

**MINIMUM TECHNICAL AND EXPLOITATION
REQUIREMENTS FOR DIGITAL SOUND
BROADCASTING DAB+ RECEIVER
DESIGNED FOR POLAND**

Version 1.0

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1. SCOPE

Present document describes basic technical parameters and requirements of a consumer receiver designed for reception of digital sound broadcasting services delivered in Poland by terrestrial or cable broadcasting in Band III of VHF range using the DAB+ system.

Requirements shall be applied to separate receivers as well as for receivers being part of multifunction equipment (e.g. alarm-clock radio, portable CD players with radio, smartphone) for stationary, portable, mobile, pocket and in-vehicle products.

These requirements are taken from International Norm EN 62104 [11] and are its subset resulting from Polish specificity and local restrictions.

When a given feature is mandatory, the word “shall” is used. Technical parameters indicated as „recommended” or “option” are not mandatory but if they appear then shall comply with given requirements.

The fulfilment of requirements defined in this specification does not preclude expendability of the receiver for other features improving its functionality or usefulness.

2. DOCUMENT HISTORY

Data	Version	Changes
April 2014	0.1	First draft of Polish Radio S.A.
May 2014	0.2	Draft for consultation in technical sub-group of NBC
May 2014	0.3	Draft after consultation in technical sub-group of NBC
May 2014	0.4	Document after consultation with WorldDMB
July 2014	1.0	Document approved by National Broadcasting Council

3. NORMATIVE 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] EN 300 401 Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers. ETSI
- [2] TS 101 499 Digital Audio Broadcasting (DAB); MOT Slide Show; User Application Specification. ETSI
- [3] TS 101 756 Digital Audio Broadcasting (DAB); Registered Tables. ETSI
- [4] TS 102 368 Digital Audio Broadcasting (DAB); DAB-TMC (Traffic Message Channel). ETSI
- [5] TS 102 371 Digital Audio Broadcasting (DAB); Digital Radio Mondiale (DRM); Transportation and Binary Encoding Specification for Electronic Programme Guide (EPG). ETSI

- [6] TS 102 563 Digital Audio Broadcasting (DAB); Transport of Advanced Audio Coding (AAC) audio. ETSI
- [7] TS 102 818 Digital Audio Broadcasting (DAB); Digital Radio Mondiale (DRM); XML Specification for DAB Electronic Programme Guide (EPG). ETSI
- [8] TS 102 979 Digital Audio Broadcasting (DAB); Journaline; User application specification. ETSI
- [9] TS 102 980 Digital Audio Broadcasting (DAB); Dynamic Label Plus (DL Plus); Application specification. ETSI
- [10] TS 103 176 Digital Audio Broadcasting (DAB); Rules of implementation; Service information features. ETSI
- [11] EN 62104 Characteristics of DAB receivers. CENELEC
- [12] EN 62106 Specification of the Radio Data System (RDS) for VHF/FM sound broadcasting in the frequency range from 87,5 MHz to 108,0 MHz. CENELEC
- [13] ISO/IEC 10646 Information technology – Universal Multiple-Octet Coded Character Set (UCS)
- [14] ISO/IEC 14496-3 Information technology – Coding of audio-visual objects – Part 3: Audio
- [15] ISO/IEC 23003-1:2007 Information technology – MPEG audio technologies – Part 1: MPEG Surround
- [16] ISO/TS 18234 Traffic and Travel Information (TTI) – TTI via Transport Protocol Expert Group (TPEG) data-streams – ALL PARTS
- [17] Recommendation ITU-R BS.450-3 Transmission standards for FM sound broadcasting at VHF

4. DEFINITIONS

Terms used in this document mean:

- 4.1. DAB+ receiver – device intended to receive and decode signals transmitted according to the DAB+ system specifications ETSI EN 300 401 [1] and ETSI TS 102 563 [6] designated for consumers.
- 4.2. Standard receiver – DAB+ receiver intended to present sound programmes with at least an alphanumeric display.
- 4.3. Multimedia receiver – DAB+ receiver intended to present sound programmes and data applications with a colour display of at least 320 x 240 pixels and 8 bits colour resolution.

5. ABBREVIATIONS AND ACRONYMS

Abbreviations and acronyms used in the document mean:

AAC	Advanced Audio Coding according to ISO/IEC 14496-3 [14]
BER	Bit-Error Ratio
BMP	Basic Multilingual Plane
CENELEC	Comité Européen de Normalisation ELECTrotechnique
CU	Capacity Unit

DAB	Digital Audio Broadcasting
DAB+	Digital Audio Broadcasting using audio coding MPEG-4 HE AACv2 according to ETSI TS 102 563 [6]
DL	Dynamic Label
EN	European Norm
EPG	Electronic Program Guide
ETR	ETSI Technical Report
ETSI	European Telecommunications Standards Institute
EWS	Emergency Warning System
FM	Frequency Modulation
FTA	Free-to-Air
IEC	International Electrotechnical Commission
ISO	International Organisation for Standardisation
ITU	International Telecommunication Union
ITU-R	ITU Radiocommunication Sector
MPEG	Moving Picture Experts Group
MPEG-4	Set of video and audio coding standards described in ISO/IEC 14496
MSC	Main Service Channel
OFDM	Orthogonal Frequency Division Multiplex
PAD	Programme Associated Data
RDS	Radio Data System
RF	Radio Frequency
T-DAB	Terrestrial - Digital Audio Broadcasting
TMC	Traffic Message Channel
TPEG	Transport Protocol Expert Group
TTI	Traffic and Travel Information
TR	Technical Report
TS	Technical Specification
VHF	Very-High Frequency (30 -300 MHz)

6. GENERAL CHARACTERISTIC OF THE DAB+ RECEIVER

6.1. Introduction

This document defines two profiles of the DAB+ receiver:

- standard receiver;
- multimedia receiver.

6.2. Receiving Capabilities

The DAB+ receiver shall support reception of T-DAB signals conforming to ETSI EN 300 401 [1] transmitted in Band III of VHF range (174-240 MHz).

6.3. Services

The DAB+ receiver shall support following services:

- a) presentation of FTA sound programmes broadcast;
- b) presentation of text messages: station name and DL;
- c) presentation of the EPG basic profile [5] [7] (recommended for receivers with suitable display);
- d) decoding of TPEG [16] and TMC [4] messages (recommended for in-vehicle receivers);
- e) decoding EWS [12] messages.

Additionally multimedia receiver shall support following services:

- f) presentation of the EPG advanced profile [5] [7];
- g) presentation of DL Plus [9] and slide show [2];
- h) presentation of Journaline [8] (recommended for receivers with suitable display).

7. RF INTERFACE PARAMETERS AND TUNING RULES OF DAB+ RECEIVER

7.1. Range of received frequency band

The DAB+ receiver shall provide reception of at least one T-DAB frequency block conforming to ETSI EN 300 401 [1] transmitted in Band III of VHF range (174-240 MHz). The nominal centre frequency of frequency blocks are given in Annex A of EN 62104 [11]. Additionally, the receiver shall be able to correctly deal with transmitter frequency offset by up to a half of the carrier spacing.

7.2. Tuning and service selection

The DAB+ receiver shall be able to scan automatically through the whole frequency range given in section 7.1 and tune-in to the correct T-DAB frequency block framing structure in order to produce a list of available services.

The in-vehicle DAB+ receiver roaming between adjacent allotment areas shall be able to switch automatically to another frequency block in order to allow maintain the continuity of receiving the chosen service, if "Service following" signalling is transmitted according to ETSI TS 103 176 [10].

The in-vehicle DAB+ receiver incorporating a VHF-FM [17] tuner with RDS [12] decoder shall be able to switch automatically from T-DAB to VHF-FM when T-DAB coverage is no longer available and vice versa, if "Service following" signalling is transmitted according to ETSI TS 103 176 [10]. The receiver shall prefer the T-DAB reception whenever possible.

7.3. Signal Quality Indicator

It is recommended that the DAB+ receiver incorporates a signal quality indicator using calculated BER measured on MSC. The displayed signal quality information should allow the user to optimize positioning of the receiving antenna.

8. PARAMETERS OF DAB+ RECEIVER DECODER

8.1. Channel decoder

According to section 4.3 EN 62104 [11]:

- a) the channel decoder of a standard receiver shall decode at least one sub-channel and shall be capable of decoding at least 144 CU (e.g. 256 kbps@EEP3B, 192 kbps@EEP3A, 96 kbps@EEP1A);
- b) the channel decoder of a multimedia receiver shall be capable of decoding at least four sub-channels simultaneously and shall be capable of decoding at least 288 CU.

8.2. Audio decoder

According to section 4.6 EN 62104 [11] the audio decoder shall correctly decode audio signals MPEG-4 HE AACv2 [14] with constraints set-out ETSI TS 102 563 [6].

The audio decoder shall also correctly handle audio streams with surround content as described in ISO/IEC 23003-1 [15] (MPEG Surround). Even if full surround decoding is not supported, the receiver shall decode such audio streams as a regular mono or stereo content without malfunction.

The audio decoder should include an error concealment mechanism but if the data stream cannot be decoded, the audio output should be muted.

9. RECEPTION OF ANALOGUE SOUND BROADCASTING

The DAB+ receiver should receive VHF-FM sound broadcasting signals transmitted according to Recommendation ITU-R BS.450-3 [17] until analogue transmissions in Poland be ceased.

10. PARAMETERS OF THE DAB+ RECEIVER DISPLAY

10.1. Text labels

The DAB+ receiver shall correctly and legibly display the audio service name (Component Label). If a Component Label is not broadcasted, the Service Label shall be used.

The text display must display the Component Label in either its short form (8 characters long) or its long form (16 characters long). It is not permissible for the receiver to truncate the label to any other length.

The alphanumeric character set used by Polish broadcasters for text labels, service labels and ensembles are defined in Annex 3 of ETSI TS 101 756 [3]:

ABCĆDEFGHIJKLMNOÓPQRSŚTUVXYZZabcćdefghijklmnoópqrsśtuvxyzz0123456789

10.2. Dynamic labels and another text services

The DAB+ receiver shall correctly display the dynamic labels regardless of another PAD services transmission (DL Plus, slide show).

The DAB+ receiver shall correctly format the dynamic labels according to decoded characters 0x0A and 0x0B according to ETSI EN 300 401 [1].

The DAB+ receiver shall remove the label from the display immediately after receiving a message with label cancellation even if the label has only been partially displayed.

The alphanumeric character set used by Polish broadcasters for text services are defined in Table BMP of ISO/IEC 10646 [13].

Note: Polish broadcasters will use in particular additional characters using UTF-8 transformation format according to ISO/IEC 10646 [13] to represent following characters specific for Polish alphabet:

ĄĆĘŁŃÓŚŻąćęłńóśż

Additionally the DAB+ receiver shall correctly and legibly display the following characters and symbols:

\$€\$%@!?"'"+-.,:;/

If the DAB+ receiver cannot correctly display characters or symbols other than those mentioned in 10.1 and 10.2 but listed in Table BMP of ISO/IEC 10646 [13], the graphical symbol shown should be a 'space'. In case of lack of technical capabilities to display letters with diacritical marks (e.g. segment display) the letter shown shall be a corresponding one without the diacritical mark according to the pattern shown below:

Decoded character:	Ą	Ć	Ę	Ł	Ń	Ó	Ś	Ż	Ż	ą	ć	ę	ł	ń	ó	ś	ż	ż
Displayed character:	A	C	E	L	N	O	S	Z	Z	a	c	e	l	n	o	s	z	z
Displayed character (option):	A	C	E	L	N	O	S	Z	Z	A	C	E	L	N	O	S	Z	Z

