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Digital Audio Broadcasting (DAB); Guide to DAB standards; Guidelines and Bibliography

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DAB Digital AudioBroadcasting

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Foreword

This Technical Report (TR) has been produced by 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 1: 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, EN 300 401 [i.1], for DAB (note 2) which now has world-wide 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 2: DAB is a registered trademark owned by one of the Eureka Project 147 partners.

1 Scope

The present document provides brief explanations about the many different standards and guidelines for Digital Audio Broadcasting (DAB), what they cover and how they interrelate. The so-called "main DAB standard" EN 300 401 [i.1] is explained first and the remaining documents are grouped into standards/documents related to DAB-receivers, DAB-networks along with transmitters and data transmission via DAB. Finally a brief overview of general literature about DAB is also given.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) 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.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

Not applicable.

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI EN 300 401: "Radio broadcasting systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers".

[i.2] ETSI TR 101 496 (all parts): "Digital Audio Broadcasting (DAB); Guidelines and rules for implementation and operation".

[i.3] ETSI TS 101 756: "Digital Audio Broadcasting (DAB); Registered Tables".

[i.4] IEC EN 62104: "Characteristics of DAB receivers".

[i.5] IEC EN 62105: "Digital Audio Broadcasting system - Specification of the Receiver Data Interface (RDI)".

[i.6] IEC EN 50320: "Digital audio broadcasting system - Specification of the DAB command set for receivers (DCSR)".

[i.7] ETSI EN 300 797: "Digital Audio Broadcasting (DAB); Distribution interfaces; Service Transport Interface (STI)".

[i.8] ETSI EN 300 798: "Digital Audio Broadcasting (DAB); Distribution interfaces; Digital baseband In-phase and Quadrature (DIQ) interface".

[i.9] ETSI ETS 300 799: "Digital Audio Broadcasting (DAB); Distribution interfaces; Ensemble Transport Interface (ETI)".

[i.10] ETSI EN 301 234: "Digital Audio Broadcasting (DAB); Multimedia Object Transfer (MOT) protocol".

[i.11] ETSI TR 101 497: "Digital Audio Broadcasting (DAB); Rules of Operation for the Multimedia Object Transfer Protocol".

[i.12] ETSI ES 201 735: "Digital Audio Broadcasting (DAB); Internet Protocol (IP) Datagram Tunnelling".

[i.13] ETSI ES 201 736: "Digital Audio Broadcasting (DAB); Network Independent Protocols for Interactive Services".

[i.14] ETSI ES 201 737: "Digital Audio Broadcasting (DAB); Interaction channel through Global System for Mobile communications (GSM) the Public switched Telecommunications System (PSTN); Integrated Services Digital Network (ISDN) and Digital Enhanced Cordless Telecommunications (DECT)".

[i.15] ETSI EN 301 700: "Digital Audio Broadcasting (DAB); VHF/FM Broadcasting: cross-referencing to simulcast DAB services by RDS-ODA 147".

[i.16] IEC EN 62106: "Specification of the radio data system (RDS) for VHF/FM sound broadcasting in the frequency range from 87,5 to 108,0 MHz".

[i.17] ETSI TS 101 498 (all parts): "Digital Audio Broadcasting (DAB); Broadcast Website".

[i.18] ETSI TS 101 499: "Digital Audio Broadcasting (DAB); MOT Slide Show; User Application Specification".

[i.19] ETSI TS 101 759: "Digital Audio Broadcasting (DAB); Data Broadcasting - Transparent Data Channel (TDC)".

[i.20] ETSI TR 101 758: "Digital Audio Broadcasting (DAB); Signal strengths and receiver parameters; Targets for typical operation".

[i.21] ETSI TS 102 367: "Digital Audio Broadcasting (DAB); Conditional Access".

[i.22] ETSI TS 101 757: "Digital Audio Broadcasting (DAB) Conformance testing for DAB Audio".

[i.23] ETSI TS 101 860: "Digital Audio Broadcasting (DAB); Distribution interfaces; Service Transport Interface (STI); STI Levels".

[i.24] ETSI TS 101 993: "Digital Audio Broadcasting (DAB); A Virtual Machine for DAB: DAB Java Specification".

[i.25] ETSI TS 102 818: "Digital Audio Broadcasting (DAB); Digital Radio Mondial (DRM); XML Specification for Electronic Programme Guide (EPG)".

[i.26] ETSI TS 102 371: "Digital Audio Broadcasting (DAB); Digital Radio Mondiale (DRM); Transportation and Binary Encoding Specification for Electronic Programme Guide (EPG)".

[i.27] ETSI TS 102 368: "Digital Audio Broadcasting (DAB); DAB - TMC (Traffic Message Channel)".

[i.28] ETSI TS 102 427: "Digital Audio Broadcasting (DAB); Data Broadcasting - MPEG-2 TS streaming".

[i.29] ETSI TS 102 428: "Digital Audio Broadcasting (DAB); DMB video service; User Application Specification".

[i.30] ETSI TS 102 563: "Digital Audio Broadcasting (DAB); Transport of Advanced Audio Coding (AAC) audio".

[i.31] ETSI TS 102 652: "Digital Audio Broadcasting (DAB); Intellitext; Application specification".

[i.32] ETSI TS 102 980: "Digital Audio Broadcasting (DAB); Dynamic Label Plus (DL Plus); Application specification".

[i.33] ETSI TS 102 978: "Digital Audio Broadcasting (DAB); IPDC Services; Transport specification".

[i.34] ETSI TS 102 979: "Digital Audio Broadcasting (DAB); Journaline; User application specification".

[i.35] ETSI TS 102 635 (all parts): "Digital Audio Broadcasting (DAB); Middleware".

[i.36] ETSI TS 102 632: "Digital Audio Broadcasting (DAB); Voice Applications".

[i.37] ETSI TS 102 693: "Digital Audio Broadcasting (DAB); Encapsulation of DAB Interfaces (EDI)".

[i.38] ETSI TS 102 821: "Digital Radio Mondiale (DRM); Distribution and Communications Protocol (DCP)".

3 Abbreviations

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

API	Application Programming Interface
BWS	Broadcast Website
CA	Conditional Access
DAB	Digital Audio Broadcasting
DCP	Distribution and Communications Protocol
DECT	Digital Enhanced Cordless Telecommunications
DIQ	Digital baseband In-phase and Quadrature
DL	Dynamic Label
DMB	Digital Multimedia Broadcasting
EBU	European Broadcasting Union
EDI	Encapsulation of DAB Interfaces
EPG	Electronic Programme Guide
ETI	Ensemble Transport Interface
FIDC	Fast Information Data Channel
FM	Frequency Modulation
GHz	Giga (10^9) Hertz
GIO	Guidelines and rules for Implementation and Operation
GSM	Global System for Mobile communication
HE AAC	Hi Efficiency Advanced Audio Coding
HTML	Hyper Text Markup Language
IP	Internet Protocol
IPDC	Internet Protocol Data Channel
ISDN	Integrated Services Digital Network
JTC	Joint Technical Committee
LI	Logical Interface
Mbit/s	Mega (10^6) bits per second
MHEG	Multimedia and Hypermedia information coding Experts Group
MHz	Mega (10^6) Hertz
MOT	Multimedia Object Transfer
MPEG	Moving Pictures Expert Group
MSC	Main Service Channel
MTU	Maximum Transfer Unit
OFDM	Orthogonal Frequency Division Multiplexing
PAD	Programme Associated Data
PFT	Protection, Fragmentation and Transport
PSI/SI	Programme Specific Information/Service Information
PSSC	Personal DAB Service Session Control
PSTN	Public Switched Telecommunications System
RDI	Receiver Data Interface
RDS	Radio Data System
RDS-ODA	RDS Open Data Application
RF	Radio Frequency
RTP	Real-time Transport Protocol
SFN	Single Frequency Network
STI	Service Transport Interface
T-DAB	Terrestrial DAB
TDC	Transparent Data Channel

TMC	Traffic Message Channel
WorldDAB IRC	WorldDAB Information and Registration Centre
XML	eXtensible Markup Language

4 DAB system standards and guidelines

4.1 EN 300 401 - DAB system

EN 300 401 [i.1] is the so-called "main DAB" standard. It describes 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 frequency bands from 30 MHz to 3 GHz. The DAB system is designed to provide spectrum and power efficient techniques in terrestrial transmitter network planning, known as the Single Frequency Network (SFN). The DAB system is suitable for satellite as well as hybrid/mixed terrestrial/satellite broadcasting.

EN 300 401 [i.1] 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. EN 300 401 [i.1] 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. EN 300 401 [i.1] 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.

4.2 TS 101 563 - DAB+

TS 101 563 [i.30] defines the method to code and transmit audio services using the HE AAC v2 audio coder, the so-called DAB+ audio. It details the necessary mandatory requirements for decoders, the permitted audio modes and the data protection and encapsulation. This audio coding scheme permits the full use of the PAD channel for carrying dynamic labels and user applications.

4.3 TS 101 756 - Tables

TS 101 756 [i.3] contains the current tables for use in the implementation of the Digital Audio Broadcasting (DAB), system as given in the "main DAB standard" EN 300 401 [i.1] and the MOT standard EN 301 234 [i.10]. The complete up-to-date set of values is always given in the "Registered tables" document (TS 101 756 [i.3]).

The tables in TS 101 756 [i.3] are maintained by the WorldDAB Information and Registration Centre (WorldDAB IRC). They apply an easy procedure for registering new values, to ensure that they may be used without the need to change the so-called "main DAB standard" EN 300 401 [i.1] and the MOT standard EN 301 234 [i.10]. The procedure for registering a new value in an existing table or the registration of a new table is described in clause 4 of TS 101 756 [i.3].

Additionally there are two annexes containing translations of Programme Type Codes and Announcement Type Codes.

4.4 TS 102 367 - CA

TS 102 367 [i.21] describes the conditional access system for DAB. It allows for scrambling to be applied to stream mode audio, stream mode data, packet mode data and FIDC service components. TS 102 367 [i.21] specifies the framework for signalling and various configurations of content and access control data.

4.5 TS 102 368 - TMC

TS 102 368 [i.27], developed by the TMC Forum in collaboration with the WorldDAB Forum, describes the mapping required to deliver TMC data via DAB transmission.

4.6 TR 101 496 - GIO

TR 101 496 [i.2] is the main guideline document, developed by the Eureka Project 147, as the major companion document to EN 300 401 [i.1]. Originally TR 101 496 [i.2] was developed in three volumes, covering: Outline and Features; Broadcast Network; and System Features, giving considerable detail and explanations to help to implement DAB systems and develop conformant equipment. It is now a single Technical Specification document, in three parts.

TR 101 496 [i.2] is now partly outdated, since it corresponds to EN 300 401(V1.3.3) published in 2001, and so does not reflect the current status. It remains a useful companion, however, to aid understanding but should not be relied upon with regard to the implementation of service information or more recently introduced DAB features.

4.7 EN 301 700 - RDS linkage

EN 301 700 [i.15] describes a standard method for signalling DAB service information to a receiver tuned to a FM-RDS service. The RDS Open Data Application (RDS-ODA) system which is used is specified in the so called "main RDS standard" (EN 62106 [i.16]).

Since some DAB services are simulcasts of existing FM services, usually with RDS, it is possible for receivers able to receive both DAB and FM services to present the listener with the DAB service, but it can fall back to the FM service outside the DAB coverage area. DAB provides the signalling, through the service following information in the Fast Information Channel, to enable a receiver to find the equivalent service on FM. EN 301 700 [i.15] describes the characteristics of an RDS-ODA for providing frequency information for DAB ensembles. Additionally the ODA can signal various Service Information attributes of DAB services thus allowing a receiver to find an equivalent DAB service.

5 DAB receiver standards and documents

5.1 General

This clause describes a set of standards and recommendations which have evolved over the years to supplement the "main DAB standard" EN 300 401 [i.1] covering the implementation of DAB receivers. EN 62104 [i.4] describes characteristics of DAB receivers. EN 62105 [i.5] (RDI) specifies the interface between DAB receivers and additional data decoders and EN 50320 [i.6] defines the DAB command set for receivers. TS 101 757 [i.22] specifies a test procedure and defines test bitstreams which can be used to verify DAB audio decoders. TR 101 758 [i.20] contains general field strength and sensitivity considerations for a DAB system.

Figure 1: Void

5.2 EN 62104

EN 62104 [i.4] describes DAB receiver characteristics for consumer equipment intended for terrestrial and cable reception operating in Band III and L-Band and for satellite reception in L-Band. Topics such as basic implementation and functional performance requirements, interfaces, recommended centre frequencies for DAB receivers and reference performance levels and measuring methods are covered in EN 62104 [i.4]. Dedicated receivers for specific applications are not within the scope of EN 62104 [i.4].

5.3 EN 62105

EN 62105 [i.5] describes an interface between the DAB receiver and data decoders. The maximum DAB data rate of 1,8432 Mbit/s as well as data for receiver control and information on the received transmitters of the SFN can be carried via the RDI. The source for the data to be carried on the Receiver Data Interface is the output bit stream of the channel decoder of a DAB receiver. Dedicated decoders for data applications, computers, etc., but also devices for audio post processing and recording can be connected to the DAB receiver through this interface.

The RDI specification is independent of any physical interfaces and interfaces commonly used in consumer electronics are supported. The use of RDI allows connection of several decoders to a single receiver and it is possible to implement a return channel for receiver control from an application terminal.

5.4 EN 50320

EN 50320 [i.6] describes a command set which allows to control DAB receivers. The command set is intended for use on different physical bus systems.

5.5 TS 101 757

TS 101 757 [i.22] specifies a test procedure and defines test bitstreams which can be used to verify whether bitstreams and decoders meet the requirements as specified in EN 300 401 [i.1]. These tests can be used for various purposes such as:

- manufacturers of encoders, and their customers, can use the tests to verify whether the encoder produces valid bitstreams;
- manufacturers of decoders and their customers can use the tests to verify whether the decoder meets the requirements specified in EN 300 401 [i.1] for the claimed decoder capabilities.

5.6 TR 101 758

TR 101 758 [i.20] describes the general principles for deriving the necessary field strength and compatible receiver sensitivity for satisfactory operation of a DAB system.

6 DAB contribution, distribution and network standards

6.1 General

A set of standards have evolved over the years to supplement the "main DAB standard" EN 300 401 [i.1] covering implementation of the requisite broadcast networking interfaces. EN 300 797 [i.7] describes the Service Transport Interface (STI), EN 300 798 [i.8] describes the digital baseband in-phase and quadrature interface and ETS 300 799 [i.9] describes the Ensemble Transport Interface (ETI). TS 102 693 [i.37] provides a mechanism for the encapsulation of STI and ETI compliant data streams for distribution over IP networks.

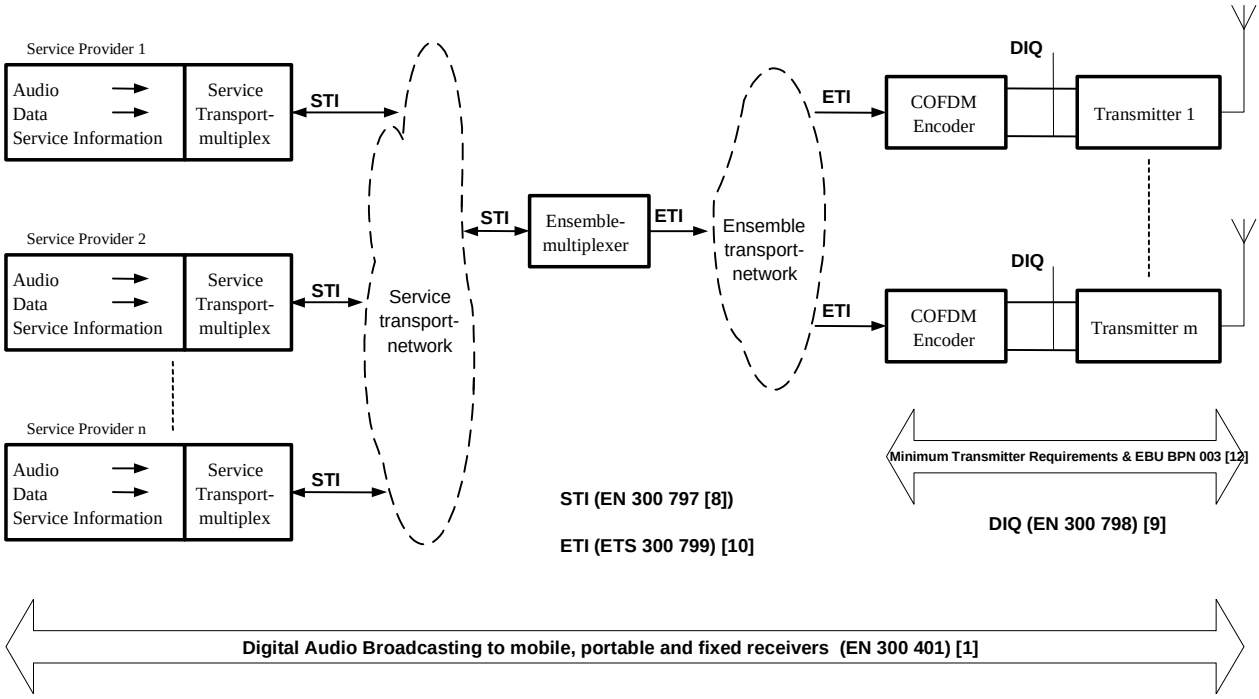

Figure 2: Conceptual DAB transmission network and related standards

6.2 EN 300 797 - STI

EN 300 797 [i.7] has been defined to provide a standardized way of transporting DAB service components, service information and control information in a DAB collection network. The collection network connects the studios of the various Service providers to the Ensemble provider's ensemble multiplexer.

The STI consists of two parts: the data part, STI-D, which carries data intended for broadcast, and the control part, STI-C, which carries data for control and monitoring purposes and is not intended for broadcast. STI-D is unidirectional in nature, whereas STI-C is bidirectional in nature. EN 300 797 [i.7] specifies first the logical interface for STI-D and STI-C, and then defines various physical implementations for them.

The STI interface is suitable for use on a number of different physical media and telecommunication networks. Provision is made for the inclusion of appropriate error detection and correction and for the management of network transit delay.

6.2.1 TS 101 860 - STI levels

TS 101 860 [i.23] has been defined to establish guidance in implementation and usage of the functionality described in the STI standard EN 300 797 [i.7]. Subsets of the STI standard are defined in order to make interoperable solutions possible for different suppliers of STI devices. The subsets are called STI Levels. Interoperability is ensured if the STI Logical Interface (LI) and STI Physical Interfaces (STI-PI, X) are the same for entities transporting DAB Service Components, Service Information and control messages in a DAB collection network.

6.3 EN 300 798 - DIQ

EN 300 798 [i.8] is applicable to DAB channel coding equipment typically located at each of the transmitter sites in a DAB SFN. The norm describes the characteristics of a suitable interface for the connection of the two major elements of the DAB OFDM generator; the baseband processing equipment and the RF modulator. The interface provides an interconnection between a single source (the baseband processor) and a single destination (the RF modulator). The standard does not cover the generation of the digital I/Q baseband signals since this is covered in EN 300 401 [i.1].

The digital baseband I/Q interface is unidirectional and does not cover the provision of status nor control information in the reverse direction (i.e. from the modulator back to the baseband processing section of the equipment).

6.4 ETS 300 799 - ETI

ETS 300 799 [i.9] establishes a method for the distribution of DAB signals between the ensemble multiplexer, and DAB modulation equipment located at the different transmission sites of an SFN. The data flow of the ETI is unidirectional by nature and the standard specifies first the logical interface the ETI, and then defines various physical implementations for it.

The interface is suitable for use on a number of different physical media including standard 2 Mbit/s switched telecommunication networks. Provision is made for the inclusion of appropriate error detection and correction and for the management of network transit delay. Limited capacity is also made available for signalling from the ensemble multiplexer to other equipment in the distribution network. ETS 300 799 [i.9] does not cover the provision of status nor control information in the reverse direction (i.e. from transmitters back to the Ensemble provider).

6.5 TS 102 693 - EDI

TS 102 693 [i.37] provides a mechanism for the encapsulation of STI-D (see EN 300 797 [i.7]) and ETI (see ETS 300 799 [i.9]) compliant data streams for distribution over IP networks. EDI is based on the existing Distribution and Communications Protocol (DCP - TS 102 821 [i.38]), and therefore a layered approach relevant to unique IP network designs can be implemented.

EDI is designed to distribute STI-D and ETI over varying conditions of IP networks, and ensure the robust delivery of STI-D and ETI compliant data over networks affected by congestion, jitter and limited packet loss. EDI can be configured to operate a re-send function, or re-construct missed packets at the receiver in times of packet loss. Once the EDI Packet has been passed to the DCP stage, Protection, Fragmentation and Transport (PFT) can add a further layer of Reed Solomon block coding and fragmentation if required; this is especially attractive for uni-directional or low Quality of Service (QoS) networks.

EDI utilizes open internet standards, and can be configured for operation over uni-directional unicast and multicast UDP/IP, and connection based TCP/IP, including MTU adaptations.

7 Data transport and applications

7.1 General

Data transmission generally takes two forms - file based and stream based. The Multimedia Object Transfer (MOT) standard allows broadcasting of file based data via DAB in a very convenient way. The Transparent data channel standard allows broadcasting of synchronous and asynchronous streams. A number of applications have been standardised that utilise these transport protocols.

Mechanisms have also been provided to allow MPEG-2 transport stream based services to be carried over DAB. This includes DMB mobile television and radio services and IPDC based services.

Some text based applications have also been specified, building on the simple functionality provided in the main DAB standard by the Dynamic Label.

Provision has been made to provide mechanisms to allow DAB to be used as part of a mobile internet network.

7.2 EN 301 234 - MOT

EN 301 234 [i.10] describes the MOT protocol which allows broadcasting of various kinds of data using the DAB system. It is tailored to the needs of Multimedia services and the specific constraints given by the broadcasting characteristics of the DAB system. MOT ensures interoperability between different data services and application types as well as equipment form different manufacturers.

EN 301 234 [i.10] defines the transport specific encoding for data types not specified in EN 300 401 [i.1] according to the transport mechanisms provided by DAB. It allows a flexible utilization of the data channels incorporated in the DAB system, as well as methods to manage and maintain a reliable transmission in a uni-directional broadcast environment. Provisions are also made for the creation and presentation of advanced Multimedia services using formats such as Hyper Text Markup Language (HTML) or Multimedia and Hypermedia information coding Experts Group (MHEG ISO).

7.2.1 TR 101 497 - RoMOT

TR 101 497 [i.11] provides guidance on the use of V1.1.1 and V1.2.1 of the MOT specification [i.10]. It is not relevant to V2.1.1 and later versions of the MOT specification [i.10].

7.2.2 TS 101 499 - SlideShow

TS 101 499 [i.18] describes the techniques required to deliver a sequence of slides which carry information in the form of images. The main use for this user application will be in context with a programme service component. Examples are: news programme items complemented by photos from the reported events and programme items with popular songs accompanied by photographs of the performers or the covers of their issued CDs. Once activated the Slide Show Application is service provider driven and does not require any interaction from the end-user of the corresponding service component. Each slide appears automatically on the display and will be replaced under the control of the service provider according to the needs of his service.

7.2.3 TS 102 818 - EPG xml

TS 102 818 [i.25] defines the XML schema data model for an Electronic Programme Guide (EPG) for Digital Audio Broadcasting (DAB). It is envisaged that this data format could be used both for transmitting schedule data to EPG applications on receivers and as the basis for exchanging information between broadcasters, network operators and content providers.

7.2.4 TS 102 371 - EPG binary

TS 102 371 [i.26] describes the techniques required to compress the EPG data within a DAB transmission channel to reduce transmitted bit-rate and to profile the data for a range of different receiver capabilities.

7.2.5 TS 101 498 - BWS

TS 101 498 [i.17] describes the DAB Broadcast Web Site application which gives the opportunity to use HTML as a content format to support information services. This concept allows a service provider to deliver an entire web site to a receiver using only the broadcast channel of DAB and without the need for any form of return channel.

7.2.6 TS 102 632 - Voice

TS 102 632 [i.36] builds upon the BWS specification by providing the capabilities to allow a voice interface. This is especially useful to some mobility cases where the user is doing other things while using the system such as driving a car or crossing the street.

7.2.7 TS 102 635 - Middleware

TS 102 635 [i.35] establishes a standard for a platform-independent environment, where executable applications can be signalled and transferred to a receiver via a broadcasting network and executed on the receiver. It does not suppose the exclusive use of a specific broadcast network but defines the commonly-required specifications among diverse broadcast networks. It includes the definitions of basic data formats, protocols to deliver data, to signal downloadable applications and to download them, ways to denote resources on broadcast networks, and detailed interfaces among receiver platform, broadcast and communication networks, and the applications. This is specified in part 1.

In order to apply the present document to a target broadcast network, it is required to map abstract interfaces to concrete entities of the network and to add additional definitions specific to the network. This is specified in part 2 for DAB.

7.2.8 TS 101 993 - Java

TS 101 993 [i.24] specifies a DAB related API for Java. This API enables the download of Java programs via DAB and the control of their execution. Additionally, it provides an interface to the functionality of DAB.

A DAB extension to the Java API has been designed to provide the software framework for designing, implementing and executing portable applications specifically targeted to the DAB system.

The DAB Java Framework is divided in three basics modules or packages: a DAB specific extension of the Java API, a runtime support for the DAB applications execution environment, and a DAB I/O package for signalling the DAB Java extension over the DAB signal.

7.3 TS 101 759 - TDC

TS 101 759 [i.19], developed by the Eureka Project 147, describes the techniques required to deliver data transparently within a DAB transmission, where the data concerned does not need to be related to any other parameters of the particular bearer DAB transmission.

7.4 TS 102 427 - MPEG-2 TS

TS 102 427 [i.28] specifies how MPEG-2 Transport Stream can be encapsulated within a DAB MSC stream data sub-channel including additional error protection. The error protection mechanism is composed of a Reed-Solomon coder and an interleaver.

7.4.1 TS 102 428 - DMB

TS 102 428 [i.29] specifies the user application for video services carried via DAB. It also includes profile definitions for the application. It defines the components of the video services; the content compression, the synchronization mechanism and multiplexing mechanism, allowing video services to be delivered to suitably equipped terminals.

From V1.2.1 it also specifies the way that DMB may be used to deliver radio services.

7.4.2 TS 102 978 - IPDC

TS 102 978 [i.33] specifies the transport of IPDC services using the MSC stream mode of DAB (EN 300 401 [i.1]) including additional error protection (TS 102 427 [i.28]). IPDC services, e.g. audio and video services, are packetized and synchronized using RTP and appropriate RTP payload format specifications. For efficiency, some appropriate restrictions to MPEG-2 TS and an efficient transmission method for PSI/SI and SAT sections are specified.
TS 102 978 [i.33]also specifies methods of macro and micro time slicing for power-efficient transmission of IPDC Services in DAB systems. The methods for sub-channel synchronization and data arrangement are specified.

7.5 Text applications

7.5.1 TS 102 652 - Intellitext

TS 102 652 [i.31] describes an extension to the DAB Dynamic Label X-PAD application (see EN 300 401 [i.1]) to enable hierarchical-menu-driven text services on a compatible receiver. The data is compiled into a simple Teletext-like database of information which the user of any DAB radio equipped with this application can browse on demand. Intellitext messages are a special form of DL messages, formatted in such a way that receivers not supporting Intellitext will continue to function normally. The Intellitext system provides a means for broadcasters to control the lifetime and basic formatting of broadcast information, while the display of information is user-driven.

7.5.2 TS 102 980 - DL Plus

TS 102 980 [i.32] describes an extension to the DAB Dynamic Label X-PAD application (see EN 300 401 [i.1]) to allow listeners to select the kind of information he is interested in. For that purpose DL messages are complemented by tags which identify specific content of the DL message by its content type. Users can select the content types of information to be presented; they do not need to read, or even be aware of, the complete stream of DL messages.
DL Plus is a backwards compatible extension of the DL feature: the transmitted tags are not visible in the DL message so that listeners with receivers without a DL Plus decoder still view the DL messages as before. For the broadcaster, the additional data rate (for tag transmission) is significantly less than the data rate necessary for text.

7.5.3 TS 102 979 - Journaline

TS 102 979 [i.34] describes a text based information service for digital radio, optimized for simple data aggregation and re-use, which is highly efficient in broadcast transmission. It supports the widest range of receiver types, from low-cost solutions with a small text display up to high-end receivers with graphical user interfaces and optional text-to-speech playback. The radio user can access the information provided by the radio station which is comparable to teletext for TV.

7.6 Mobile internet

7.6.1 ES 201 735 - IP tunnelling

ES 201 735 [i.12], developed by the Eureka Project 147, describes how to transport Internet Protocol (IP) datagrams in a Digital Audio Broadcasting (DAB) packet mode service component, a technique described as "IP tunnelling".

The use of IP tunnelling provides DAB with a mechanism for the adaptation of Internet services to DAB and is also a key component for DAB services using two-way interaction with personal DAB. The use of IP tunnelling enables the use of IP as a common network layer protocol, end-to-end, for DAB data services. IP tunnelling through DAB is unidirectional. The tunnel is created from the packet mode encoder on the transmitting side, to the packet mode decoder on the receiving side, of the DAB system.

7.6.2 ES 201 736 - Protocols

ES 201 736 [i.13], developed by the Eureka Project 147, describes the protocol stacks to be used for the different types of services that are defined, as local interactive, one-way interactive and two-way interactive service. The specification also defines a protocol PSSC (Personal DAB Service Session Control) which allows the set up of personal DAB service sessions and functionalities like handover between DAB cells, etc. It also defines the message format to be used and allows for further future extensions.

7.6.3 ES 201 737 - Interaction channel

ES 201 737 [i.14], developed by the Eureka Project 147, describes the Interaction Channels through Global System for Mobile communication (GSM), the Public Switched Telecommunications System (PSTN), Integrated Services Digital Network (ISDN), Digital Enhanced Cordless Telecommunications (DECT). It describes low level network management and basically references relevant telecommunication standards and describes how the implementation of low level interaction is handled.

History

Document history		
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V1.2.1	January 2005	Publication
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