SLOVENSKI STANDARD
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Elektromagnetna združljivost in zadeve v zvezi z radijskim spektrom (ERM) - Meteorološki pripomoļki (Met Aids) - Radiosonde za uporabo v frekvenļnem območju od 1 668,4 MHz do 1 690 MHz - 1. del: Tehniļne karakteristike in preskusne metode

Electromagnetic compatibility and Radio spectrum Matters (ERM) - Meteorological Aids (Met Aids) - Radiosondes to be used in the 1 668,4 MHz to 1 690 MHz frequency range - Part 1: Technical characteristics and test methods

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

For non-EU countries the present document may be used for regulatory (Type Approval) purposes.

The present document is part 1 of a multi part deliverable, covering digitally modulated Radiosonde transmitters in the Meteorological Aids frequency band from 1 668,4 MHz to 1 690 MHz, as identified below:

Part 1: "Technical characteristics and test methods";

Part 2: "Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive".

Clauses 1, 2 and 3 provide a general description on the types of equipment covered by the present document and the references, definitions and abbreviations used.

Clause 4 provides a guide as to the number of samples required in order that type tests may be carried out, and any markings on the equipment which the manufacturer should provide.

Clauses 5 and 6 give guidance on the test and general conditions for testing of the device. Clause 7 gives the maximum measurement uncertainty values.

Clause 8 specifies the spectrum utilization parameters, which are required to be measured. These are the maximum limits, which have been chosen to minimize harmful interference to other equipment and services. The clause provides details on how the equipment should be tested and the conditions, which should be applied.

Annex A provides specifications concerning radiated measurements.

Annex B provides information on the spectrum analyser specification.

Annex C provides related bibliography information.

National transposition dates	
Date of adoption of this EN:	29 June 2007
Date of latest announcement of this EN (doa):	30 September 2007
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 March 2008
Date of withdrawal of any conflicting National Standard (dow):	31 March 2008

Introduction

Meteorological aids, Radiosondes, are mainly used for *in situ* upper air measurements of meteorological variables (pressure, temperature, relative humidity, wind speed and direction) in the atmosphere up to an altitude of 36 km. The measurements are vital to national weather forecasting capability (and hence severe weather warning services for the public involving protection of life and property). The Radiosonde systems provide simultaneous measurements of the vertical structure of temperature, relative humidity and wind speed and direction over the full height range required. The variation of these meteorological variables in the vertical contains the majority of the critical information for weather forecasting. These systems are the only meteorological observing systems able to regularly provide the vertical resolution that meteorologists need for all four variables.

The Radiosonde observations are produced by Radiosondes carried by ascending balloons launched from land stations or ships. Radiosonde observations are carried out routinely by almost all countries, two to four times a day. The observation data are then circulated immediately to all other countries within a few hours via the WMO (World Meteorological Organization) Global Telecommunications System (GTS). The observing systems and data dissemination are all organized under the framework of the World Weather Watch Programme of WMO.

The observation stations are required, worldwide, at a horizontal spacing of less than or equal to 250 km, during the first decade of the twenty-first century, with a frequency of observation of from one to four times per day.

Remotely sensed measurements from satellites do not have the vertical resolution available from Radiosondes. Successful derivation of vertical temperature structure from these satellite measurements usually requires a computation initialized either directly from Radiosonde statistics or from the numerical weather forecast itself. In the latter case, the Radiosonde measurements ensure that the vertical structure in these forecasts remains accurate and stable with time. In addition, the Radiosonde measurements are used to calibrate satellite observations by a variety of techniques.

Radiosonde observations are thus seen to remain absolutely necessary for meteorological operations for the foreseeable future.

Other applications, independent of the main civilian meteorological organizations include environmental pollution, hydrology, radioactivity in the free atmosphere, significant weather phenomena (e.g. winter storms, thunderstorms, etc.) and investigation of a range of physical and chemical properties of the atmosphere.

The Radiosondes are operated on two frequency bands: 403 MHz band covers primary and co-primary allocations from 400,15 MHz to 406 MHz and 1 680 MHz band from 1668,4 MHz to 1690 MHz. The 403 MHz Radiosonde technology applies RNSS (Radio Navigation Satellite Systems) for wind measurement, whereas the 1 680 MHz systems base the wind measurement on balloon tracking with a RDF (Radio Direction Finding) antenna. Because the 403 MHz wind measurement depends on the availability of the RNSS signals, many operators do not consider this technology secure enough for critical applications (e.g. defence and national security), and consequently prefer 1 680 MHz systems.

About 150 000 Radiosondes are annually used in Europe, about 10 % of them are in 1 680 MHz band. This use is not decreasing with time, since with modern automation it is now much easier to successfully operate systems without highly skilled operators and a large amount of supporting equipment.

1 Scope

The present document applies to digitally modulated Radiosonde transmitters and whole units in the range from 1 668,4 MHz to 1 690 MHz. Because the World Radio Conference WRC-2003, allocated the Mobile Satellite Service (MSS) in the band from 1 670 MHz to 1 675 MHz, and the sub band from 1 683 MHz to 1 690 MHz is used for meteorological satellite, it is encouraged to consolidate the Radiosondes in the sub band from 1 675 MHz to 1 683 MHz.

The present document shall not be applied to the widely used analogue FM Radiosonde transmitter.

The present document does not necessarily include all the characteristics, which may be required by a user, nor does it necessarily represent the optimum performance achievable. It is a product family standard, which may be completely or partially superseded by specific standards covering specific applications.

For non-harmonized parameters, national regulatory conditions can apply regarding the type of modulation, channel/frequency separations, and the inclusion of an automatic transmitter shut-off facility as a condition of the issue of an individual or general license, or, as a condition of use under license exemption. The automatic transmitter shut-off facility may be based on elapsed time from the beginning of the sounding or atmospheric pressure measured by the Radiosonde.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- 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.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

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

[1] 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).

[2] ETSI TR 100 028 (V1.4.1): "Radio Equipment and Systems (RES); Uncertainties in the measurement of mobile radio equipment characteristics".

[3] CISPR 16-1: "Specification for radio disturbance and immunity measuring apparatus and methods; Part 1: Radio disturbance and immunity measuring apparatus".

[4] ANSI C63.5 (2004): "American National Standard for Electromagnetic Compatibility-Radiated Emission Measurements in Electromagnetic Interference (EMI) Control-Calibration of Antennas (9 kHz to 40 GHz)".

[5] IEC 60489-3: "Methods of measurement for radio equipment used in the mobile services. Part 3: Receivers for A3E or F3E emissions".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

allocated frequency band: as defined by ITU in the Radio Regulations

carrier power: average power delivered to the artificial antenna during one radio frequency cycle in the absence of modulation

NOTE: See clause 8.2.1.

conducted measurements: measurements, which are made using a direct 50 Ω connection to the EUT

dedicated antenna: removable antenna supplied and tested with the radio equipment, designed as an indispensable part of the equipment

effective radiated power: power radiated in the direction of the maximum level under specified conditions of measurements in the absence of modulation

NOTE: See clause 8.3.1.

frequency error of the transmitter: difference between the measured unmodulated carrier frequency and the nominal frequency as stated by the manufacturer under normal and extreme conditions

NOTE: See clause 8.1.1.

frequency stability under low voltage conditions: ability of the equipment to remain on the assigned operating frequency band, when the battery voltage falls below the lower extreme voltage level

NOTE: See clause 8.6.1.

integral antenna: permanent fixed antenna, which may be built-in, designed as an indispensable part of the equipment

manufacturer: means the manufacturer, or his authorized representative or the person responsible for placing the equipment on the market

operating frequency range: total range of frequencies covered, either by one type, in which case the tuning range equals operating frequency range, or by a family of equipment, in which case there are different design transmitters involved

NOTE: See clause 4.1.2.2.

radiated measurements: measurements, which involve the absolute measurement of a radiated field

spurious emissions: emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions

NOTE 1: As defined by ITU.

NOTE 2: See clause 8.5.1.

telemetry: use of radio communication for recording measurement or other data at a distance

transmission power spectral density: spectrum of a transmitter under defined conditions of modulation and output power

NOTE: See clause 8.4.1.

trimming: act by, which the value (in this case relating to frequency) of a component is changed within the circuit

NOTE: This act may include the physical alteration, substitution (by components of similar size and type) or activation/de-activation (via the setting of soldered bridges) of components. See clause 4.1.2.1.

tuning range: maximum frequency range, as specified by the manufacturer, over which the transmitter can be operated without any changes to the circuit, other than the substitution or programming of read only memories or crystals and the trimming of discrete components

NOTE: See clause 4.1.2.1.

3.2 Symbols

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

dB	decibel
E	field strength
FR_L	Lower end of Frequency Range
FR_C	Centre of Frequency Range
FR_H	Higher end of Frequency Range
SND/ND	Signal + Noise + Distortion / Noise + Distortion
°C	Temperature in degrees Celsius
hPa	Atmospheric pressure in hecto Pascal
%RH	Air Relative Humidity in percentage
λ	Wavelength

3.3 Abbreviations

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

EUT	Equipment Under Test
GTS	Global Telecommunications System
ICAO	International Civil Aviation Organization
MSS	Mobile Satellite Service
OATS	Open Area Test Site
OFR	Operating Frequency Range
R&TTE	Radio and Telecommunications Terminal Equipment
RDF	Radio Direction Finding
RF	Radio Frequency
RH	Relative Humidity
RNSS	Radio Navigation Satellite Systems
TR	Tuning Range
VSWR	Voltage Standing Wave Ratio
WMO	World Meteorological Organization

4 Technical requirement specifications

4.1 Presentation of equipment for testing purposes

Each equipment submitted for testing shall fulfil the requirements of the present document on all frequencies over which it is intended to operate.

Where appropriate the nominal frequency 1 680 MHz should be used for testing.

If equipment is designed to operate with different carrier powers, measurement of each transmitter parameter shall be performed at the highest power level at which the transmitter is intended to operate.

To simplify and harmonize the testing procedures between the different testing laboratories, measurements shall be performed, according to the present document, on samples of equipment defined in clauses 4.1.1 to 4.1.4.