

Proposed list of services

- For the digital radio launch in Germany -

- EDITION 2 -

version 2.0

0. Change history

version/ revision	date	author	Description
0.1	2011-02-23	Sebastian Kett	Initial document
0.2	2011-02-24	Achim Quellmalz/ Sebastian Kett	Minor changes in section 2 (receiver requirements)
0.3	2011-02-28	Achim Quellmalz/ Sebastian Kett	Changes in section 1, sections 3 and 4 added
0.4	2011-03-02	Sebastian Kett	Minor changes after ARD-meeting
0.5	2011-03-03	Olaf Korte	Changes in section 2 (technical amendments)
0.6	2011-03-04	Sebastian Kett	Receiver categories added
0.7	2011-03-09	Sebastian Kett/ Helmut G. Bauer/ Carsten Friedrich/ Achim Quellmalz	Feedback from working group added and table for national DAB-mux added
0.8	2011-03-09	Chris Weck	Adding services from Deutschlandradio
0.9	2011-03-16	Sebastian Kett	Feedback from Fraunhofer (Markus Prosch) included
0.10	2011-03-22	Sebastian Kett	Intended TPEG services of ARD-group amended, intended services of Neue Welle added
0.11	2011-03-31	Sebastian Kett	Split requirements into "functional requirements" and "requirements relating to the user experience". Table "further helpful features" and minor changes added.
0.12	2011-04-07	Sebastian Kett/ Chris Weck	Mandatory receiver requirements according to ETSI TR 101 496 part 2. Also clarification on BWS and addition of Intellitext™ added.
0.13	2011-04-14	Sebastian Kett	Minor changes in Basic data sections
1.0	2011-04-18	Sebastian Kett/ Joachim Kraus/ Christoph Kruse/ Markus Prosch/ Andreas Schneider/ Frank Nowack	Various input from working group included ### feature-freeze as Edition 1 ###
1.1	2011-06-09	Sebastian Kett	Feedback from working groups "devices" and "data and traffic" included
1.2	2011-06-17	Sebastian Kett/ Christoph Kruse	New proposed services from Regiocast and requirements regarding multiplex reconfiguration added.
1.3	2011-10-12	Sebastian Kett	Updated column status-quo. Further details and new requirements added for Service Linking, Multiplex Reconfiguration, programme listings and Surround signalling. Annex A/B/C added.
1.4	2011-10-19	Andreas Gorsak/ Olaf Korte/ Sebastian Kett	Update after conf-call 'Device working group': New Annex A/C added. Receiver requirements for 'secondary service component' and 'MFN' handling updated.

2.0	2011-10-26	Norbert Irnich/ Sebastian Kett	Annex C added. Minor changes/mistakes as to feedback from working group added. ### feature-freeze as Edition 2 ###
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1. Foreword

Public and commercial broadcasters, system operators, network providers, receiver manufacturers and authorities in Germany are working together on the improvement of Germany's first national digital terrestrial radio multiplex which was launched on August 1st 2011, as well as on the subsequent enhancement and extension of the regional digital terrestrial radio multiplexes.

Hosted by the German Federal Ministry of Economics and Technology (BMWi) a device working group addresses broadcast receiver related (technical/technology standard) matters since February 2011, to ensure appropriate decoding and provision of broadcasted services by the receivers and a consistent media experience for the customer. This working group consists of all interested stakeholders in the digital radio ecosystem.

This document describes the results of the mutual discussions in the device working group. It contains the intended list of services from those broadcasters who are involved in the digital radio launch in Germany and derives necessary receiver requirements out of these intentions.

The implementation of the listed services is structured in 3 stages whereas stage 1 services have been launched by August 1st; stage 2 services will be investigated as of late 2011/early 2012 and stage 3 services represent long-term goals, which will be also investigated and implemented as stage 2 services in some extent.

This 2nd edition of the 'Proposed list of services' is intended to be kept as stable document until mid of 2012. Gained experiences of both broadcasters and receiver manufacturers shall then be introduced in the revision work towards a 3rd edition. Please note that any information contained in this document may be subject to change without notice to address errata.

2. German radio market

According to the German constitution both public as well as commercial broadcasting are under the jurisdiction of the German Bundesländer (federal states). For this reason the organisation broadcasting is regulated not only by the interstate broadcasting treaty but also by individual state media laws.

Public radio

Public broadcasters in Germany are the ARD-group and Deutschlandradio. The ARD-group is the association of public broadcasters in the federal republic of Germany and consists (due to the federal structure of Germany) of nine affiliates (see picture 1) with corresponding regional distribution areas. All together these affiliates are broadcasting more than 60 radio brands. Deutschlandradio is the national public radio broadcaster in Germany and provides 3 radio brands.



Picture 1: ARD group and its affiliates of regional public broadcasters. Deutschlandradio in comparison is the national public broadcaster

Commercial radio

In every German Bundesland (federal state) commercial and private radio is only broadcasted local and/or regional. Germany has about 210 commercial radio stations.

German Radio market

The radio market in Germany is an extensive market and a key market for Digital Radio in Europe:

- a. 58.71 Mio. people are listening to radio every day (79,3 % of all Germans)*
- b. Average listening per hour 199 minutes per day (3 h 19 min)*

The market share of the public broadcasters is continuing stable around 55%. 45% are listening to commercial radio.

* media analysis July 2011; <http://agma-mmc.de>; biannual survey of attendance figures

3. Proposed list of DAB services

3.1 National DAB-ensemble of commercial broadcasters and Deutschlandradio

Stage 1 – started on Aug 1 st , 2011)		
Service	Details/status-quo	Receiver requirements
Audio	<p>The already licensed private broadcasters on the national multiplex will broadcast around 10 new live audio services (brands) with additional services.</p> <p>Deutschlandradio will broadcast 2 brands in DAB (MPEG-1 Layer II), one digital only brand in DAB+ as well as one special brand/channel.</p> <p>‘90elf – Dein Fussballradio’ has special requirements regarding its service listings:</p> <ul style="list-style-type: none"> • Currently all audio services are signalled permanently (i.e. 90elf, 90elf1, 90elf2, 90elf3, 90elf4, 90elf5). • This is due to the fact that during ‘Bundesliga’ matchdays all six services carry different audio, whilst at any other point of time the services 90elf1 - 90elf5 refer to the 90elf main audio programme. • It is intended to signal 90elf1 - 90elf5 as secondary services. However the majority of receivers are currently not able to decode secondary services hence 90elf1 - 90elf5 must be signalled as primary services which affects the user experience on the other side. 	<p>(Mandatory for Profile-1 devices according to WorldDMB Receiver Profiles)</p> <p>See description and requirements in section ARD</p> <p>Additional Functional Requirements:</p> <ul style="list-style-type: none"> • Receivers must support the automatic lookup and listing of signalled secondary services components in the service listing when signalled via FIG 0/2. • Labels for secondary service components should not appear in the service listing, if the primary service component does not have a sub-channel assigned (in FIG0/2). • Receivers should update the service listing from the tuned ensemble automatically, so that changes in the sub-channel reconfiguration can be understood by the listener.

	<p>A separate data channel will be also an available on the national multiplex.</p> <p>Note: Also see Annex A for further info on stereo mixdown of MPEG-Surround audio signals.</p>	
MPEG Surround	<p>Deutschlandradio is prepared to broadcast MPEG Surround.</p> <p>However, for the time being only few contents will be available.</p>	<p>Requirements:</p> <ul style="list-style-type: none"> • MPEG Surround should be supported for receivers with surround capabilities
Basic data and announcements	<p>Basic data describes information signalled in FIG's of the Fast Information Channel (e.g. information for Service Linking, road-traffic-flash announcements etc.)</p> <p>Basic data also includes the service and ensemble information as described in ETSI TR 101 496 part 2 (chapter 3.6) which provide supplementary information.</p> <p>Multiplex reconfigurations should no longer be seen as an exceptional event. In the context of temporary regionalisation of an audio service the re-configuration mechanism is expected to be used frequently (e.g. by Regiocast's brand 90elf).</p> <p>Note: According to the standard a multiplex configuration must be kept stable for at least six seconds. The exact point of time for a multiplex reconfiguration is specified by the occurrence counter (signalled via FIG 0/0). If CIF cnt. == Occ. cnt. the new multiplex configuration must be activated.</p>	<p>(Mandatory for Profile-1 devices according to WorldDMB Receiver Profiles)</p> <p>See description and requirements in section ARD, especially for dynamic reconfiguration.</p>
Categorized DL/DL Plus	<p>Deutschlandradio will use Intellitext™, a simple, categorized</p>	<p>(Mandatory for Profile-2 devices according to WorldDMB Receiver</p>

(Intellitext™)	version of Dynamic Label, for newsticker and other specific information.	Profiles) Please see: ETSI TS 102 652
DL/DL Plus	Deutschlandradio will broadcast Dynamic Label services and presumably DL Plus. The already licensed private broadcasters will broadcast DL services and will presumably broadcast DL Plus services.	(Mandatory for Profile-1 devices according to WorldDMB Receiver Profiles) See description and requirements in section ARD
TMC/TPEG	MEDIA BROADCAST is planning to start a TMC/TPEG transmission for which CA is required.	(Mandatory for Profile-2 in-car products according to WorldDMB Receiver Profiles) See description and requirements in section ARD Additional Functional Requirements: <ul style="list-style-type: none"> • CA is required
EPG	Deutschlandradio will provide an EPG as key information for time sovereign listening in the future. The already licensed private broadcasters will insert EPG Data into the national EPG which is transported by Media Broadcast	(Recommended for Profile-1 devices according to WorldDMB Receiver Profiles) (Mandatory for Profile-2 devices) See description and requirements in section ARD
Journaline	Deutschlandradio will broadcast structured text services (e.g. news) using Journaline. This includes also information like a geo referenced DAB service list for automatic tuning (Ensemble Guide). Deutschlandradio plans to provide a complete list of ensembles, so that – owing to the nationwide single frequency network – there will be no need of a frequency scan if this information is used.	(Recommendation for Profile-2 receivers according to WorldDMB Receiver Profiles) Please see: ETSI TS 102 979 Functional Requirements: <ul style="list-style-type: none"> • The receiver must be able to filter Journaline content depending on the lon/lat info (i.e. present only content which is relevant to the listener at a given place).

	<p>'Die Neue Welle' and Regiocast will presumably broadcast a Journaline service by Aug 1st. Whenever possible Journaline content which is being broadcasted will carry lon/lat information for geo referencing.</p>	<ul style="list-style-type: none"> • The receiver must support interactivity features (e.g. SMS-linking, email, hot-button, depict on a map, calculate route/destination) • The receiver must be able to bookmark Journaline pages. • The receiver should support keyword search in the whole Journaline tree. • The receiver must support the extended RDS character set on products with a suitable display (as defined in the RDS Forum proposed revision to ISO EN 62106; see www.rds.org.uk).
SLS	<p>Deutschlandradio will provide SLS (e.g. accompanying pictures to the live audio service)</p> <p>MPEG-1 L2 services as well as DAB+ services will carry SLS. SLS is intended to be transmitted as NPAD-service in enhanced packet mode (approx. 4- 12 kbit/s).</p> <p>The already licensed private broadcasters (e.g Regiocast and 'Die Neue Welle') will broadcast SLS by Aug 1st as PAD-service.</p> <p>All slides will be 320x240px in size (PNG or JPEG format).</p>	<p>(Mandatory for Profile-2 devices according to WorldDMB Receiver Profiles)</p> <p>Please see: ETSI TS 101 499 V2.2.1</p> <p>See description and requirements in section ARD</p>
BWS	<p>Deutschlandradio will start broadcasting a simple html-page for test purposes, when DAB is received using a smartphone or a Tablet-PC in order to pave the way for hybrid services. Deutschlandradio will support the development of an HbbTV-like standard for radio.</p> <p>The goal is to develop applications for local interactivity as well as for hybrid content-provision.</p> <p>Detailed use-cases will be developed.</p>	<p>BWS is recommended for Profile-2 devices according to WorldDMB Receiver Profiles; however the "integrated receiver" profile seems really outdated. Therefore the goal is to use a standard html solution which is currently in development for HbbTV.</p> <p>Please see: ETSI TS 101 498-1 V2.1.1 Please see: ETSI TS 101 498-2 V1.1.1 Further standardisation work required</p>

RadioVIS	<p>Deutschlandradio is currently using RadioDNS for testing and trials using simple slides and text.</p> <p>The already licensed private broadcasters will also broadcast RadioVIS.</p>	<p>No standard yet existing, hence not yet included in a Receiver Profile.</p> <p>See also description in section ARD</p>
Stage 2 – investigation will start in late 2011		
Categorized Slideshow	<p>Categorized SLS is a not yet standardized enhancement of the regular SLS, allowing the device to cache categorized slides in local memory for later call-up by the listener.</p> <p>The already licensed private broadcasters will presumably also broadcast Categorized Slideshow.</p>	<p>Not yet included in Receiver Profiles hence not mandatory for Profile-1 devices according to WorldDMB Receiver Profiles.</p>
FileCollector	<p>Deutschlandradio may use FileCollector in combination with BWS and control functions of Dynamic Label Plus.</p> <p>The already licensed private broadcasters will presumably also broadcast FileCollector in combination with BWS and control functions of Dynamic Label Plus and RadioTAG to evaluate the full possibilities of hybrid radio models.</p> <p>FileCollector will be trialled and investigated via media research as soon as it is implemented on a prototype receiver.</p>	<p>Not yet included in Receiver Profiles</p> <p>See description and requirements in section ARD</p>
BWS	<p>The already licensed private broadcasters will presumably also broadcast BWS. Also in combination with FileCollector and DL Plus/RadioTag for evaluating the full power of hybrid radio (see below).</p>	<p>BWS is recommended for Profile-2 devices according to WorldDMB Receiver Profiles; however the "integrated receiver" profile seems really outdated. Therefore the goal is to use a standard html solution which is currently in development for HbbTV.</p> <p>Please see: ETSI TS 101 498-1 V2.1.1 Please see: ETSI TS 101 498-2 V1.1.1 Further standardisation work required</p>

General remarks for basic list of services from Deutschlandradio:

The list above shows the services which will be provided in the national DAB multiplex. However this does not mean that it is expected that every receiver should be able to present all the textual and visual services to a user. It is understood that there is a hierarchy in the provided services:

Simple receivers should at least be able to show Dynamic Label text. The next group of receivers should be able to store some Dynamic Label information which is the idea behind Intellitext™. The next group of receivers should in addition show the EPG. The Journaline information, that allows much longer texts, completes the services for receivers with alphanumeric displays. The possibility of storing Journaline Information or audio programmes based on the EPG or using links (URLs) in the EPG for available podcasts would be an option too. The reason for all the different text services is to make digital radio very attractive for all the different Profile-1 receivers in the market. However, the goal should be to provide the user with as much data services as possible.

Slideshow is a service for Profile-2 receivers. With graphic displays the presentation of EPG and Journaline could be advanced too.

The BWS is the window to hybrid services and addresses receivers like smartphones and Tablet-PCs and also HbbTV receivers for radio usage. It provides with HbbTV-like solutions an open standard for different applications based on a simple browser. It should be the basis for applications with local interaction as well as interactive services via a return channel.

3.2 Regional DAB-ensembles of ARD-group

Stage 1 – started as soft-launch on August 1 st , 2011		
Service	Details/status-quo	Receiver requirements
Audio	<p>ARD group provides more than 60 radio brands in FM. Within digital radio ARD will mainly broadcast its existing FM-brands (Simulcast).</p> <p>By the end of October the following ARD-broadcasters are available in their regional ensembles, covering nine federal states [Länder]):</p> <ul style="list-style-type: none"> • BR (15 audio services) • MDR (21 audio services) • rbb (10 audio services) • SR (5 audio services) • SWR (6 audio services) • WDR (7 audio services) <ul style="list-style-type: none"> • NDR (launch planned for Nov 1st 2011) • hr (launch planned for Dec 1st 2011) <p>The Brandenburg state will only be covered in the area around Berlin (reaching approx. 1m of 2.5m inhabitants).</p> <p>The Bremen state will only be covered by the NDR mux for Lower-Saxony. A Radio-Bremen owned mux is intended for beginning of 2012.</p> <p>Most of the ensembles are (will be) mixed with MPEG-1 L2</p>	<p>(Mandatory for Profile-1 devices according to WorldDMB Receiver Profiles)</p> <p>Please see: ETSI TR 101 496 part 2</p> <p>Functional Requirements:</p> <ul style="list-style-type: none"> • The receiver must be able to decode DAB (audio) signals transmitted in Band III (blocks 5 to 12) • The receiver must support auto/manual scan of Band III (blocks 5 to 12) in order to find existing audio services. <u>Note:</u> In a few countries (e.g. Norway, Italy and Sweden) block 13 falls within Band III. • The receiver must decode MPEG-1 L2 and DAB+ audio signals with any bit rate defined in the standard. • The receiver must be able to decode and process mono and stereo audio signals. • The receiver must resynchronize automatically in case of signal-loss • The receiver must be capable of listing and decoding secondary audio service components. • The receiver must be capable of decode EEP protected audio signals • The receiver must decode a minimum of one sub-channel with at least 280 CU if this sub-channel contains DAB audio. • The receiver must decode a minimum of one sub-channel with

	<p>and DAB+ services. Audio bitrates differ in the regional MUXes between:</p> <ul style="list-style-type: none"> • 48 kbit/s (SBR) and 144 kbit/s for AAC+ services • 48 kbit/s and 160 kbit/s for MPEG-1 L2 services <p>All currently used audio bitrates (PL's/CU's) are inline with WorldDMB receiver profile 1.</p> <p>Secondary service components are intended for instance when it comes to EPG or FileCollector services (see below) in mixed multiplexes of public and commercial broadcasters. Mixed multiplexes will come up in several federal states (e.g. Baden-Württemberg, Rhineland-Palatine, Hesse).</p> <p>ARD broadcasters don't intend to use prefixed blanks in their service labels (e.g. in order to generate a centered appearance of the service label on an 8-char display). However this is left to the decision of each broadcaster hence service labels may be marked in that way out of editorial reasons.</p> <p>CA is not intended.</p> <p>Note: Also see Annex A for further info on stereo mixdown of MPEG-Surround audio signals.</p>	<p>at least 140 CU if this sub-channel contains DAB+ audio.</p> <p>Requirements relating to the user experience:</p> <ul style="list-style-type: none"> • The receiver must provide a service listing of available audio services, preferably including the (long) service labels, on user request (e.g. freq-scan). • If secondary service components are signalled, the receiver must provide (preferably) the (long) service component labels. • The receiver should provide an ensemble listing of available ensembles, preferably including the (long) ensemble labels. • The order of the programme listing is left to the implementer. However it is assumed that the provided listings are understandable for the listener (e.g. alphanumeric instead of SId-ascending listing) • The receiver shall ignore prefixed blanks in the service label hence sort the audio service in the listing depending on its first de facto alphanumeric character. • If an audio service is available in different ensembles with identical SId's the receiver shall include this service only once in the listing.
<p>Basic data and announcements</p>	<p>Basic data describes information signalled in FIG's of the Fast Information Channel (e.g. information for Service Linking, road-traffic-flash announcements etc.)</p> <p>Basic data also includes the service and ensemble information as described in ETSI TR 101 496 part 2 (chapter 3.6) which provide supplementary information.</p>	<p>(Mostly mandatory for Profile-1 devices according to WorldDMB Receiver Profiles)</p> <p>Please see: ETSI EN 300 401 V1.4.1</p> <p>Functional Requirements:</p> <ul style="list-style-type: none"> • In-car and smartphone receivers must support service linking

	<p>Depending on the different media laws/authorities/etc. in the 16 Bundesländer different situations concerning frequency allocation will occur. At least in a few Länder two DAB-ensembles will be operated in parallel over a period of a few years. Thus service following from 'DAB to DAB' as well as 'DAB to FM' and vice-versa is a crucial requirement.</p> <p>ARD described its use cases for Service Linking (see Annex B) and expects further guidance by the revised "rules of implementation" for database service information on DAB receivers which are currently discussed in WorldDMB. However Service Linking is expected to be accomplished with the following priority setting:</p> <ol style="list-style-type: none"> 1. Identical linking (between identical DAB/SId) 2. Explicit linking (LSN in FIG 0/6) 3. Implicit linking (FM/RDS/PI equals DAB/SId) 4. Soft-linking (S/H bit in FIG 0/6) 5. no Service Linking (start station lookup) <p>In areas where two DAB (identical) ensembles are available on different frequencies, ARD will support duplicate ensemble handling on the receiver by signalling frequency information in FIG 0/21. See Annex C for further info.</p> <p>Also multiplex reconfigurations should no longer be seen as an exceptional event. In the context of temporary regionalisation of an audio service as well as occasional "Event Channels" (e.g. for parliamentary debates) the re-configuration mechanism is used more frequently.</p>	<p>to DAB by decoding identical/explicit/implicit links.</p> <ul style="list-style-type: none"> • Portable and desktop receivers should support service linking to DAB by decoding identical/explicit/implicit links. • In-car, smartphone, desktop and portable receiver types should support service following to FM if they support FM-RDS. <u>Note:</u> There is currently a TaskForce in WorldDMB working on providing clarification and guidelines for service following in general. Results are expected to be published in November 2011. Also see ETSI TR 101 496 part 2 (chapter 3.6.23) for further details. • Receiver types that support service linking must also support Soft Linking in order to allow service linking between regionalised radio brands. In such case the receiver should offer a function that allows de-/activation of soft linking analogous to the 'REG on/off' function in FM radios (e.g. 'RSL on/off' [Related Service Linking on/off]). • Any receiver must decode mandatory and/or necessary FIG's carried in the Fast Information Blocks as described in and according to ETSI TR 101 496 part 2 (chapter 3.3). • If signalled via FIG 0/21, any receiver should store multiple frequencies per ensemble record (i.e. maintain an internal database for linking/ frequency information). • Any receiver should store available frequencies after a freq. scan in the service listing ordered by (1) strongest detected signal, (2) weaker/weakest detected signal/s, (3) indicated signal (FIG 0/21). • When a service can't be tuned, the receiver should try to tune (1) already detected 'weaker' signals and (2) indicated signals (FIG 0/21). • The receiver must be able to handle Multiplex re-configurations as described in ETSI TR 101 496 part 2 (chapter
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	<p>ARD will signal such multiplex reconfigurations correctly as soon as the broadcast systems are capable. Currently it may happen that “Event Channels” are signalled hence appear in the programme listing on the receiver although they don’t carry audio. This misfeature is to be fixed asap.</p> <p>Note: According to the standard a multiplex configuration must be kept stable for at least six seconds. The exact point of time for a multiplex reconfiguration is specified by the occurrence counter (signalled via FIG 0/0). If CIF cnt. == Occ. cnt. the new multiplex configuration must be activated.</p> <p>Not all brands will be carrying traffic information. However TA/TP (road-traffic-flash announcements) information will refer to neighboring audio services in the same mux.</p>	<p>3.3.5).</p> <ul style="list-style-type: none"> • The receiver must handle multiplex reconfiguration (e.g. add/terminate primary/secondary service components, stop/begin signalling road-traffic-service). • Where secondary service components are used and later stop transmitting, the radio must fall back to the primary component thus continuing the service with the same station. • Where primary service components are used and later stop transmitting, the radio must fall back to the station menu listing thus allow the listener to select another station. • The receiver must handle service continuity even if it is not seamlessly possible (the SId indicates that e.g. the audio service is being continued). • The receiver must support traffic announcement signalization and announcement switching for in-car, smartphone and desktop receivers. <p>Requirements relating to the user experience:</p> <ul style="list-style-type: none"> • The receiver should present the long service label and must present at least the short service label • The receiver should present the ensemble label • The receiver should present Date/Time information • The receiver should present the Programme Type (PTy) information • The receiver should indicate the signal strength • The receiver should offer a function that allows the listener to decide whether soft-linking should be activated (e.g. RSL on) or deactivated (e.g. RSL off) • When multiplex reconfigurations are signalled and new primary/secondary service components are added/terminated the station list menu must automatically be updated.
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		<ul style="list-style-type: none"> The receiver must support extended RDS character set on products with a suitable display (as defined in the RDS Forum proposed revision to ISO EN 62106; see www.rds.org.uk). <p><u>Note:</u> This section still needs more clarification especially regarding announcements (e.g. EWS, road-traffic-flash etc.).</p> <p>Please also note that not all requirements in this column are mandatory for WorldDMB Profile-1 receivers.</p>
DL/DL Plus	<p>Dynamic Label services and presumably DL Plus will be broadcasted from every brand/station.</p> <p>DL Plus is currently transmitted as PAD service (using 10, 12 and 16 kbit/s for DAB+ services and 8 kbit/s for MPEG-1 L2 services).</p> <p>For stage 1 it can be assumed that all ARD brands are at least "DL ready".</p> <p>ARD expect that receiver manufacturers don't fall behind the passed and published DAB-standard. However for the launch period ARD accepts the implementation of a DL+ SubSet consisting of the elements proposed in Annex D.</p>	<p>(Mandatory for Profile-1 devices according to WorldDMB Receiver Profiles)</p> <p>Please see: ETSI EN 300 401 V1.4.1 for DL Please see: ETSI TS 102 980 V1.1.1 for DL Plus</p> <p>Functional Requirements:</p> <ul style="list-style-type: none"> The receiver must support DL including the specified control characters The receiver should support DL Plus The receiver must support extended RDS character set on products with a suitable display (as defined in the RDS Forum proposed revision to ISO EN 62106; see www.rds.org.uk). <u>Note:</u> DL Plus is not mandatory for Profile-1 receivers. <p>Requirements relating to the user experience:</p> <ul style="list-style-type: none"> The receiver should present DL/DL Plus information automatically as soon as data is received. DL Plus capable receivers should allow the toggling of received DL Plus information on the user request.
TPEG	Traffic information is one of the most important additional	(Mandatory for Profile-2 in-car products according to WorldDMB

	<p>services which are requested by the listeners and which public radio has great expertise in.</p> <p>Status-quo:</p> <ul style="list-style-type: none"> • Existing TMC-messages can be converted into TPEG-messages (TMC to TPEG) • Editorial systems for native TPEG generation are to be implemented in 2012 • Currently new sources are going to be integrated for higher accuracy <p>ARD-group already started with TPEG transmission in some regional MUXes. The data sources are the existing TMC-messages which are converted into TPEG format.</p> <p>TMC delivery/broadcast will be limited to FM only.</p> <p>ARD is currently working on its precise and detailed roadmap for the rollout of TPEG services which will be then published in this document.</p> <p>Basically the following TPEG services are planned:</p> <ul style="list-style-type: none"> • asap: TEC (Traffic Event Compact) which is already the de-facto standard • later: TFP, PKI (using ADAC as information source) <p>Georeferencing in TPEG will be based on Loc 2. ARD-group, IRT and Fraunhofer are working with joint effort on the final development and specification of TPEG Loc 2.</p> <p>TPEG is currently transmitted as N-PAD service (using 8 and 16</p>	<p>Receiver Profiles)</p> <p>Please see: ISO TS 18234 for TPEG 1 Please see: ISO TS 21219 for TPEG 2</p> <p>Also see report of BMWi working group 'Data & Traffic'</p> <p>Functional Requirements:</p> <ul style="list-style-type: none"> • For in-car products: if the receiver is linked to an external host (i.e. navigation system) the receiver must support TPEG decoding and/or forwarding to the external host.
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	<p>kbit/s)</p> <p>Current available TPEG transmissions are signalled as 'technical test'. ARD will signal 'public test' by Dec 1st 2011. As soon as the editorial systems for native TPEG production are implemented, 'regular public service' will be signalled.</p>	
EPG	<p>All brands of the ARD group are publishing up-to-date EPG-data in DVB-S and on the Internet (since 2005).</p> <p>Tools for converting the DVB-S EPG-data into DAB-EPG-data are available.</p> <p>DAB-EPG is currently transmitted as N-PAD service (using 16 and 24 kbit/s).</p> <p>ARD worked out several use-cases for the provisioning of added value based on the delivered EPG data (see Annex E).</p>	<p>(Recommended for Profile-1 devices and mandatory for Profile-2 devices according to WorldDMB Receiver Profiles) Please see: ETSI TS 102 818 V1.4.1 for EPG-XML Please see: ETSI TS 102 371 V1.3.1 for EPG binary</p> <p>Functional Requirements if EPG is supported:</p> <ul style="list-style-type: none"> • The receiver must support DAB-EPG base profile • The receiver should support DAB-EPG extended profile • The receiver must process an EPG which is transmitted as a secondary service component • Timer/wake-up/recording functions may be supported but are not required <p>Requirements relating to the user experience if EPG is supported:</p> <ul style="list-style-type: none"> • The receiver should display available EPG-data per brand and in an appropriate listing which is left to the implementer • The receiver should be able to start EPG-navigation out of the running live audio service. • The receiver should display the brand logo if transmitted via EPG and if the receiver has an appropriate display
Journaline	<p>ARD is currently investigating whether it is possible to broadcast a Journaline service.</p>	
SLS	<p>SLS is intended to be one of the key benefits for the listeners. ARD's recent media research confirms that accompanying</p>	<p>(Mandatory for Profile-2 devices according to WorldDMB Receiver Profiles)</p>

	<p>pictures to the live audio service (e.g. CD cover of current track/title) is one of the most requested information.</p> <p>SLS is is curently transmitted for all audio services as PAD-service (using 10, 12 and 16 kbit/s for DAB+ services and 8 kbit/s for MPEG-1 L2 services).</p> <p>All slides will be 320x240px in size (PNG or JPEG format).</p> <p>ARD is currently investigating whether it is possible to publish hybrid slideshows following the RadioVIS specifiaction also.</p>	<p>Please see: ETSI TS 101 499 V2.2.1</p> <p>Functional Requirements:</p> <ul style="list-style-type: none"> • The receiver must support the MOT SLS when an appropriate display is available • SLS shall only be broadcasted using TriggerTime now and TriggerTime present in the MOT header of each slide so the receiver may support absolute Trigger Times but it is not required. <p>Requirements relating to the user experience:</p> <ul style="list-style-type: none"> • The receiver must present a slide automatically as soon as it is successfully received • The receiver should present the last received slide and as long as the next slide is received successfully
Stage 2 – investigation will start in early 2012		
TPEG	<p>Continuation of stage 1 TPEG services:</p> <p>For stage 2 it can be assumed that ARD-group will implement the following TPEG-services:</p> <ul style="list-style-type: none"> • later: PTI (airport data already available, local transport data is currently being organized) • later: WEA (not specified yet) • never: FPI 	<p>(Mandatory for Profile-2 in-car products according to WorldDMB Receiver Profiles)</p> <p>Please see: ISO TS 18234 for TPEG 1 Please see: ISO TS 21219 for TPEG 2</p> <p>Also see report of BMWi working group ‘Data & Traffic’</p> <p>Functional Requirements:</p> <ul style="list-style-type: none"> • For in-car products: if the receiver is linked to (or has an integrated navigation system) the receiver must support TPEG decoding.
FileCollector	FileCollector is a not yet standardized user application which	Not yet included in Receiver Profiles hence not mandatory for

	<p>allows to transmit data files (e.g. mp3, videos etc.) on a separate N-PAD data channel in the background of a live audio service.</p> <p>FileCollector will be trialed and investigated via media research as soon as it is implemented on a prototype receiver.</p> <p>FileCollector is currently being standardized by WorldDMB/ETSI – including the Filecasting Spec from UK (Channel4 initiative).</p> <p>The Filecasting TF at WorldDMB is chaired by the German institute for broadcasting technology (IRT, Alexander Erk).</p>	<p>Profile-1 devices according to WorldDMB Receiver Profiles.</p> <p>Requirements:</p> <ul style="list-style-type: none"> • Pick up extended header parameters in MOT header • Store received files persistently in local memory • Allow access/playback of files by user (depending on receiver capabilities)
Categorized SLS	<p>Categorized SLS is a not yet standardized enhancement of the regular SLS, allowing the device to cache categorized slides in local memory for later call-up by the listener.</p> <p>ARD-group is collecting input and will come up to WorldDMB with a mutual position asking for supporters.</p>	<p>Not yet included in Receiver Profiles hence not mandatory for Profile-1 devices according to WorldDMB Receiver Profiles.</p> <p>Requirements:</p> <ul style="list-style-type: none"> • Pick up extended header parameters in MOT header • Cache received slides in local memory • Allow access to slides by user interaction <p><i>Draft spec with use-cases available</i></p>
BWS	<p>BWS is a standardized DAB application which is interesting for hybrid reception scenarios in particular.</p> <p>The goal of BWS integration would be to develop methods for hybrid content-provision, i.e. to result in the ‘best-of-both-worlds’ (broadcast and internet). Detailed use-cases need to be developed.</p> <p>From ARD’s point of view the adoption of BWS coincides with</p>	<p>Recommended for Profile-2 devices according to WorldDMB Receiver Profiles</p> <p>Please see: ETSI TS 101 498-1 V2.1.1 Please see: ETSI TS 101 498-2 V1.1.1</p>

	<p>the evolution of the HbbTV standard for DVB.</p> <p>MDR and NDR will broadcast BWS as part of their stage 1 services. BR is already broadcasting BWS, transmitted as N-PAD service (using 8 kbit/s).</p>	
Stage 3 – investigation already started; implementation depends on availability of head-end systems and receiver technology		
MPEG Surround	<p>MPEG Surround is currently being trialled by several broadcasters within ARD-group (e.g. Bayerischer Rundfunk).</p> <p>The DAB+ standard already explicitly covers MPEG Surround. For DAB Classic, MPEG D standardizes how MPEG Surround is transported within Layer II and this will be explicitly covered by the next version of the DAB base standard (ETSI EN 300 401).</p> <p>Exact usage figures etc. are to come when trials are finished.</p> <p>Since August 2011 issues have been observed, where receivers crashed when trying to decode such surround signals.</p> <p><u>Note:</u> DAB+ (Surround) is a backwards compatible extension to DAB+ stereo (HE-AAC) and therefore contains additional meta data (e.g. 'mpeg_surround_config' signalling parameter). As described in the standard, DAB+ stereo or mono receivers shall ignore these MPEG-surround meta data. A test ETI-file is available. See Annex A for further details.</p>	<p>Requirements:</p> <ul style="list-style-type: none"> • MPEG Surround should be supported for receivers with surround capabilities.
RadioTAG	<p>RadioDNS is a collaborative project to enable the convergence of radio broadcasting and IP-delivered services. It aims to significantly enhance the experience of radio listening using</p>	<p>No standard yet existing, hence not mandatory for Profile-1 devices according to WorldDMB Receiver Profiles.</p>

	<p>scalable and resilient broadcast technology in tandem with additional information via IP.</p> <p>Three standards are in preparation:</p> <ul style="list-style-type: none">• RadioVIS is equivalent to DAB SLS• RadioEPG is equivalent to DAB-EPG• RadioTAG has no DAB equivalent yet hence it is interesting for testing and trialling	
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4. Further requirements which might be helpful

Expert Menu

The menu should provide (expert) information about details of the received audio signal (such as frequencies, audio bit-rate, bit-error rate, subchannel ID). The menu could therefore help in case of error-handling with broadcaster/manufacturee hotlines etc.

5. Hybrid radio approach

As it can be found in the table above, German broadcasters are following a hybrid approach when it comes to future transmission/broadcasting of live radio services (brands) and programmes.

This means that a future digital radio receiver should not be limited to one distribution channel only. Already today live audio services and additional data are also available on broadcasting systems like FM or over the Internet.

From the broadcaster perspective, a future digital radio receiver should offer the best of those worlds under one hood – offering the listeners a consistent radio experience without having to take notice or to make decisions about the best (or currently available) distribution channel.

For instance, if a listener is listening to DAB-radio while being on its way home from work, the radio should automatically switch to internet reception (e.g. using the indoor WiFi hotspot), when the listener steps into his house and DAB-signals may be breaking away. Also the device should switch to FM reception if the radio station isn't available on the Internet but can be received over FM (e.g. without additional data services).

In this sense a future radio receiver should also support service-following between DAB or FM to Internet radio services and vice versa. The mutual goal of both broadcasters and device manufacturers must be: to generate a consistent media experience for the listener. Therefore the work of international organisations like the Internet Media Device Alliance (IMDA) or RadioDNS should take up room in further conversations and deliberations.

On top of that aspect the next questions will soon arise: Which broadcasting technology should be preferred if more than one distribution channel is available? And how can broadcasters (the device manufacturers) tell the device how the ranking of should be in such a case?

Also broadcasters and device manufacturers should consider carefully which services are helpful and/or of strategic interest on a given hybrid receiver. For instance a DAB-enabled iPhone is basically a hybrid receiver but internet-based and broadcast-enabled in particular. A PURE Sensia is also a hybrid receiver but broadcast-based and internet-enabled. In the first case the listener can download interesting on-demand content from the internet using the corresponding data flat rate hence FileCollector may be superfluous here. In the second example the listener may also download on-demand content from the internet. But as the device has a fixed reception spot the strategic goal of using the broadcast channel and by implication decreasing the ISP/internet expenses predominates here.

6. Glossary

desktop receiver

Describes a type of receiver that is part of a personal computer (e.g. USB-Stick, laptop with integrated radio receiver)

in-car receiver

Describes a type of receiver that is (fixed) integrated in a car (e.g. car radio)

may

This word, or the adjective "optional", means that an item is truly optional

must

This word, or the terms "required", "mandatory" or "shall", means that the definition is an absolute requirement of the specification

must not

This phrase, or the phrase "shall not", means that the definition is an absolute prohibition of the specification

portable receiver

Describes a type of receiver that usually has a fixed location but could be moved to any other place and perhaps could be battery-operated (e.g. kitchen radio, bathroom radio, clock radio)

should

This word, or the adjective "recommended", means that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course

should not

This phrase, or the phrase "not recommended", means that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behaviour described with this label

smartphone receiver

Describes a type of receiver which is integrated into a mobile/cell phone hence radio is not the primary function

stationary receiver

Describes a type of receiver that is truly stationary (e.g. satellite radio receiver, entertainment cabinet)

Annex A

DAB+ Surround – How it works

DAB+ Surround is a backwards compatible extension to DAB+ stereo (HE-AAC). It contains additional MPEG Surround metadata. As clearly described in the DAB+ Standard, DAB+ stereo or mono receivers shall simply ignore these MPEG Surround metadata.

Non standard conform receiver implementations

Since the start of DAB+ Surround services, problems with some receivers have been reported.

The MPEG Surround metadata contain a signalling parameter (“mpeg_surround_config”) that describes the channel configuration of the multichannel audio. This parameter is not intended to be used by stereo only decoders! Normally this parameter is set to “MPS-5.1” when using MPEG Surround in DAB+. In some cases, it can also be set to “MPS-others”. Tests have shown the following behaviour:

Receiver	DAB+ Stereo only	DAB+ Surround (“MPS-5.1”)	DAB+ Surround (“MPS-others”)
DAB+ conform stereo/mono receiver	Play stereo	Play stereo	Play stereo
DAB+ non-conform (mute only)	Play stereo	Mute	Mute
DAB+ non-conform (with crash)	Play stereo	Crash	Mute

Incompatible receivers must be fixed by Firmware upgrades. If that is not possible, they must be removed from the market.

Having higher volumes of such receivers in the market would prevent regular DAB+ Surround transmissions forever! This would be a major problem for DIGITALRADIO in general, as in the future, Surround Sound will be one of the major benefits to the listeners in car environments or AV receivers at home.

How to test the receivers

To test the correct behaviour of any DAB+ stereo receiver, ETI-Files containing DAB+ Surround are provided at WorldDMB for their members. Obviously some receiver manufacturers did not check their implementations against these test files.

In order to make such tests easier, Fraunhofer IIS offers an ETI File that includes audio subchannels with DAB+ Surround in all configurations and also DAB+ stereo only. Fraunhofer will make this file available to everybody and it should be distributed as widely as possible to prevent implementation errors in the future. Please note that the ETI File is not a normative reference, but it is intended to be used to detect implementation errors as described above.

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References

- ✦ ETSI TS 102 563 V1.2.1 (2010-05) "DAB; Transport of AAC audio"
- ✦ <http://www.mpeg-surround.com>

Annex B

Hardlinking – the linked radio brands are equal and must(!) provide identical audio content.

Softlinking – the linked radio brands are related but provide partly different audio content.

Types of radio brands

- a) Brands which are covering one federal state only hence they have identical DAB/Sid and FM/RDS/PI codes (e.g. WDR 2)
- b) Brands which are covering one federal state only but have different DAB/Sid and FM/RDS/PI codes (e.g. ???)
- c) Brands which are covering two or more federal states but have identical DAB/Sid and FM/RDS/PI codes (e.g. SWR3)
- d) Brands which are covering two or more federal states but have different DAB/Sid and FM/RDS/PI codes (e.g. SWR2)
- e) Brands which are temporarily split into (numerous) regional sub-brands in FM where they have different FM/RDS/PI codes, whilst in DAB all regional sub-brands are transmitted simultaneously where all (sub-)brands have different DAB/Sid codes (e.g. BAYERN 1).
- f) Brands which are temporarily split into (numerous) regional sub-brands in FM but not in DAB, hence they have different FM/RDS/PI codes but only one DAB/Sid code for the main service (e.g. SWR4BW)

Identical linking (between identical DAB Sid)

- Brand type a
- Brand type c
- Brand type f

Note: Identical linking tries to recover exactly the same service at another frequency. This occurs e.g. in areas where two or more ensembles are available with the same audio services.

Explicit linking (signalled via LSN in FIG 0/6)

- Brand type b
- Brand type d (in case the audio content is identical in all coverage areas/federal states)
- Brand type e (in times when the FM brands aren't split into regional sub-brands [no regionalisation]. In such case all (sub-)brands on DAB provide identical audio content.)
- Brand type f (in times when the FM brands aren't split into regional sub-brands [no regionalisation])

Note: The required LSN listings for explicit linking are currently coordinated by IRT. For brand types d/e/f the head-end system must support the submission of the Linc Actuator in FIG 0/6 (which is currently automatically set to ,1' for AVT/VDL head-end system).

Implicit linking (FM/RDS/PI equals DAB/Sid)

- Brand type a
- Brand type c
- Brand type e (in times when the FM brands are split into regional sub-brands)

Note: implicit linking currently seems to be the only reliable/available receiver implementation for service linking/following.

Soft linking (signalled via S/H bit in FIG 0/6)

- Brand type d (in case the audio content differs [e.g. even only for a short time per day])
- Brand type f (in times when the FM brands are split into regional sub-brands)

Note: In order to be transparent to the listener, the soft linking function on the receiver should favorably be activatable/deactivatable by the listener (see "REG on/off" function on FM receivers [e.g. "REG on" = Soft linking activated; "REG off" = Soft linking deactivated]). Preferably this function is not linked to the REG on/off function but available as a separate feature (e.g. related service linking [RSL on/off]).

If more than one of the above described alternatives is signalled for an audio service, the receiver shall ensure service linking in the following priority setting:

1. Identical linking (between identical DAB/SId)
2. Explicit linking (LSN in FIG 0/6)
3. Implicit linking (FM/RDS/PI equals DAB/SId)
4. Soft-linking (S/H bit in FIG 0/6)
5. no Service Linking (start station lookup)

Annex C

To be included in the next version of this document.

Annex D

SubSet of DL+ items which are commonly used in Germany:

Category ITEM

ITEM.TITLE	Title of the current item on air; e.g. title of track that belongs to an album
ITEM.ARTIST	A person or band/collective generally considered responsible for the work
ITEM.COMPOSER	Name of the original composer/author
ITEM.CONDUCTOR	The artist(s) who performed the work
ITEM.BAND	Band/orchestra/accompaniment/musician
ITEM.ALBUM	The collection name to which this item belongs
ITEM.COMPOSITION	A complete composition (for classical music)
ITEM.MOVEMENT	A movement is a large division of a composition or musical form
ITEM.GENRE	The main genre of the audio (e.g. classical, hip-hop etc.)
ITEM.COMMENT	For relevant additional track/work-related information

Category INFO

INFO.NEWS	News headline (optional)
INFO.SPORT	Match-Tables etc. (optional)
INFO.EVENT	Event Info (optional)
INFO.WEATHER	Weather Info (optional)
INFO.TRAFFIC	Traffic Info (optional)
INFO.ADVERTISEMENT	for more Information about a Product or Service
INFO.URL	Link

Category RPROGRAMME

STATIONNAME.SHORT	Name describing the radio station (in USA: call letters as station identifiers)
STATIONNAME.LONG	Name describing the radio station (and its motto)
PROGRAMME.NOW	Info about the current programme (EPG present); useful if DAB EPG service is not available or terminal has no DAB EPG decoder
PROGRAMME.HOST	Name of the host of the radio show
PROGRAMME.HOMEPAGE	Link to radio station homepage
PHONE.HOTLINE	Phonenumber of Stations-Hotline for On Air-Games etc.
PHONE.STUDIO	Phonenumber of Stations-Studio
PHONE.OTHER	Any other given telephone number
EMAIL.HOTLINE	Mailadress of Station (optional)
EMAIL.STUDIO	Mailadress of Studio
EMAIL.OTHER	Any other given Mailadress

Category DESCRIPTOR

DESCRIPTOR.PLACE	Could be interesting for developing Location Based Services (optional)
DESCRIPTOR.PURCHASE	For selling Music or Products from Ad-Breaks (optional)

Annex E

Use-cases for the provision of added value on the foundation of delivered EPG-data (requires receiver functionality):

1. Provision of background information to the running programme

Dynamic Label provides quick info/access to the current live audio service. Using DL (or DL+) the listener stays informed about the current or last track/title/artist, the brand claim/slogan, the studio telephone number etc.

However especially for culture radios or when longer programmes are an integral part of the brand (e.g. essays, radio plays, radio interview etc.) the DL information is not sufficient. In such a case listeners require more information which can be ideally provided using the Electronic Programme Guide and which is then far away from 64 or 128 characters.

2. „What’s on“ on other stations?

One outstanding benefit of an Electronic Programme Guide is that the listener can obtain information about all live services in the ensemble while already listening to a given live service in that ensemble.

Thus the listener can investigate ,what’s currently on‘ on other stations to see whether it’s more attractive to change or to stick with the current station.

This can be achieved e.g. by providing a listing or scheme view with all currently running programmes included.

It should be possible for the listener to select a programme (i.e. a certain radio station) out of the listing or scheme view. In such a case the device should automatically tune into the selected station.

3. Bookmark radio programmes

Today’s radio has an accompanying character. However there are still a lot of interesting programmes that are worth to be tuned-in and listened to at their given point of time.

But for tuning into an interesting radio programme, the listener must (a) know what’s scheduled (e.g. within the next days) and must (b) remember at the corresponding point of time that something interesting is being broadcasted (i.e. something that he found interesting a few days ago).

In such a case a bookmarking functionality could support the listener and prevent interesting radio content of being broadcasted without any further notice.

Intelligent receivers could allow the listener to bookmark (tag) interesting radio programmes out of the EPG. All bookmarks could be stored in a separate listing for quick access. Also the device could give a short acoustic or visual signal (e.g. bleep) when the bookmarked radio programme starts (or rather five minutes earlier).

It would even be possible to update a bookmark, e.g. when a live broadcast is being shifted to another time/date due to current happenings (e.g. breaking news that have an impact on the proposed live schedule).

4. Programme/on-air radar

When thinking about listener notification, intelligent devices could also warn the listener if interesting content is „now“ receivable on a certain station in the ensemble.

Therefore the device could allow the listener to (a) enter certain terms/catchwords or (b) select out of different items what's interesting. The device would then look for such terms/items/genres/etc. in the EPG-data. If interesting content is „now“ receivable, the device could indicate it using a short acoustic or visual signal (e.g. bleep).

5. Record live programmes

If the device has built-in memory (or a built-in memory card slot), it could also be possible to record live programmes that were selected by the listener at an earlier point of time out of the provided EPG-data.

Intelligent receivers could allow the listener to browse through the EPG-data of a given radio brand and select interesting programmes. Those selected programmes would be then automatically being recorded (i.e. as a one-time download or in terms of a subscription) out of the live audio service and stored persistently on the internal memory of the device.

Note: For use cases three, four and five it would be sufficient if the receiver buffers EPG-data for the current day and a seven day forecast (i.e. eight days in total).