dot pattern (see note)	Phasing	A) Format specifier	B) Identification	C) End of sequence	D) Error check
20 bits	6 DX (125) 8 RX (111 to 104)	2 identical symbols (2 times)	5 symbols (2 times)	3 DX (127) 1 RX (127)	1 symbol (2 times)
NOTE: May be omitted.					

Figure 3: ATIS signal composition

Time diversity is provided in the ATIS signal sequence as follows:

- besides the phasing signals, each signal is transmitted twice in a time-spread mode; the first transmission (DX) of a specific signal is followed by the transmission of four other signals before the re-transmission (RX) of that specific signal takes place, allowing for a time-diversity reception interval of $33 \frac{1}{3}$ ms.

Dot Pattern (note)	
DX	
	RX 7
DX	
	RX 6
DX	
	RX 5
DX	
	RX 4
DX	
	RX 3
DX	
	RX 2
A	
	RX 1
A	
	RX 0
B	
	A
B	
	A
B	
	B
B	
	B
B	
	B
C	
	B
D	
	B
C	
	C
C	
	D

RX/DX = Phasing sequence;
 A = Format specifier;
 B = Identification;
 C = End of sequence;
 D = Error check symbol.

NOTE: may be omitted.

Figure 4: ATIS transmission sequence

4.4.7.2 Limit

The ATIS format shall be as covered in the definition (clause 4.4.7.1).

4.4.7.3 Conformance

Conformance tests as defined in clause 5.3.2.7 shall be carried out.

4.4.8 ATIS programming

4.4.8.1 Definition

The ATIS programming shall be defined as the identification data stored within the ATIS equipment.

4.4.8.2 Limit

It shall not be possible for the operator to disconnect or to change the programming of the ATIS facility.

4.4.8.3 Conformance

Conformance tests as defined in clause 5.3.2.8 may be carried out.

4.4.9 Harmonic distortion and rated audio-frequency output power

4.4.9.1 Definition

The harmonic distortion at the receiver output is defined as the ratio, expressed as a percentage, of the total r.m.s. voltage of all the harmonic components of the modulation audio frequency to the total r.m.s. voltage of the signal delivered by the receiver.

The rated audio frequency output power is the value stated by the manufacturer to be the maximum power available at the output, for which all the requirements of the present document are met.

4.4.9.2 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 %.

4.4.9.3 Conformance

Conformance tests as defined in clause 5.4.2 may be carried out.

4.4.10 Audio frequency response

4.4.10.1 Definition

The audio frequency response is defined as the variation in the receiver's audio frequency output level as a function of the modulation frequency of the radio frequency signal with constant deviation applied to its input.

4.4.10.2 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 as shown in figure 5.

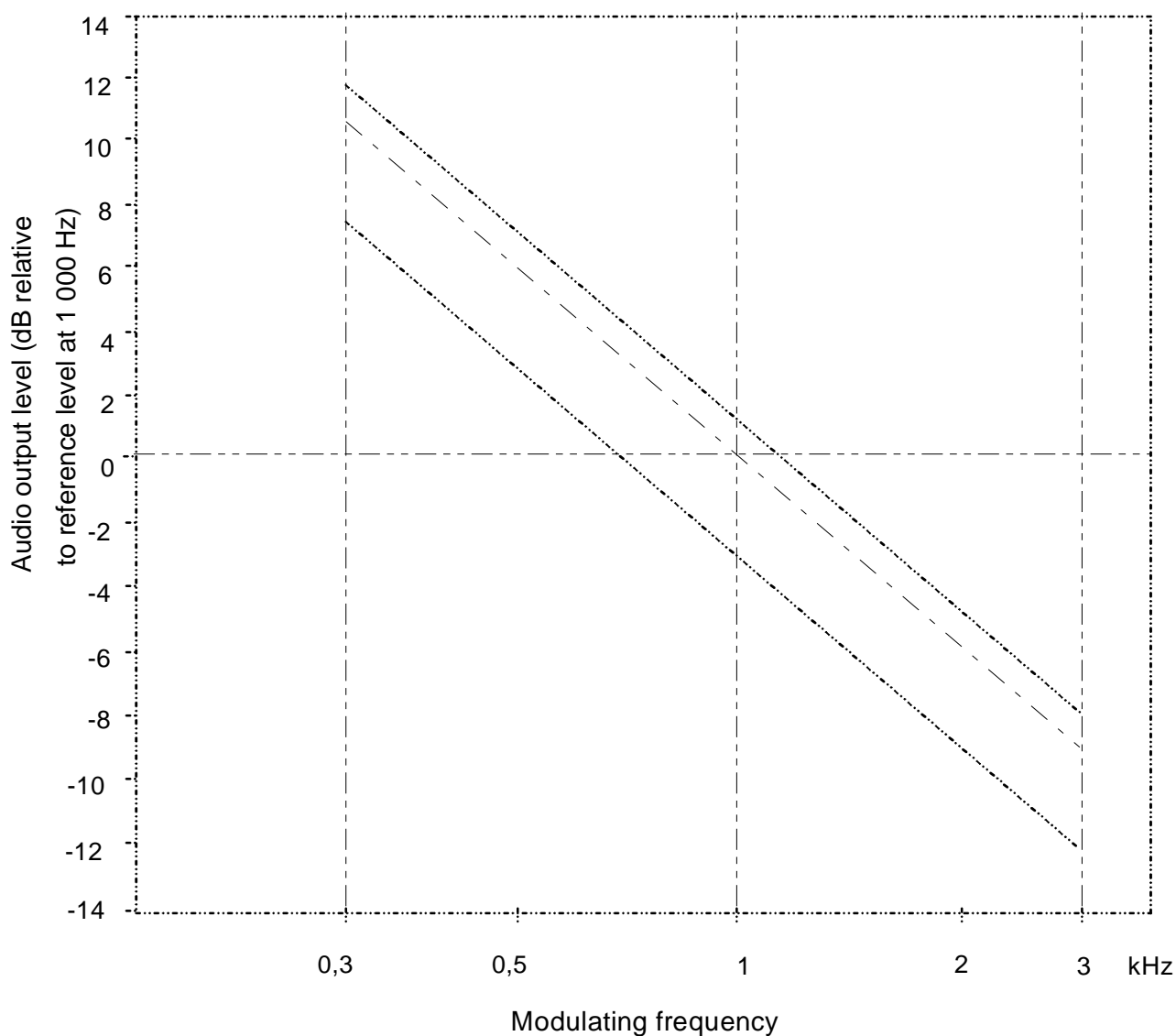


Figure 5: Audio frequency response

4.4.10.3 Conformance

Conformance tests as defined in clause 5.4.3 may be carried out.

4.4.11 Receiver residual noise level

4.4.11.1 Definition

The receiver residual noise level is defined as the ratio, in dB, of the audio-frequency power of the noise and hum resulting from spurious effects of the power supply system or from other causes, to the audio-frequency power produced by a high-frequency signal of average level, modulated by the normal test modulation and applied to the receiver input.

4.4.11.2 Limit

The receiver residual noise level shall not exceed -40 dB.

4.4.11.3 Conformance

Conformance tests as defined in clause 5.4.4 may be carried out.

4.4.12 Squelch operation

4.4.12.1 Definition

The purpose of the squelch facility is to mute the receiver audio output signal when the level of the signal at the receiver input is less than a given value.

4.4.12.2 Limits

Under the conditions specified in a) clause 5.4.5, the audio frequency output power shall not exceed -40 dB relative to the rated output power.

Under the conditions specified in b) clause 5.4.5, the input level shall not exceed +6 dB μ V (e.m.f.) and the SINAD ratio shall be at least 20 dB.

Under the conditions specified in c) clause 5.4.5, the input signal shall not exceed +6 dB μ V (e.m.f.) when the control is set at maximum.

4.4.12.3 Conformance

Conformance tests as defined in clause 5.4.5 may be carried out.

4.4.13 Squelch hysteresis

4.4.13.1 Definition

Squelch hysteresis is the difference in dB between the receiver input signal levels at which the squelch opens and closes.

4.4.13.2 Limit

The squelch hysteresis shall be between 3 dB and 6 dB.

4.4.13.3 Conformance

Conformance tests as defined in clause 5.4.6 may be carried out.

5 Testing for compliance with technical requirements

5.1 Test conditions, power supply and ambient temperatures

5.1.1 Arrangements for test signals

5.1.1.1 Receiver

Test signal sources shall be connected to the receiver antenna port in such a way that the impedance presented to the receiver antenna port is 50 Ω , irrespective of whether one or more test signals are applied to the receiver simultaneously.

The levels of the test signals shall be expressed in terms of the electromotive force (e.m.f.) at the terminals to be connected to the receiver.

The nominal frequency of the receiver is the carrier frequency of the selected channel.

5.1.1.2 Transmitter

For the purpose of the present document, the audio frequency modulating signal applied to the transmitter shall be produced by a signal generator applied to the connection terminals replacing the microphone transducer.

5.1.2 Artificial antenna

When tests are carried out with an artificial antenna, this shall be a non-reactive, non-radiating 50 Ω load.

5.1.3 Normal test modulation

For normal test modulation, the modulation frequency shall be 1 kHz and the frequency deviation shall be 3 kHz.

5.1.4 Squelch

Unless otherwise specified, the receiver squelch facility shall be made inoperative for the duration of the conformance tests.

5.1.5 Test power source

During conformance testing, the equipment shall be supplied from a test power source capable of producing normal and extreme test voltages as specified in clauses 5.1.6.2 and 5.1.7.2.

The internal impedance of the test power source shall be low enough for its effect on the test results to be negligible. For the purpose of testing the power source voltage shall be measured at the power input port of the equipment.

During testing, the power source voltages shall be maintained within a tolerance of ± 3 % relative to the voltage level at the beginning of each test.

5.1.6 Normal test conditions

5.1.6.1 Normal temperature and humidity

The normal temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges:

- temperature: +15 °C to +35 °C;
- relative humidity: 20 % to 75 %.

5.1.6.2 Normal test power supply

5.1.6.2.1 Mains voltage and frequency

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage or any of the declared voltages for which the equipment is indicated as having been designed for.

The frequency of the test power source, corresponding to the mains, shall be 50 Hz \pm 1 Hz.

5.1.6.2.2 Power source from a battery

Where the equipment is designed to operate from a battery, the normal test voltage shall be the nominal voltage of the battery (12 volts, 24 volts, etc).

5.1.6.2.3 Other power sources

For operation from other power sources, the normal test voltage shall be fixed by agreement between the equipment manufacturer and the authority conducting the tests.

5.1.7 Extreme test conditions

5.1.7.1 Extreme temperatures

For tests at extreme temperatures, measurements shall be made in accordance with the procedures specified in clause 5.1.8 at a lower temperature of $-15\text{ °C} \pm 3\text{ °C}$ and an upper temperature of $+55\text{ °C} \pm 3\text{ °C}$.

5.1.7.2 Extreme test power supply values

5.1.7.2.1 Extreme mains voltage and frequency

The extreme test voltages for equipment to be connected to the mains shall be the nominal mains voltage $\pm 10\%$.

5.1.7.2.2 Power source from a battery

Where the equipment is designed to operate from a battery, the extreme test voltages shall be 1,3 and 0,9 multiplied by the nominal voltage of the battery (12 volts, 24 volts, etc).

5.1.7.2.3 Other power sources

For equipment using other test power sources, the extreme voltages shall be fixed by agreement between the manufacturer and the authority conducting the tests.

5.1.8 Procedures for tests at extreme temperatures

The equipment shall be placed in the test chamber at normal temperature. The maximum rate of raising or reducing the temperature of the chamber shall be 1 °C/minute . The equipment shall be switched off during the temperature stabilizing periods.

Before conducting tests at extreme temperatures, the equipment in the test chamber shall have reached thermal equilibrium and be subjected to the extreme temperature for a period of 10 hours to 16 hours.

For tests at the lower extreme temperature, the equipment shall then be switched on to standby or receive condition for one minute, after which the equipment shall meet the requirements of the present document.

For tests at the higher extreme temperature, the equipment shall then be switched on in the high power transmit condition for half an hour, after which the equipment shall meet the requirements of the present document.

The temperature of the chamber shall be maintained at the extreme temperatures for the whole duration of the performance test.

At the end of the test, with the equipment still in the chamber, the chamber shall be brought to normal temperature in not less than 1 hour. The equipment shall then be exposed to normal temperature and relative humidity for not less than 3 hours or until moisture has dispersed, whichever is the longer, before the next test is carried out. Alternatively, observing the same precautions, the equipment may be returned direct to the conditions required for the start of the next test.

5.1.9 Tests on equipment with a duplex filter

If the equipment has an integral duplex filter or a separate associated duplex filter, the characteristics of the present document shall be met, with the measurements carried out using the antenna port of the filter.

5.1.10 Test channels

Conformance tests shall be made on at least the highest frequency and the lowest frequency within the equipment's frequency band, and on channel 16 unless specified otherwise.

5.2 Interpretation of the measurement results

The interpretation of the results recorded in a test report for the measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of the present document;
- the value of the measurement uncertainty for the measurement of each parameter shall be included in the test report;
- the recorded value of the measurement uncertainty shall be, for each measurement, equal to or lower than the figures in table 1.

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with TR 100 028 [i.2] and shall 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)).

Table 1 is based on such expansion factors.

Table 1: Absolute measurement uncertainties: maximum values

Parameter	Maximum uncertainty
Audio frequency	$\pm 1 \times 10^{-5}$
Maximum frequency deviation	$\pm 5 \%$
RF power	$\pm 0,75$ dB

5.3 Essential radio test suite

5.3.1 Environmental tests

5.3.1.1 Introduction

Environmental tests shall be carried out before tests are performed on the same equipment with respect to the other requirements of the present document.

5.3.1.2 Procedure

Unless otherwise stated, the EUT shall be connected to an electrical power source during the periods for which it is specified that electrical tests shall be carried out. These tests shall be performed using the normal test voltage (clause 5.1.6.2).

5.3.1.3 Performance check

Where the term "performance check" is used, this shall be taken to mean a visual inspection of the equipment, a test of the transmitter output power and frequency error, and the receiver sensitivity to show that the equipment is functioning and that there is no visible damage or deterioration.

a) For the transmitter:

The transmitter shall be connected to the artificial antenna (clause 5.1.2) and tuned to channel 16. The measurements shall be made in the absence of modulation with the power switch set at maximum. The output power shall be between 6 W and 25 W, and the frequency error, as measured in EN 300 698-1 [1], clause 5.3.1, shall be less than $\pm 1,5$ kHz.

b) For the receiver:

Maximum usable sensitivity of the receiver as measured in EN300 698-1 [1], clause 9.3.2.

5.3.1.4 Vibration test

The EUT, complete with any shock and vibration absorbers with which it is provided, shall be clamped to the vibration table by its normal means of support and in its normal attitude. Provision may be made to reduce or nullify any adverse effect on equipment performance, which could be caused by the presence of an electromagnetic field due to the vibration unit.

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.

A resonance search shall be carried out throughout the test. If any resonance of the equipment had $Q \geq 5$ measured relative to the base of the vibration table, the equipment shall be subjected to a further vibration endurance test at each resonant frequency at the vibration level specified in the test with a duration of 2 hours. If resonances occur only with $Q < 5$, the further endurance test shall be carried out at one single observed resonant frequency. If no resonance occurs, the endurance test shall be carried out at a frequency of 30 Hz.

The performance check shall be carried out at the end of each 2-hour endurance test period.

The procedure shall be repeated with vibration in each of two mutually perpendicular directions in the horizontal plane.

After conducting the vibration tests, the equipment shall be inspected for any mechanical deterioration.

The results obtained shall be compared to the limits in clause 4.3.1.2 in order to prove compliance with the requirement.

5.3.1.5 Temperature tests

5.3.1.5.1 Dry heat

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 hours to 16 hours 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.

The results obtained shall be compared to the limits in clause 4.3.2.2.2 in order to prove compliance with the requirement.

5.3.1.5.2 Damp heat

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 hours $\pm 0,5$ hours. These conditions shall be maintained for a period of 10 hours to 16 hours. 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 minutes later, or after such period as agreed with the manufacturer, and shall be kept operational for at least 2 hours 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 hour. 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.

The results obtained shall be compared to the limits in clause 4.3.2.3.2 in order to prove compliance with the requirement.

5.3.1.5.3 Low temperature

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 ($\pm 3^{\circ}\text{C}$) for a period of 10 hours to 16 hours. 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 minutes later, or after such period as agreed by the manufacturer, and shall be kept operational for at least 2 hours during which period the EUT shall be subjected to a performance check. The temperature of the chamber shall be maintained at -15°C ($\pm 3^{\circ}\text{C}$) 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.

The results obtained shall be compared to the limits in clause 4.3.2.4.2 in order to prove compliance with the requirement.

5.3.2 Conformance tests

5.3.2.1 Transmit output power on specific channels

The transmitter shall be connected to an artificial antenna (see clause 5.1.2). The transmitter output power switch shall be set to maximum power. The measurements given below shall be made under normal test conditions (see clause 5.1.6) and under extreme test conditions (see clause 5.1.7).

Each of the specified channels shall be selected in turn and the power delivered to this artificial antenna shall be measured when the push-to-talk switch is operated.

The results obtained shall be compared to the limits in clause 4.4.1.2 in order to prove compliance with the requirement.

5.3.2.2 Use of channel 70

- 1) The microphone push-to-talk switch shall be keyed and the transmitter shall not activate.
- 2) If an external DSC interface is present on the equipment this additional test shall be performed:
 - the standard audio signal described in clause 5.3.2.3 shall be applied to the microphone;
 - the transmitter shall be activated by the key input of the DSC interface;
 - the residual modulation of the transmitter shall be measured as described in clause 5.3.2.6.

The results obtained shall be compared to the limits in clause 4.4.2.2 in order to prove compliance with the requirement.

5.3.2.3 Sensitivity of the modulator, including microphone

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.

The results obtained shall be compared to the limits in clause 4.4.3.2 in order to prove compliance with the requirement.

5.3.2.4 Audio frequency response

A modulating signal at a frequency of 1 kHz shall be applied to the transmitter and the deviation shall be measured at the output. The audio input level shall be adjusted so that the frequency deviation is ± 1 kHz. This is the reference point in figure 1 (1 kHz corresponds to 0 dB).

The modulation frequency shall then be varied between 300 Hz and 3 kHz, with the level of the audio frequency signal being kept constant and equal to the value specified above.

The results obtained shall be compared to the limits in clause 4.4.4.2 in order to prove compliance with the requirement.

5.3.2.5 Audio frequency harmonic distortion of the emission

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 with the output power switch at both maximum and minimum.

- a) Under normal test conditions (clause 5.1.6) the RF signal shall be modulated successively at frequencies of 300 Hz, 500 Hz and 1 kHz with a constant modulation index of 3.

The distortion of the audio frequency signal shall be measured at all the frequencies specified above.

- b) Under extreme test conditions (clause 5.1.7), the measurements shall be carried out at 1 kHz with a frequency deviation of ± 3 kHz.

The results obtained shall be compared to the limits in clause 4.4.5.2 in order to prove compliance with the requirement.

5.3.2.6 Residual modulation of the transmitter

The normal test modulation defined in clause 5.1.3 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 μ s.

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.

The results obtained shall be compared to the limits in clause 4.4.6.2 in order to prove compliance with the requirement.

5.3.2.7 ATIS format

The ATIS signal shall be analysed with the calibrated apparatus for correct configuration of the signal format, including time diversity.

The results obtained shall be compared to the limits in clause 4.4.7.2 in order to prove compliance with the requirement.

The decoded ATIS protocol shall be stated in the test report.

5.3.2.8 ATIS programming

Where equipment is capable of operating in modes other than just inland waterways then the "inland waterway" mode of operation shall be selected.

The transmitter shall be connected to the artificial antenna as specified in clause 5.1.2 and a suitable FM demodulator. The equipment shall be set to transmit a continuous identification sequence.

Each control normally available to the operator shall be adjusted in turn. There shall be no change to the received signal.

The results obtained shall be compared to the limits in clause 4.4.8.2 in order to prove compliance with the requirement.

5.4 Other test specifications

5.4.1 General

The requirements in clauses 4.4.9 to 4.4.13 inclusive have been set on the assumption that the test specifications in clauses 5.4.2 to 5.4.6 will be used to verify the performance of the equipment.

5.4.2 Harmonic distortion and rated audio-frequency output power

Test signals at levels of +60 dB μ V (e.m.f.) and +100 dB μ V (e.m.f.), at a carrier frequency equal to the nominal frequency of the receiver and modulated by the normal test modulation (clause 5.1.3) shall be applied in succession to the receiver input under the conditions specified in clause 5.1.1.

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 (clause 4.4.9.1). The value of this load shall be stated by the manufacturer.

Under normal test conditions (clause 5.1.6) 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.

The results obtained shall be compared to the limits in clause 4.4.9.2 in order to prove compliance with the requirement.

5.4.3 Audio frequency response

A test signal of +60 dB μ V (e.m.f.), at a carrier frequency equal to the nominal frequency of the receiver and modulated with normal test modulation (clause 5.1.3) shall be applied to the receiver antenna port under the conditions specified in clause 5.1.1.

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 (clause 4.4.9.1). This setting shall remain unchanged during the test.

The frequency deviation shall then be reduced to \pm 1kHz 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.

The results obtained shall be compared to the limits in clause 4.4.10.2 in order to prove compliance with the requirement.

5.4.4 Receiver residual noise level

A test signal with a level of +30 dB μ V (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 5.1.3, 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 4.4.9.1.

The output signal shall be measured by an 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.

The results obtained shall be compared to the limits in clause 4.4.11.2 in order to prove compliance with the requirement.

5.4.5 Squelch operation

- a) With the squelch facility switched off, a test signal of +30 dB μ V (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 5.1.3, shall be applied to the input terminals of the receiver. An audio frequency load and a psophometric filtering network 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 4.4.9.

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) 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 dB μ V (e.m.f.) and the receiver shall be set to produce 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) (Applicable only to equipment with continuously adjustable squelch control.) 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 dB μ V (e.m.f.), and the receiver shall be adjusted to give 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 at its maximum position and the level of the input signal increased until the output power again is 50 % of the rated audio output power.

The results obtained shall be compared to the limits in clause 4.4.12.2 in order to prove compliance with the requirement.

5.4.6 Squelch hysteresis

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.

The results obtained shall be compared to the limits in clause 4.4.13.2 in order to prove compliance with the requirement.

Annex A (normative): HS Requirements and conformance Test specifications Table (HS-RTT)

The HS Requirements and conformance Test specifications Table (HS-RTT) in table A.1 serves a number of purposes, as follows:

- it provides a statement of all the requirements in words and by cross reference to (a) specific clause(s) in the present document or to (a) specific clause(s) in (a) specific referenced document(s);
- it provides a statement of all the test procedures corresponding to those requirements by cross reference to (a) specific clause(s) in the present document or to (a) specific clause(s) in (a) specific referenced document(s);
- it qualifies each requirement to be either:
 - Unconditional: meaning that the requirement applies in all circumstances; or
 - Conditional: meaning that the requirement is dependent on the manufacturer having chosen to support optional functionality defined within the schedule.
- in the case of Conditional requirements, it associates the requirement with the particular optional service or functionality;
- it qualifies each test procedure to be either:
 - Essential: meaning that it is included with the Essential Radio Test Suite and therefore the requirement shall be demonstrated to be met in accordance with the referenced procedures;
 - Other: meaning that the test procedure is illustrative but other means of demonstrating compliance with the requirement are permitted.

Table A.1: HS Requirements and conformance Test specifications Table (HS-RTT)

Harmonized Standard EN 300 698-3						
The following requirements and test specifications are relevant to the presumption of conformity under the article 3.3 (e) of the R&TTE Directive						
Requirement			Requirement Conditionality		Test Specification	
No	Description	Reference: Clause No	U/C	Condition	E/O	Reference: Clause No
1	General, operational and technical requirements	4.2	U		X	
2	Vibration	4.3.1	U		E	5.3.1.4
3	Dry heat	4.3.2.2	U		E	5.3.1.5.1
4	Damp heat	4.3.2.3	U		E	5.3.1.5.2
5	Low temperature	4.3.2.4	U		E	5.3.1.5.3
6	Transmit output power – specific channels	4.4.1	U		E	5.3.2.1
7	Use of channel 70	4.4.2	U		E	5.3.2.2
8	Sensitivity of the modulator, including microphone	4.4.3	U		E	5.3.2.3
9	Audio frequency response	4.4.4	U		E	5.3.2.4
10	Audio frequency harmonic distortion of the emission	4.4.5	U		E	5.3.2.5
11	Residual modulation of the transmitter	4.4.6	U		E	5.3.2.6
12	ATIS format	4.4.7	U		E	5.3.2.7
13	ATIS programming	4.4.8	U		E	5.3.2.8

Harmonized Standard EN 300 698-3						
The following requirements and test specifications are relevant to the presumption of conformity under the article 3.3 (e) of the R&TTE Directive						
Requirement			Requirement Conditionality		Test Specification	
No	Description	Reference: Clause No	U/C	Condition	E/O	Reference: Clause No
14	Harmonic distortion and rated audio-frequency output power	4.4.9	U		O	5.4.2
15	Audio frequency response	4.4.10	U		O	5.4.3
16	Residual noise level	4.4.11	U		O	5.4.4
17	Squelch operation	4.4.12	U		O	5.4.5
18	Squelch hysteresis	4.4.13	U		O	5.4.6

Key to columns:

Requirement:

No A unique identifier for one row of the table which may be used to identify a requirement or its test specification.

Description A textual reference to the requirement.

Clause Number Identification of clause(s) defining the requirement in the present document unless another document is referenced explicitly.

Requirement Conditionality:

U/C Indicates whether the requirement is to be *unconditionally* applicable (U) or is *conditional* upon the manufacturers claimed functionality of the equipment (C).

Condition Explains the conditions when the requirement shall or shall not be applicable for a technical requirement which is classified "conditional".

Test Specification:

E/O Indicates whether the test specification forms part of the Essential Radio Test Suite (E) or whether it is one of the Other Test Suite (O).

NOTE: All tests whether "E" or "O" are relevant to the requirements. Rows designated "E" collectively make up the Essential Radio Test Suite; those designated "O" make up the Other Test Suite; for those designated "X" there is no test specified corresponding to the requirement. The completion of all tests classified "E" as specified with satisfactory outcomes is a necessary condition for a presumption of conformity. Compliance with requirements associated with tests classified "O" or "X" is a necessary condition for presumption of conformity, although conformance with the requirement may be claimed by an equivalent test or by manufacturer's assertion supported by appropriate entries in the technical construction file.

Clause Number Identification of clause(s) defining the test specification in the present, document unless another document is referenced explicitly. Where no test is specified (that is, where the previous field is "X") this field remains blank.

Annex B (informative): The EN title in the official languages

The enlargement of the European Union (EU) resulted in a requirement from the EU for a larger number of languages for the translation of the titles of Harmonized Standards and mandated ENs that are to be listed in the Official Journal to support the implementation of this legislation.

For this reason the title translation concerning the present document can be consulted via the [e-approval](#) application.

Annex C (informative): Bibliography

ITU-T Recommendation P.53 (1994): "Psophometer for use on telephone-type circuits".

ISO 25862:2009: "Ships and marine technology - Marine magnetic compasses, binnacles and azimuth reading devices".

"Regional Arrangement concerning the Radiotelephone service on Inland Waterways"; Basel, 6 April 2000.

History

Document history		
V1.1.1	May 2001	Publication
V1.2.1	August 2009	One-step Approval Procedure OAP 20091129; 2009-08-01 to 2009-11-30