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Sistemi radiodifuzije - Digitalna zvokovna radiodifuzija (DAB) za mobilne, prenosne in fiksne sprejemnike

Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers

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Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers

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Foreword

This European Standard (Telecommunications series) has been produced by the Joint Technical Committee (JTC) Broadcast of the European Broadcasting Union (EBU), Comité Européen de Normalisation ELEctrotechnique (CENELEC) and the European Telecommunications Standards Institute (ETSI).

NOTE: The EBU/ETSI JTC Broadcast was established in 1990 to co-ordinate the drafting of standards in the specific field of broadcasting and related fields. Since 1995 the JTC Broadcast became a tripartite body by including in the Memorandum of Understanding also CENELEC, which is responsible for the standardization of radio and television receivers. The EBU is a professional association of broadcasting organizations whose work includes the co-ordination of its members' activities in the technical, legal, programme-making and programme-exchange domains. The EBU has active members in about 60 countries in the European broadcasting area; its headquarters is in Geneva.

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The Eureka Project 147 was established in 1987, with funding from the European Commission, to develop a system for the broadcasting of audio and data to fixed, portable or mobile receivers. Their work resulted in the publication of European Standard, ETS 300 401 [7], for DAB (see note) which now has worldwide acceptance. The members of the Eureka Project 147 are drawn from broadcasting organizations and telecommunication providers together with companies from the professional and consumer electronics industry.

NOTE: DAB is a registered trademark owned by one of the Eureka Project 147 partners.

The present document on Digital Audio Broadcasting (DAB) is based on the overall system and service requirements adopted by the ITU-R Recommendation 774 [1] and ITU-R Recommendation 789 [2]. The DAB system has been recommended by the ITU-R, as Digital System A, for terrestrial and satellite delivery [16], [17]. The audio coding algorithm used by the DAB system has been subject to the standardization process within the ISO/Moving Pictures Expert Group (MPEG), see ISO/IEC 11172-3 [3] and ISO/IEC 13818-3 [14]. The layered ISO open system interconnect model ISO 7498 [4] has been used to the extent possible, and interfacing to information technology equipment and communications networks has been taken into account where applicable.

The present document defines the nature and content of the transmitted DAB signal with reference to the conceptual emission part. The emphasis is given to the normative elements. Informative elements are included only to the extent necessary to provide interpretative guidance to the DAB system users and equipment manufacturers.

The DAB system is a novel sound broadcasting system intended to supersede the existing analogue amplitude and frequency modulation systems. It is a rugged, yet highly spectrum and power efficient sound and data broadcasting system. It has been designed for terrestrial and satellite as well as for hybrid and mixed delivery. The DAB system has been publicly demonstrated on a number of occasions during its development. It has been subject to extensive field tests and computer simulations in Europe and elsewhere. It is now in regular service in many European countries and throughout the world. In 1995, the European DAB Forum (EuroDab) was established to pursue the introduction of DAB services in a concerted manner world-wide, and it became the World DAB Forum (World DAB) in 1997.

With respect to the second edition of ETS 300 401 published in May 1997, the present document contains several refinements to the Eureka 147 DAB system. These refinements were performed and agreed by the Eureka 147 Consortium and include the following areas:

- database management signalling for certain service information FIGs;
- use of packet mode without data groups;
- definition of user application signalling, a universal character set, and global/ensemble region signalling.

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1 Scope

The present document establishes a broadcasting standard for the Digital Audio Broadcasting (DAB) system designed for delivery of high-quality digital audio programme and data services for mobile, portable and fixed reception from terrestrial or satellite transmitters in the Very High Frequency (VHF)/Ultra High Frequency (UHF) frequency bands as well as for distribution through cable networks. The DAB system is designed to provide spectrum and power efficient techniques in terrestrial transmitter network planning, known as the Single Frequency Network (SFN) and the gap-filling technique. The DAB system is suitable for satellite as well as hybrid/mixed terrestrial/satellite broadcasting, using a simple, nearly omni-directional receiving antenna. The DAB system meets the required sharing criteria with other radiocommunication services.

The present document defines the DAB transmission signal. It includes the coding algorithms for audio, multiplexing of audio programme and data services, channel coding and modulation. A limited range of supplementary services associated with programme services is defined. Provision is also made for transmission of additional data services which may be programme related or not, within the limit of the total system capacity. The present document provides information on the system configuration which includes information about the ensembles, services, service components and linking of them. Provision is made for a compatible cross-reference to existing Frequency Modulation (FM) services and Amplitude Modulation (AM) services.

The present document describes the nominal characteristics of the emitted DAB signal. The aspects related to the receiver design are outside the scope of the present document. Hardware implementation considerations are not covered.

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.

- [1] ITU-R Recommendation BS.774 (March 1994): "Digital sound broadcasting to vehicular, portable and fixed receivers using terrestrial transmitters in the VHF/UHF bands".
- [2] ITU-R Recommendation BO.789 (March 1994): "Digital sound broadcasting to vehicular, portable and fixed receivers for BSS (sound) in the frequency range 500 - 3 000 MHz".
- [3] ISO/IEC 11172-3 (March 1993): "Information technology - Coding of moving pictures and associated audio for digital storage media at up to 1,5 Mbit/s - Part 3: Audio".
- [4] ISO 7498-1: "Information technology - Open Systems Interconnection - Basic Reference Model: The Basic Model".
- [5] EN 50067: "Specification of the radio data system (RDS) for VHF/FM sound broadcasting in the frequency range from 87,5 to 108,0 MHz".
- [6] ITU-T Recommendation X.25: "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".
- [7] ETSI ETS 300 401 (1997): "Radio broadcasting systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers".
- [8] ETSI ETS 300 174 (1992): "Network Aspects (NA); Digital coding of component television signals for contribution quality applications in the range 34-45 Mbit/s".
- [9] ISO 3901 (1986): "Documentation - International Standard Recording Code (ISRC)".

- [10] Norwegian Telecom, Issue 2 (July 20, 1989): "NR - MSK Access Control System".
- [11] EN 50094 (1992): "Access control system for the MAC/packet family: EUROCRYPT".
- [12] IEC 60958: "Digital audio interface".
- [13] ITU-R Recommendation BS.562-3 (1990): "Subjective assessment of sound quality".
- [14] ISO/IEC 13818-3: "Information technology - Generic coding of moving picture and associated audio information - Part 3: Audio".
- [15] EN 797: "Bar coding - Symbology specifications EAN/UPC".
- [16] Void.
- [17] Void.
- [18] Void.
- [19] CEPT Final Acts Wiesbaden (July 1995): "Special Arrangement of the European Conference of Postal and Telecommunications Administrations (CEPT) relating to the use of the bands 47 - 68 MHz, 87.5 - 108 MHz, 174 - 230 MHz, 230 - 240 MHz and 1452 - 1492 MHz for the introduction of Terrestrial Digital Audio Broadcasting (T-DAB)".
- [20] ETSI EN 301 234 (V1.2): "Digital Audio Broadcasting (DAB); Multimedia Object Transfer (MOT) protocol".
- [21] ISO/IEC 10646-1 (1993): "Information technology - Universal Multiple-Octet Coded Character Set (UCS) Part 1 : Architecture and Basic Multilingual Plane; Amendment 2 (1996): UCS Transformation Format 8 (UTF-8)".
- [22] ETSI ES 201 735: "Digital Audio Broadcasting (DAB); Internet Protocol (IP) datagram tunnelling".
- [23] ETSI TS 101 756: "Digital Audio Broadcasting (DAB); Registered Tables".
<https://standards.iteh.ai/catalog/standards/sist/9dd8e5e6-d2b2-4546-8532->
- [24] ETSI TS 101 759: "Digital Audio Broadcasting (DAB); Transparent Data Channel".

3 Definitions, abbreviations, symbols and conventions

3.1 Definitions

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

Access Control System (ACS): particular set of rules for managing entitlement checking and conditional access messages

alias component: mirrored signal component resulting from sub-Nyquist sampling

announcement cluster: group of services which share the same announcement interruption privileges

audio bit stream: sequence of consecutive audio frames

audio frame: frame of a duration of 24 ms (at 48 kHz sampling frequency) or of 48 ms (at 24 kHz sampling frequency) which contains a Layer II encoded audio signal ISO/IEC 11172-3 [3], ISO/IEC 13818-3 [14], corresponding to 1 152 consecutive audio samples. It is the smallest part of the audio bit stream which is decodable on its own

audio mode: the audio coding system provides single channel, dual channel, stereo and joint stereo audio modes. In each mode, the complete audio signal is encoded as one audio bit stream

Auxiliary Information Channel (AIC): all or part of sub-channel 63, used to carry information redirected from the Fast Information Channel

bark: see "Critical band"

bit allocation: time-varying assignment of bits to samples in different sub-bands according to a psychoacoustic model

blackout state: the denial of access to a service because it is restricted for some reason (for example, targeted only to a particular geographical region)

bound: the lowest sub-band in which Intensity stereo coding is used, in the case of Joint stereo mode

Capacity Unit (CU): the smallest addressable unit (64 bits) of the Common Interleaved Frame (CIF)

Change Event Indication (CEI): set of FIG fields with particular values to indicate a change of database content for certain service information features

Common Interleaved Frame (CIF): the serial digital output from the main service multiplexer which is contained in the Main Service Channel part of the transmission frame. It is common to all transmission modes and contains 55 296 bits (i.e. 864 CUs)

Conditional Access (CA): mechanism by which the user access to service components can be restricted

Control Word (CW): secret part of the IW that depends on the ACS used

convolutional coding: the coding procedure which generates redundancy in the transmitted data stream in order to provide ruggedness against transmission distortions

critical band: psychoacoustic measure in the frequency domain which corresponds to the frequency selectivity of the human ear. The unit of this psychoacoustic measure is called Bark. The Bark scale is a non-linear mapping of the frequency scale over the entire audio frequency range

DAB audio frame: same as audio frame, but includes all specific DAB audio-related information

DAB transmission signal: the transmitted radio frequency signal

database key: set of FIG fields that sub-divide a database for certain service information features

data service: service which comprises a non-audio primary service component and optionally additional secondary service components