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Radio Equipment and Systems (RES); Private wide area paging service; Part 1: Technical characteristics for private wide-area paging systems

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Radio Equipment and Systems (RES) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS consists of two parts as follows:

Part 1: "Technical characteristics for private wide-area paging systems";

Part 2: "Functional characteristics and access protocol for private wide-area paging systems on shared channels".

This ETS has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 83/189/EEC (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

This ETS, together with ETS 300 741, is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility ("the EMC Directive") (89/336/EEC as amended).

Technical specifications relevant to the EMC Directive are given in annex E.

This ETS includes the following annexes:

- annex A is normative and specifies requirements concerning test sites and general arrangements for measurements involving the use of radiated fields;
- annex B is normative and specifies requirements for a simulated human body for measurements on pocket receivers;
- annex C is normative and specifies an adjacent channel power measuring receiver;
- annex D is normative and specifies the calculations of spurious response frequencies;
- annex E is normative and specifies the technical requirements relevant for compliance with the essential requirements the EMC Directive;
- annex F is informative and describes basic system services;
- annex G is informative and contains a bibliography.

Transposition dates

Date of adoption:	20 June 1997
Date of latest announcement of this ETS (doa):	31 October 1997
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	30 April 1998
Date of withdrawal of any conflicting National Standard (dow):	30 April 1998

Introduction

Private Wide-Area Paging (PWAP) systems are basically On-Site Paging (OSP) systems with an extended range achieved by using a higher transmitter power (for guidance 25W could be a suitable value) and antenna location, as well as a specified receiver sensitivity. These systems can use time sharing in order to increase the number of virtual available channels. The time sharing as specified in part 2 of this ETS is a free running system that requires minimum overhead and supplies minimum loss of net-air time.

Potential applications include emergency services, hospitals and manufacturing industry that may be located at various sites within the covered area.

This ETS is based mainly on ETS 300 224, ETS 300 133 part 5, ESPA publication 4.2.7.

In preparing this ETS, much attention has been given to assure a low interference probability, while at the same time allowing a maximum flexibility and service to the end-user.

The conditions for licensing as well as conditions for interfacing to the Public Switched Telephone Network (PSTN) are determined by the appropriate authorities.

Additional standards or specifications may be required for equipment intended to interface to the Public Switched Telephone Network.

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1 Scope

This European Telecommunication Standard (ETS) specifies the minimum performance characteristics and related methods of measurement for Private Wide-Area Paging (PWAP) systems operating on frequencies up to 470 MHz.

The types of equipment covered by this ETS are as follows:

- base station transmitters;
- base station receivers;
- base station transceivers;
- pocket receivers.

This ETS does not include performance characteristics that may be required by the user or requirements for interfacing equipment.

2 Normative references

This ETS incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- [1] ETR 027: "Radio Equipment and Systems (RES); Methods of measurement for mobile radio equipment".
- [2] ETR 028: "Radio Equipment and Systems (RES); Uncertainties in the measurement of mobile radio equipment characteristics".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of this ETS, the following definitions apply:

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

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

messages: The transmission of information to a paging receiver. This information can be in the form of data or digital speech.

base station transceiver: A combination of a base station transmitter and a base station receiver.

base station transmitter: A transmitter fitted with an antenna socket and intended for use in a fixed location. This can be a stand-alone device or part of a transceiver.

base station receiver: A receiver fitted with an antenna socket and intended for use in a fixed location. This can be a stand-alone device or part of a transceiver.

full tests: All of the tests contained in this ETS and performed according to the appropriate methods of measurement.

pocket receiver: A pocket-sized receiver fitted with an integral antenna intended to be carried on a person.

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

test fixture: An apparatus for testing devices with an integral antenna.

salty man: Rotatable acrylic tube filled with salt water (annex B) to simulate the human body.

acceptance rate: the ratio of the number of messages received successfully to the number of messages transmitted.

3.2 Symbols

For the purposes of this ETS, the following symbols apply:

DM1, DM2, DM3	test signals defined in subclause 6.1.1
dBc	decibels relative to carrier
f_{cs}	channel spacing
rms	root-mean square
Rx	Receiver
T_{off}	switch-off instant
T_{on}	switch-on instant
Tx	Transmitter

3.3 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

ad	amplitude difference
EMC	ElectroMagnetic Compatibility
emf	electro-motive force
erp	effective radiated power
fd	frequency difference
LF	Frequency range 30 kHz to 300 kHz (Low Frequency)
MPFD	Maximum Permissible Frequency Deviation
OATS	Open Air Test Site
OSP	On-Site Paging
PABX	Private Automatic Branch eXchange
POCSAG	Post Office Code Standardization Advisory Group
PSTN	Public Switched Telephone Network
PWAP	Private Wide-Area Paging
RF	Radio Frequency
RSSI	Received Signal Strength Indication
SIC	System Identification Code
SINAD	(Signal + Noise And Distortion)/(Noise + Distortion) ratio
VLF	Frequency range 3 kHz to 30 kHz (Very Low Frequency)
VSWR	Voltage Standing Wave Ratio

4 General

4.1 Presentation of radio paging equipment for testing purposes

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

To simplify and harmonize the type testing procedures between the different test laboratories, measurements shall be performed according to this ETS. The following subclauses are intended to give confidence that the requirements set out in this ETS have been met.

4.1.1 Choice of model for type testing

The manufacturer shall provide one or more production models of equipment, as appropriate, for type testing.

4.1.2 Definition of alignment range

The manufacturer shall, when submitting equipment for test, state the alignment range for the receiver or the transmitter. The alignment range is defined as the frequency range over which the receiver or the transmitter can be programmed and/or re-aligned to operate without any physical change of components other than programmable read only memories or crystals (for the receiver and the transmitter). For the purpose of all measurements the receiver and transmitter shall be considered separately.

4.1.3 Definition of the categories of the alignment range (AR1 and AR2)

Category AR1 corresponds to a limit of the alignment range of the receiver and transmitter which is less than, or equal to, 10 % of the highest frequency of the alignment range.

Category AR2 corresponds to a limit of the alignment range of the receiver and transmitter which is greater than 10 % of the highest frequency of the alignment range.

4.1.4 Choice of frequencies

The frequencies for testing shall be chosen by the manufacturer in accordance with subclauses 4.1.5 and 4.1.6.

4.1.5 Testing of equipment of category AR1

Full tests shall be carried out on a channel within 100 kHz of the centre frequency of the alignment range of one sample of the equipment.

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4.1.6 Testing of equipment of category AR2

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Full tests shall be carried out on three samples of the equipment, each sample aligned to a different channel.

The frequency of the channel of:

- the first sample shall be within 100 kHz of the lowest frequency of the alignment range;
- the second sample shall be within 100 kHz of the centre frequency of the alignment range;
- the third sample shall be within 100 kHz of the highest frequency of the alignment range.

4.2 Mechanical and electrical design

Station transmitters and receivers may be individual or combination units. The power source specified by the manufacturer shall be used for testing purposes.

4.3 Controls

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

4.4 Transmitter shut-off facility

If the transmitter is fitted with an automatic shut-off facility, it shall be made inoperative for the duration of the tests.

4.5 Receiver mute or squelch circuit

If the receiver is equipped with a mute, squelch or battery-saving circuit, this circuit shall be made inoperative for the duration of the tests.

4.6 Auxiliary test equipment

All necessary test signal sources and setting up information shall accompany the equipment when it is submitted for type testing.

4.7 Categories of emission

Any type of constant envelope modulation, using analogue or digital modulating signals, which meets the limits of this ETS may be used.

4.8 Presentation and interpretation of the measurement results

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

- the measured value related to the corresponding limit shall be used to decide whether an equipment meets the requirements of this ETS;
- the measurement uncertainty value 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 8 (see clause 9).

The relevant application form and test report defined by CEPT should be used. If the application form and test report form for this ETS are not available, the relevant documents should be based on the model application form and the model test report form.

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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**5.2.2.1 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 this ETS, the nominal mains 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.

5.2.2.2 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. 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 standby 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 test 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;

the equipment shall then either:

- transmit "on" and "off", according to the duty cycle as declared by the applicant, for a period of five 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.