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**Elektromagnetna združljivost (EMC) in zadeve v zvezi z radijskim spektrom (ERM)
– Storitve osebne klica na kraju samem – 1. del: Tehnične in funkcijske
karakteristike, vključno s preskusnimi metodami**

ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); On-site paging service; Part 1: Technical and functional characteristics, including test methods

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**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
On-site paging service;
Part 1: Technical and functional characteristics,
including 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).

The present document is part 1 of a multi-part deliverable covering the on-site paging service, as identified below:

Part 1: "Technical and functional characteristics, including test methods";

Part 2: "Harmonized Standard under article 3.2 of the R&TTE Directive".

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Date of adoption of this EN:	15 December 2000
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1 Scope

The present document applies to on-site paging equipment operating in the frequency range of 25 MHz to 470 MHz and loop systems below 146 kHz.

NOTE: Frequencies and frequency bands, used for on-site paging equipment, are not harmonized throughout the community. The frequency band 47 MHz to 47,25 MHz and operating frequencies or operating bands within 440 MHz to 470 MHz, are recommended by CEPT/ERC in Report 25 [3].

The existence of a Harmonized Standard does not imply the availability of the above frequency spectrum for the particular types of equipment covered by the present document.

An on-site paging system is a privately owned and operated wireless communication system, used in a restricted and predefined area, with the primary function to alert and/or inform ambulant people. The air interface of the system, using a single radio channel, comprises at least one transmitter.

The paging system may be extended with a return frequency. This return or talk-back frequency is mainly used for call acknowledgement but may also be used to supply some of the features of a mobile radio service or other two-way radio services, without the need to use a separate system.

The types of equipment covered by the present document are as follows:

- base station transmitters (radio and loop) and transcoders, with or without an external 50 Ω antenna connector;
- base station receivers, with a permanent 50 Ω connector;
- pocket unit (receiver, transmitter or transceiver), with or without an external 50 Ω antenna connector.

NOTE: The functional characteristics of an on-site paging system are described in ETS 300 224 [2].

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, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- [1] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications equipment and the mutual recognition of their conformity. (R&TTE Directive).
- [2] ETSI ETS 300 224 (Ed. 1, 1998): "Electromagnetic compatibility and Radio spectrum Matters (ERM); On-site paging service; Technical and functional characteristics for on-site paging systems, including test methods".
- [3] CEPT/ERC Report 25: "Frequency band 29.7 MHz to 105 GHz and associated European table of frequency allocations and utilizations", revision February 1998.
- [4] ETSI ETR 028: "Radio Equipment and Systems (RES); Uncertainties in the measurement of mobile radio equipment characteristics".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in the R&TTE Directive [1], and the following apply:

base station receiver: receiver intended for use in a fixed location

base station transmitter: transmitter intended for use in a fixed location

coded messages: transmission of messages to a paging receiver via coded signals

constant envelope modulation: either phase or frequency modulation with or without pre-emphasis

integral antenna: antenna designed as an indispensable part of the equipment, with or without the use of an antenna connector

Low Frequency (LF): frequency range 30 kHz to 300 kHz

pocket unit: pocket size equipment fitted with an integral antenna carried on a person or held in the hand

preamble facility: signal, needed in a system in which a battery saving system is used, in order to activate and prepare receivers for the calls to come

transcoder: transmitter and encoder combined in a single housing and operated in a fixed location indoors

Very Low Frequency (VLF): frequency range 3 kHz to 30 kHz

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3.2 Abbreviations

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For the purpose of the present document the following abbreviations apply: <https://standards.iteh.ai/SIST/EN/300-224-1-V1-3-1-2003>

Emf	electromotive force
IF	Intermediate Frequency
LF	Low Frequency
MPFD	Maximum Permissible Frequency Deviation
RF	Radio Frequency
Rms	root-mean-squared
SINAD	(Signal + Noise And Distortion) / (Noise + Distortion) ratio
Tx	Transmitter
VLF	Very Low Frequency
VSWR	Voltage Standing Wave Ratio

4 General

4.1 Presentation of equipment for testing purposes

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

Recommendations for testing and choice of frequencies can be found in ETS 300 224 [2].

4.2 Controls

Those controls, which if maladjusted can increase the capability of the equipment to cause interference, shall not be accessible without breaking a seal.

4.3 Modulation

All types of constant envelope modulation by code and speech are permitted, which shall meet the limits of the present document.

4.4 Interpretation of the measurement results

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

- a) the measured value related to the corresponding limit shall be used to decide whether an equipment meets the requirements of the present document;
- b1) the values of the actual measurement uncertainty shall be, for each measurement, equal to or lower than the figures given in clause 10 (maximum acceptable value of the measurement uncertainties);
- b2) the actual measurement uncertainty of the laboratory carrying out the measurements, for each particular measurement, shall be included in the corresponding test report (if any).

5 Test conditions, power sources and ambient temperatures

5.1 Normal and extreme test conditions

Type tests shall be made under normal operational conditions and, where stated, under extreme conditions. The test conditions and procedures shall be as specified in subclauses 5.2 and 5.3.

5.2 Normal operational test conditions

5.2.1 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 %.

When it is impracticable to carry out the tests under these conditions, a note to this effect, stating the ambient temperature and relative humidity during the tests, shall be added to the test report.

5.2.2 Normal test power source

- a) Mains supply:
 - the normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of type testing to the present document, the nominal voltage shall be the declared voltage or any of the declared voltages for which the equipment was designed;
 - the frequency of the test power source corresponding to the ac mains shall be between 49 Hz and 51 Hz.

b) Other power sources:

- for operation from other power sources or types of battery (primary or secondary), the normal test voltage shall be that declared by the equipment manufacturer and approved by the test authority;
- such values shall be stated in the test report;
- in pocket equipment with integral antenna, the battery shall not be replaced with an external power source when making radiating measurements, because this external power source could influence the test results.

5.3 Extreme test conditions

5.3.1 Procedure for tests at extreme temperatures

Before measurements are made the equipment shall have reached thermal balance in the test chamber.

The equipment shall be switched to stand-by during the temperature stabilizing period.

In the case of equipment containing stabilization circuits designed to operate continuously, the temperature stabilization arrangements shall be switched on for 15 minutes after thermal balance has been obtained, and the equipment shall then meet the specified requirements. For such equipment the manufacturer shall provide for the power source circuit feeding the crystal oven to be independent of the power source to the rest of the equipment.

a) Procedure for equipment designed for continuous operation:

- if the manufacturer states that the equipment is designed for continuous operation, the procedure shall be as follows:
 - before tests at the upper temperature, the equipment shall be placed in the test chamber and left until thermal balance is attained. The equipment shall then be switched on in the transmit condition for a period of half an hour, after which the equipment shall meet the specified requirements. For tests at the lower temperatures, the equipment shall be left in the test chamber until thermal balance is attained, after which the equipment shall meet the specified requirements.

b) Procedure for equipment designed for intermittent operation:

- if the applicant states that the equipment is designed for intermittent operation, the test procedure shall be as follows:
 - before tests at the upper extreme temperature are made, the equipment shall be placed in the test chamber and left until thermal balance is attained in the test chamber.

The equipment shall then either:

- transmit "on" and "off", according to the duty cycle as declared by the applicant, for a period of 5 minutes; or
- if the "on" period as declared by the applicant exceeds one minute, transmit in the "on" condition for a period not exceeding one minute, followed by a period in the "off" or "standby" mode for four minutes, after which the equipment shall meet the specified requirements.

For tests at the lower extreme temperature the equipment shall be left in the test chamber until thermal balance is attained, then the equipment shall be switched to the "standby" or "receive" condition for one minute, after which the equipment shall meet the specified requirements.

5.3.2 Extreme temperature limits

For tests at extreme temperatures, measurements shall be made in accordance with procedures specified in subclause 5.3.1 over an ambient temperature range of:

- Base station equipment: -25° C to +55° C;
- Transcoder used in temperature-controlled environments: -10° C to +55° C;
- Pocket unit equipment: -10° C to +55° C.

5.3.3 Extreme test power source

a) Mains voltage:

- the extreme source voltages for equipment to be connected to an ac mains source shall be the nominal mains voltage $\pm 10\%$.

b) Battery power source:

- when the equipment is intended for operation from the usual types of battery power sources, the extreme voltages shall be as follows:
 - the end point voltages indicated by the battery status indicator of the unit under test;
 - where the equipment does not have a battery status indicator, and the manufacturer has not declared the end point voltages, the following end point voltages shall be used:
 - 1) Leclanche or Lithium type of battery:
0,85 multiplied by the nominal voltage of the battery.
 - 2) Nickel Metal Hydride or Nickel Cadmium type of battery:
0,9 multiplied by the nominal voltage of the battery;
No upper extreme test voltages apply for 1) and 2).
 - 3) Equipment using other power sources:

For equipment using other power sources, or capable of being operated from a variety of power sources, the extreme test voltages shall be those agreed between the equipment manufacturer and the testing laboratory and shall be recorded in the test report.

5.3.4 Test power source

During type tests the power source of the equipment shall be replaced by a test power source, capable of producing normal and extreme test voltages as specified in subclauses 5.2.2 and 5.3.3. The internal impedance of the test power source shall be low enough to ensure that its effect on the test results is negligible. For the purpose of tests, the voltage of the power source shall be measured at the input terminals of the equipment.

If power to the equipment is provided from an external power source, the test voltages shall be those measured at the point of connection of the power cable to the equipment.

In battery operated equipment, the test power source shall be applied as close to the equipment battery supply terminals as practicable.

During the tests the test power source voltages shall be maintained within a tolerance $\leq 1\%$ relative to the voltage at the beginning of each test. The value of this tolerance is critical for certain measurements. Using a smaller tolerance provides a better uncertainty value for these measurements.

6 Electrical test conditions

6.1 Normal test signals and test modulation

The test modulation signal is a baseband signal which modulates a carrier and is dependent upon the type of equipment under test and also the measurement to be performed.

6.1.1 Normal test signals for analogue speech

These test signals are defined as:

A-M1: a 1 000 Hz tone;

A-M2: a 1 250 Hz tone.

The normal level of the test signals A-M1 and A-M2 shall produce a deviation of 12 % of the channel separation or any lower value as declared by the manufacturer as the normal operating level.

A-M3: a 400 Hz tone, at a level which produces a deviation of 12 % of the channel separation. This signal is used as an unwanted signal for analogue and digital measurements.

6.1.2 Normal test signals for data

This test signal is defined as:

D-M3: a test signal shall be agreed between the accredited test laboratory and the manufacturer in case selective messages are used and are generated or decoded within the equipment. The agreed test signal may be formatted and may contain error detection and correction.

The normal level of the test signal D-M3 shall produce a deviation of 20 % of the channel separation or any other value as declared by the manufacturer as the normal operating level.

For test purposes if special equipment is required to generate or indicate correct acceptance of the messages, it shall be supplied by the manufacturer.

6.2 Artificial load

Tests shall be carried out using an artificial load which shall be a substantially non-reactive non-radiating load of 50 Ω connected to the antenna connector.

6.3 Test fixture for transmitters with an integral antenna

With equipment intended for use with an integral antenna, and not equipped with a 50 Ω output connection, the manufacturer may be required to supply a test fixture. This test fixture is a radio frequency coupling device for coupling the integral antenna to a 50 Ω radio frequency terminal at the working frequencies of the equipment under test. This allows certain measurements to be performed using conducted measuring methods. Only relative measurements may be performed.

If applicable the test fixture shall provide:

- a connection to an external power supply;
- an audio interface either by direct connection or by an acoustic coupler.