

# Digital Audio Broadcasting

Principles and Applications  
of DAB, DAB+ and DMB

THIRD EDITION

Editors

**WOLFGANG HOEG**

*Audio Consultant, Berlin, Germany*

and

**THOMAS LAUTERBACH**

*Georg-Simon-Ohm, University of Applied Sciences, Nürnberg, Germany*

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# 1

## Introduction

### 1.1 General

The new digital radio system DAB (Digital Audio Broadcasting, nowadays often called *Digital Radio*) is a very innovative and universal multimedia broadcast system which will replace the existing AM and FM audio broadcast services in many parts of the world in the future. It was developed in the 1990s by the Eureka 147/DAB project. DAB is very well suited for mobile reception and provides very high robustness against multipath reception. It allows use of single frequency networks (SFNs) for high frequency efficiency.

Besides high-quality digital audio services (mono, two-channel or multichannel stereophonic), DAB is able to transmit programme-associated data and a multiplex of other data services (e.g. travel and traffic information, still and moving pictures, etc.). A dynamic multiplex management on the network side opens up possibilities for flexible programming.

In several countries in Europe and overseas broadcast organisations, network providers and receiver manufacturers are going to implement digital broadcasting services using DAB system in pilot projects and public services.

DAB works very differently from conventional broadcasting systems. Most of the system components such as perceptual audio coding, channel coding and modulation, multiplex management or data transmission protocols are new solutions and typically not so familiar to the expert in existing analogue or digital broadcast systems.

DAB was developed to a DAB system family, comprising the DAB (Digital Audio Broadcasting), DAB+ (extended DAB system for new audio coding schemes) and DMB (Digital Multimedia Broadcasting) systems.

The level of standardisation of the DAB system is rather advanced and the various recent international standards and related documents are introduced and referred to for easy access for the reader seeking technical details.

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## 1.2 Radio in the Digital Age

Radio broadcasting is one of the most widespread electronic mass media comprising hundreds of programme providers, thousands of HF transmitters and billions of receivers worldwide. Since the beginning of broadcasting in the early 1920s, the market has been widely covered by the AM and FM audio broadcasting services.

Today we live in a world of digital communication systems and services. Essential parts of the production processes in radio houses were changed to digital ones in recent times, beginning with the change from conventional analogue audio tape to digital recording on magnetic tape or hard disk, digital signal processing in mixing desks and digital transmission links in distribution processes. In addition, there are also other digital distribution or storage media in a growing music market such as several digital tape or disk formats (CD, MiniDisk or DVD), or streaming and download formats (such as MP3) for distribution via the Internet (see also section 1.6.4).

Consequently, broadcast transmission systems now tend to change from conventional analogue transmission to digital. The first steps in the introduction of digital broadcasting services were taken by the systems NICAM 728 (Near Instantaneously Companded Audio Multiplex, developed by the BBC for stereo television sound in the VHF/UHF bands), DSR (Digital Satellite Radio, which was already shut down), or ADR (Astra Digital Radio), see section 1.6.1, but none were suited to replace the existing conventional services completely, especially for mobile reception. For that reason, the universal digital multimedia broadcasting system Eureka 147 DAB was developed and is now being introduced worldwide. In parallel, other digital broadcasting systems such as DRM (Digital Radio Mondiale, see section 1.6.3) or DVB-T (Digital Video Broadcasting, see section 1.6.2) are going to complement digital radio and television.

Normally, it takes a period of a human generation (or at least a period in the life of a receiver type generation, i.e. approximately 10 years) to replace an existing broadcasting system with a new one. Therefore, strong reasons and very convincing advantages are required to justify the introduction of such a new system.

## 1.3 Benefits of the Eureka 147 DAB Systems Family

### 1.3.1 *The Original DAB System*

As expected, there will always be some problems, or additional effort will be needed, when replacing an existing technology with a new one, such as:

- lack of transmission frequencies;
- costs for development and investment;
- looking for providers for new non-conventional services (e.g. data services);
- solving the chicken and egg problem (who will be first – the service provider or the receiver manufacturer?).

Nevertheless, the Eureka 147 DAB system family provides a wealth of advantages over conventional audio broadcast systems such as analogue VHF/FM or

AM radio, and also partly over other existing digital broadcast systems such as DSR (no longer available), ADR, etc. The following list will only highlight some key advantages; many more details will be explained in the corresponding sections of the book.

#### 1.3.1.1 Quality of Service

DAB uses all the possibilities of modern digital communication technologies and can thus provide a much higher level of quality of service, such as:

- *Superior sound quality*: DAB users can enjoy pure undistorted sound close to CD quality. New features such as Dynamic Range Control (DRC) or Music/Speech Control can be used individually by customers to match the audio quality to their needs.
- *Usability*: Rather than searching wavebands, users can select all available stations or preferred formats from a simple text menu.
- *Perfect reception conditions*: With just a simple, non-directional whip antenna, DAB eliminates interference and the problem of multipath while in a car. It covers wide geographical areas with an even, uninterrupted signal. Once full services are up and running, a driver will be able to cross an entire country and stay tuned to the same station with no signal fade and without altering frequency.

#### 1.3.1.2 Wide Range of Value-added Services

DAB is quite unique in that both music and data services can be received using the same receiver. One receiver does it all, such as:

- *Typical audio broadcasting (main service)*: Music, drama, news, information, etc., can be received in monophonic or stereophonic form as is well known from conventional radio programmes; there is also the potential to transmit multichannel (5.1 format) audio programmes as well.
- *Programme-associated data (PAD)*: DAB broadcast receivers can display text information in far greater detail than RDS, such as programme background facts, a menu of future broadcasts and complementary advertising information. Receivers attached to a small screen will display visual information such as weather maps or CD cover images.
- *Information services*: Services from sources other than the broadcasting station are included within the same channel for the user to access at will. These include news headlines, detailed weather information or even the latest stock market prices.
- *Targeted music or data services*: Because digital technology can carry a massive amount of information, specific user groups can be targeted with great accuracy because each receiver can be addressable.
- *Still or moving pictures*: Data can also appear as still or moving photographic pictures, accompanied by an audio service or as separate information.

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