DRM

— worldwide digital radio, ready to use and meet industry and listeners' needs

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The release of the DRM Digital Radio Receiver profiles was an important milestone for digital radio. The announcement at IBC in September 2009 followed the standardization via ETSI of the DRM+ system enhancement.

The DRM receiver profiles are designed to help create a digital radio market across the world by defining minimum functionality for different classes of digital radio receivers that use the DRM system. In addition, they are designed to complement those of other digital radio systems, such as DAB/DAB+/DMB, thus providing the possibility of multi-standard reception devices.

DRM solutions are now available for all of the broadcasting bands up to 174MHz *(see Fig. 1)*.

The DRM receiver profiles are designed to help create a digital radio market across the world by defining minimum functionality for different classes of digital radio receivers that use the DRM system. This provides broadcasters with confidence that the services they plan will be receivable, and gives consumers an appreciation of the functions and features they can expect to be present on a DRM receiver. This will promote the development of services which utilise the full potential of quality audio and multimedia content. It positions digital radio as more than simply "better radio".

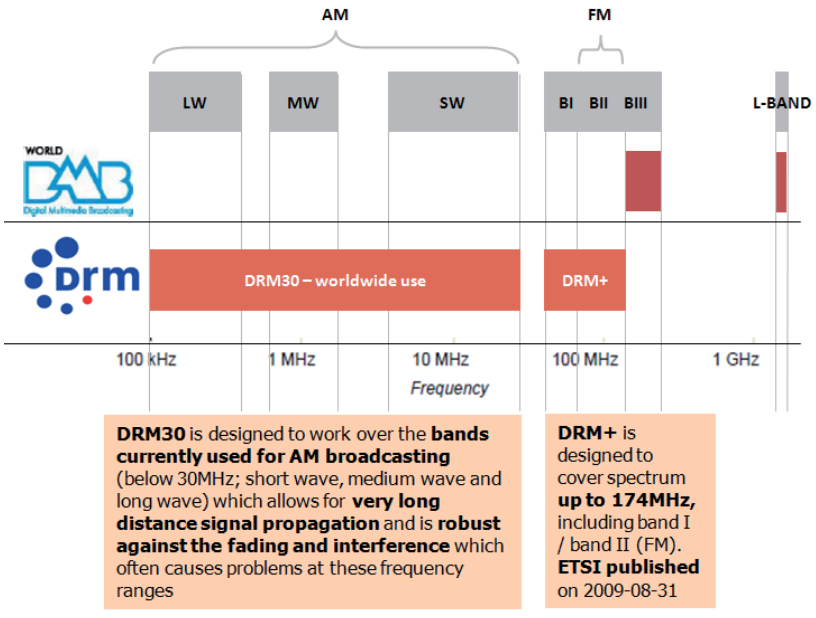

Figure 1
DRM in the digital radio landscape

Furthermore, the profiles give manufacturers the confidence to build and market devices which fulfil the consumers' needs. The profiles allow the benefits of digital radio to be promoted without the consumer needing to have a technical grasp of the DRM system. Furthermore, they are designed to

complement those of other digital radio systems such as WorldDMB (Eureka-147), providing the possibility of multi-standard reception devices. This additionally gives regulatory bodies and broadcasting unions the confidence to develop and promote harmonized digital radio strategies and policies.

Process to establish the profiles

The DRM consortium agreed at its General Assembly in March 2009 that it should establish a set of receiver profiles to meet industry expectations and to signal that the system is ready for mass-scale markets. A working group was tasked with delivering a proposal which could be approved and released in less than 5 months at IBC 2009. Given the close links with the development in 2008 of the WorldDMB digital receiver profiles – and similarities in the required outcomes – the DRM working group applied the same frameworks used in that process, and this greatly simplified the task. A major part of this process was a consultation with industry stakeholders to ensure that a range of views was considered. This took the form of a survey in which opinions were sought from broadcasters, transmission and network providers, regulators, manufacturers, technology developers, research and academic institutions.

Some of the strengths of the DRM system – it's flexibility and global scope – have, until recently, been a barrier to receiver development, given the diverse market requirements. There is a demand for simple "low-cost" receivers but the system can also deliver rich media content to high-end devices. Thus two profiles were needed to satisfy the "basic" and "multimedia" functionalities. Receiver sophistication is clearly linked to price but, to allow manufacturers the most freedom, the working group focused purely on *features* offered by the receivers. A key goal throughout the process of developing the receiver profiles was to minimize barriers to market for a manufacturer – or any stakeholder in a DRM service, product development or distribution – so that receivers appropriate to any market could be produced and delivered as simply as possible.

Other factors in the profile development were:

- **To consider DRM only**

  This does not mean a DRM-only receiver was envisaged, but rather that the group would focus only on functionality and features relevant to DRM, irrespective of any other standards which might exist in the receiver. At the same time, compatibility with other standards such as DAB/DMB was sought in order to maintain flexibility and promote universality.

- **To minimize optional elements**

  Since more options lead to greater complexity (and cost), it was decided to preserve simplicity by minimizing the options to achieve well-defined functionality.

- **To consider regional variations**

  With variations in spectrum regulation and access occurring between ITU Regions and special provisions in individual countries, the working group had to evaluate the impact this might have on receiver profiles. The profiles adopted were able to accommodate such variations.

- **To avoid distinction between DRM30 and DRM+**

  DRM is to be considered as one system rather than being fragmented.

- **Consistency with the minimum receiver requirements**

  Since the minimum receiver requirements provide technical guidance for receiver performance, the functionality defined by receiver profiles has to be technically achievable in these terms, without re-defining the technical parameters themselves. In other words the hierarchical structure of *Fig. 2* is to be respected.

Structure of the profiles

The DRM Digital Radio Receiver profiles define the minimum functionality requirements for products within each profile. Two profiles have been established. These are a ***Standard radio receiver*** (an audio receiver with at least a basic alphanumeric display) and a ***Rich Media radio receiver*** (an audio receiver with a colour display of at least 320 x 240 pixels).

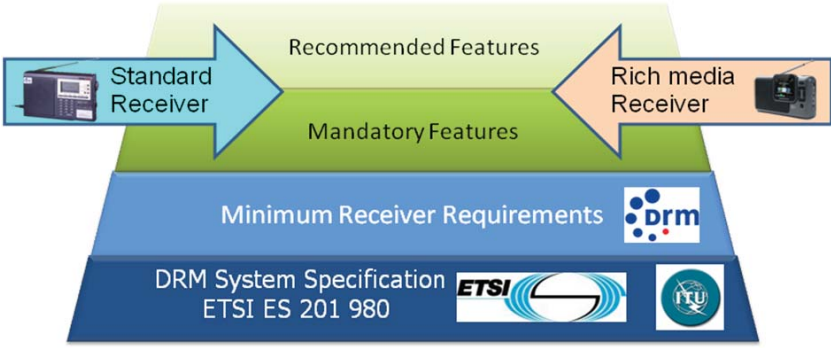

Figure 2
Structure of the DRM profiles

The Standard radio receiver is designed to be able to receive high quality DRM30 and DRM+ audio services as well as a range of data services and applications delivered in a textual format. The Rich Media radio receiver is additionally capable of providing enhanced visual multimedia services by virtue of its colour screen.

Both profiles comprise mandatory features which must be implemented, and recommended features which can optionally be implemented to increase the product appeal. Manufacturers may design products which offer extra features beyond the scope of the profiles in order to differentiate their products.

The profiles do not make reference to receiver physical form and design, the manner in which the features are incorporated, nor the technical specifications of products which determine the resulting performance. These are implementation issues left to the manufacturer according to market preferences and price constraints.

However, the DRM digital receiver profiles have been developed on a foundation of technical standards and specifications which ensure that conforming receivers will be fit for purpose and deliver a high-quality consumer experience.

At the base of the foundation is the standardized DRM system specification, described in ETSI ES 201980. This includes the DRM+ enhancement which provides a mode for operating in the bands above 30MHz and up to 174MHz. Additionally, reference is made to relevant standards for several of the data services and applications mandated or recommended in the profiles. These include Journaline, Electronic Programme Guide (EPG), the traffic and travel information services TPEG and TMC, the service following systems AM-AMSS and FM-RDS, and MOT Slideshow. As these are standardized applications, there is compatibility with other digital radio systems capable of decoding them, making it easier to build multi-standard devices without increasing receiver complexity. The relevant ETSI and ISO standards are detailed in footnotes in the DRM Digital Radio Receiver Profiles document.

Furthermore, the DRM receiver profiles are designed to match the Minimum Receiver Requirements, a specification document and self-certification process which gives guidance to manufacturers seeking to implement DRM reception and decoding functions. It describes in detail the technical characteristics to achieve minimum acceptable performance, including functions for audio and channel decoding, service selection, tuning and RF front-end performance, user and data interfaces, etc.

Products which conform to the DRM digital radio profiles provide a step change in usability over analogue radios, with service selection by station name and the use of automatic frequency switching (AFS) to ensure the receiver is locked onto the best performing transmission bearer. This is achieved through frequency scanning and evaluation of alternative frequency information contained in service lists stored in the receiver – including those of other transmission systems, if applicable.

Details of the profiles

The DRM Digital Receiver Profiles are represented in tabular form in *Table 1*. This shows which functions and features are mandatory or recommended in the Standard and Rich Media receiver types.

Table 1
"Mandatory" and "Recommended" functions and features of DRM Receiver Profiles 1 and 2

DRM Digital Receiver Profiles	Profile 1: Standard Radio Receiver		Profile 2: Rich Media Radio Receiver	
	Mandatory	Recom-mended	Mandatory	Recom-mended
Spectrum				
DRM reception in MF, HF, FM bands	✓		✓	
DRM reception in all broadcasting bands mandated regionally	✓		✓	
DRM reception in all broadcasting bands below 174 MHz		✓		✓
Channel Decoding				
All defined channel bandwidths	✓		✓	
Audio				
Stereo decoding (if stereo-capable output provided)	✓		✓	
Surround Sound				✓
Emergency Warning				
Emergency warning / alert feature	✓		✓	
Text				
Service label (station name) display	✓		✓	
Text message display (if 2 or more lines); except in-car	✓		✓	
Journaline presentation		✓	✓	
Regional character sets appropriate to target region/market		✓		✓
EPG				
EPG presentation		✓	✓	
Advanced EPG profile decoding				✓
Slideshow				
SlideShow presentation			✓	
Traffic and Travel				
TPEG and TMC decoding for in-car products		✓		✓
Service Following				
DRM to DRM service following (AFS)	✓		✓	
DRM to analogue, if product features AM-AMSS, FM-RDS	✓		✓	
DRM to other digital systems , if featured		✓		✓

The main criteria are established as follows:

Spectrum

The profiles do not distinguish between DRM30 and DRM+, instead they simply provide mandatory reception in the MF, HF and international FM bands and recommend reception in all bands below 174MHz. In instances where there are regional variances in the licensed service plans, it is manda-

tory that receivers are capable of tuning in to these bands. For example this includes LF in ITU Region 1.

Channel decoding

All defined channel bandwidths are mandatory in both types of receiver. "Full channels" are 9kHz or 10kHz for DRM30, and 100kHz for DRM+. To be able to receive half channels and double channels as well as full channels does not present any implementation issues or increase the complexity since, in any case, DRM+ channels in the FM bands are to be decoded in all receivers.

Audio presentation

If a stereo-capable output is provided (e.g. as two speakers, on headphones or via line out) then stereo signal decoding is mandated. Surround sound is an attractive feature for an enhanced listening experience, recommended in the Rich Media profile.

Character sets

It is recommended that receivers in both profiles include character sets appropriate to the target market for the receiver. This is particularly important not only for menu navigation by the user, but where broadcasters wish to utilise textual content or visual data applications for service enhancement. It is a mandatory part of the minimum receiver requirements that all receivers support the basic Latin character set.

Service following

It is mandatory to provide DRM-to-DRM service following in both receiver profiles. This enables service continuity through automatic frequency switching, where the strongest available carrier of the service is selected. This is useful for example in mobile environments when moving between coverage zones, or when transmission frequencies change for scheduling reasons or are disturbed by propagation effects.

If a receiver supports AMSS or RDS for analogue transmissions, then it is also mandatory that receivers are capable of switching automatically from DRM to the respective analogue service. If other digital radio systems (e.g. DAB/DRM) are included in receivers of either profile, then it is recommended that service following be provided to switch between DRM and these systems.

Abbreviations

AFS	Alternative Frequency Signalling
AM	Amplitude Modulation
AMSS	AM Signalling System
DAB	Digital Audio Broadcasting (Eureka-147) http://www.worlddab.org/
DAB+	DAB using the AAC codec
DMB	Digital Multimedia Broadcasting http://www.worlddab.org/
DRM	Digital Radio Mondiale http://www.drm.org/
DRM30	DRM for the bands below 30MHz
DRM+	DRM for the higher frequency bands, up to 174MHz
EPG	Electronic Programme Guide
ETSI	European Telecommunication Standards Institute http://pda.etsi.org/pda/queryform.asp
FM	Frequency Modulation
HF	High-Frequency
ISO	International Organization for Standardization http://www.iso.org
ITU	International Telecommunication Union http://www.itu.int
LF	Low-Frequency
MF	Medium-Frequency
MOT	Multimedia Object Transfer
RDS	Radio Data System http://www.rds.org.uk/
TMC	Traffic Message Channel
TPEG	Transport Protocol Experts Group http://www.tisa.org/

Andrew Flynn serves on the DRM Executive Board and was a member of the DRM Receiver Profiles Working Group. He has a first degree in Electronics and Electrical Engineering, a masters degree in Radio Frequency and Communications Engineering and, in 2009, was awarded an MBA with distinction.

Mr Flynn joined Christian Vision in 1994 as it began its first radio project in Zambia, and is now the Director of International Broadcasting for Christian Vision's CVC network which operates in six continents, overseeing transmission and distribution strategy including the introduction of digital and new media technologies.

Alert feature

The alert feature permits automatic switching to emergency broadcast services when so triggered by authorities, in the event of disasters or catastrophes. The inclusion of this feature in all types of DRM radio receiver was strongly supported in the stakeholder consultation, so it is mandatory in both profiles. This is distinct from other types of announcement features which can be implemented at the discretion of manufacturers.

Data services and applications

The display of service label is mandatory in both receiver profiles. Receivers which are not used in cars and which have a display of at least two lines must be capable of showing simple text messages. The textual information service Journaline is a distinctive digital application, differentiating DRM from analogue radio, so it is mandatory to feature Journaline in Rich Media receivers while being recommended for Standard receivers.

Having a colour display, Rich Media receivers must also implement Slideshow presentation, by decoding the images from packet mode. The EPG is another application mandated in Rich Media receivers and recommended for Standard receivers, while decoding of the Advanced EPG profile (carrying additional objects typically compressed with GZIP) is also recommended in Rich Media receivers. Finally, it is recommended that all in-car receivers are able to decode Traffic Message Channel (TMC) and TPEG travel information services. Decoded TMC information is typically sent to a display or speech synthesizer and often interfaces with a navigation system.

Conclusions

The DRM digital radio system is a global open standard, suitable for use in any part of the world. The receiver profiles which have been discussed in this article should encourage the production of DRM receiver devices for mass markets. By making essential features mandatory and by recommending additional features to give enhanced value, the profiles provide a baseline for manufacturers to design products which will enable broadcasters to deliver DRM digital radio services to consumers, meeting their expectations and satisfying their needs.

Products that do not meet the minimum requirements of the receiver profiles may be manufactured for a specific market, but it is strongly recommended to produce conforming products. Furthermore, according to market needs, manufacturers are encouraged to deliver products which go beyond the profiles in terms of features, capability and performance, to derive competitive advantage for their brands.

It is also desirable that DRM products are designed for interoperability with other digital radio systems to stimulate wide acceptance of digital radio in a manner that systems are complementary and enhance the consumer experience rather than confuse and fragment the markets. The DRM digital receiver profiles deliberately promote such harmonization while also meeting the needs of audiences for DRM services.

The DRM Digital Radio profiles document can be downloaded from:

http://www.drm.org/uploads/media/DRM_Receiver_Profiles_Final.pdf

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