



DCMS REVIEW OF DAB DIGITAL RADIO
The BBC submission

October 2004

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I. Executive summary

The BBC has been asked by the Secretary of State for Culture, Media and Sport to report on the progress of DAB¹ digital radio in the UK, with a view to considering the future of analogue radio. The terms of reference for the Secretary of State's review, which is required by the provisions of the Broadcasting Act 1996, can be found at Appendix 7.1.

In this submission, the BBC sets out our rationale and strategy for taking radio digital and we give our assessment of DAB digital radio's development to date. We then consider the risks to its continued growth before outlining a proposal for the next phase of its evolution that addresses the question of digital switchover.

I.1 Why radio must go digital

At a time of rapid change for the media and communications industries, radio must continue to evolve to ensure that it is as relevant tomorrow as it is today. The medium must meet the expectations of emerging generations of audiences accustomed to increased choice over their media consumption. Alongside the challenges, the digital transition offers a unique opportunity for the radio industry to transform its relationship with its audiences.

A notable stage in radio's digital journey so far has been the arrival over the past five years of the internet and digital television as platforms for radio. The BBC has been at the forefront of these developments and welcomes both the success of these platforms and the fresh dimensions that they bring to digital radio. They complement DAB but they do not affect its primacy as the technology that the radio industry believes will convert the vast majority of radio listening from analogue to digital. Only DAB digital radio is a robust broadcast technology that is effective in mobile, portable or static environments, capable of cheap, mass production and of integration into a variety of devices. DAB replicates radio's analogue strengths while extending them through digital technology.

I.2 The journey so far

The UK leads the world in the adoption of DAB digital radio owing to unparalleled cooperation among its various stakeholders. The Government's early allocation of spectrum² enabled broadcasters to plan with confidence and a propitious regulatory regime ensured that commercial radio and the BBC could invest in the medium's digital future.

DAB's journey over the past 10 years has been defined by some key landmarks. Both the BBC and commercial radio have significantly expanded their UK transmitter networks, and local and regional radio stations from the BBC and the commercial sector have begun their digital migration. Government approval for the BBC to launch five digital-only radio services³ enabled us to follow the commercial sector's investment in content with a substantial outlay of our own and to renew our promotional effort for digital radio.

¹ Digital Audio Broadcasting. The terms "DAB" and "DAB digital radio" are used interchangeably throughout this paper; the term "digital radio" is used to refer generically to any digital delivery system for radio, e.g. digital television, unless it is used in the context of DAB digital radio receivers. See also Appendix 7.2

² The limited number of bands of frequencies used to transmit broadcast signals. See also Appendix 7.2

³ Five Live Sports Extra, 6 Music, 1Xtra, Asian Network and BBC7

Japanese receiver manufacturers have entered the market and the small British companies that pioneered DAB have secured an early foothold. The range of products fills every established segment, prices have fallen and thousands of retailers stock sets. Future sets will showcase DAB data services⁴ and innovative functionality, thus extending DAB's appeal.

1.3 Risks to the continued progress of DAB digital radio

There are two key factors that could destabilise DAB digital radio's continued progress. Spectrum scarcity has particularly serious consequences for the BBC as we lack the capacity⁵ to migrate all of our local and national regional⁶ services to DAB, but small commercial stations and the new community radio⁷ tier are similarly affected. Even where BBC services are carried on local commercial digital radio multiplexes,⁸ much of their analogue audience is unable to receive them because of differences between the commercial digital footprint and the BBC analogue service area. The radio industry's ability to strengthen the audio quality of its services and enhance them with data is also affected by lack of spectrum.

Despite encouraging advances in the DAB digital radio receiver market, the important in-car segment needs stimulating and the mobile sector remains underdeveloped. In addition, the uneven growth of DAB digital radio across Europe as a whole could jeopardise its position in the UK because the establishment of a pan-European DAB market would give greater impetus to the large Japanese manufacturers to produce affordable sets in mass volumes.

1.4 The role of Government

The BBC believes that Government's vital support for radio's digital journey should continue during this critical next phase. As well as alleviating the pressures on spectrum, advocacy of DAB digital radio to other European governments and trade partners in Japan would be welcome, as would help for UK industry to sustain this burgeoning British success story.

As DAB digital radio penetration has grown, the question of a digital switchover date has arisen. The BBC believes that it would be undesirable and impractical to set a date now. Despite our commitment to DAB digital radio as the replacement technology for analogue radio, we contend that the conditions, namely accessibility, affordability and take-up, are not yet in place for switchover. Therefore, to set a date when the path to switchover lacks definition could unsettle the market and risk causing consumer concern. However, we do recognise the value of a switchover date so the BBC recommends that Government review the situation again in three years to allow the entire industry time to address the issues impeding switchover. This second review could therefore be conducted with a view to setting a switchover date supported by a set of realistic targets.

⁴ Services broadcast over DAB that do not consist of a continuous stream of audio or video, e.g. text, still images. See also Appendix 7.2

⁵ The amount of data that can be accommodated within a given transmission. See also Appendix 7.2

⁶ BBC local radio serves England; national regional radio serves Scotland, Wales and Northern Ireland

⁷ Previously known as "Access Radio". Community radio's purpose is to deliver social gain to a given community of interest, rather than financial profit. A full definition is available at http://www.ofcom.org.uk/consultations/past/comm_radio/com_radio/what_is/?a=87101

⁸ A multiplex is when two or more data streams are configured for broadcast as a single entity. See also Appendix 7.2

1.5 Summary of recommendations

Digital switchover

- The BBC recommends that Government review the progress of DAB digital radio in three years with a view to setting a date for switchover. This review should consider the affordability, accessibility and take-up of DAB digital radio and aim to reconcile the differing needs of all stakeholders, including UK citizens
- In advance of this review, a joint industry plan for the digital migration of the entire UK radio sector should be agreed. This plan should ensure that, before switchover, analogue provision is matched and no participant in the radio sector is left behind
- Any such joint industry plan should include the consideration of spectrum, coverage,⁹ receivers and consumers as well as the role of long wave in a national emergency

Spectrum

- The BBC recommends that Government release up to five blocks of Band III spectrum for DAB digital radio for use by the entire radio industry
- Specifically, the BBC advocates that sufficient spectrum is released to allow:
 - The complete migration of BBC local and national regional services to DAB
 - The complete digital migration of the rest of the radio sector, including small commercial stations, and the migration of community radio
 - The enhancement of the audio quality of BBC and commercial services
 - Data enhancements of BBC and commercial radio services
- The BBC seeks a joint industry approach to allocating and managing spectrum. We have devised a plan that will deliver enhancements to all tiers of digital radio provision. We will share with Ofcom and Government outline proposals for ways in which the UK could use additional spectrum to the advantage of all participants

The establishment of a pan-European market for DAB digital radio

- The BBC recommends that Government take the lead in advocating DAB digital radio in inter-governmental business, particularly in sharing the UK's regulatory experience
- We suggest that Government combine this with liaison with trade partners in the consumer electronics and automotive industries, especially the Japanese sector
- We would encourage UK commercial radio to redouble its efforts to persuade its continental counterparts of the benefits of DAB, alongside the BBC's activities

DAB digital radio receivers

- The BBC recommends that Government explore ways to support the UK DAB digital radio chip and receiver manufacturing industry
- We would encourage manufacturers to develop, agree, uphold and promote pan-industry performance criteria for receivers to improve the consumer experience

⁹ See Appendix 7.2 for information about DAB coverage criteria

2. Why radio must go digital

From small beginnings over 80 years ago, radio in the UK has come to occupy a central place on the media landscape, delivering social, cultural, democratic and economic value to its citizens. The medium has thrived in the analogue world, with growth in the number of stations fuelling innovation throughout radio, from station formats to production techniques, which has served to retain and refresh radio's audience appeal over the years. However, for radio to maintain its position of strength during a period of unprecedented technological change, it must continue to evolve.

Today, radio in the UK enjoys excellent health. Nine out of 10 adults tune in every week, listening on average for 24 hours,¹⁰ rivalling the time they spend in a week watching television¹¹ and comfortably surpassing time spent on the internet¹² or reading.¹³ The UK's radio sector offers a rich mix of stations ensuring that the medium flourishes across boundaries of age, ethnicity, geography and wealth. People in the UK turn to their radios for music that they love or will come to love, for news and information about their local areas, the UK and the world, and for stimulation and companionship through the spoken word. Radio's core strengths - its secondary nature enabling people to pursue other activities while listening, its portability, its intimacy - have helped it to withstand the coming of age of television and the internet and to continue to hold its place in public affection.

Radio's resilience over the decades could be attributed in part to its capacity to adapt. Where once the radio was the preserve, and even the focal point, of the living room, advances in analogue technology have driven change in the medium. As receiver components have become smaller and cheaper, radios have spread around the home and the average household now owns between four and five analogue radios¹⁴ of differing size, functionality and price. With the advent of FM, sound quality improved and radio became the ultimate mobile medium, found everywhere from the car to the baseball cap, from the pocket to the mobile phone. The next step in radio's evolution must be for it to take advantage of digital conversion or risk being marginalised.

Digital technology transforms every industry it touches and it is acting as the catalyst for extraordinary change in the media and communications industries. The radio industry is ripe for this change, not least because it has no room to grow in analogue. For radio to be the only medium with its ambition capped by technological constraints would be to diminish its appeal to the production and presentation community that nurtures creativity within it; ultimately, this would reduce radio's standing with its audiences. However, the wealth of opportunity that digital technology unlocks is already infusing radio with an impressive dynamism. Production and transmission processes are being remodelled and the experience for audiences is assuming dimensions of choice and interactivity for those who want them.

¹⁰ Source: RAJAR/Ipsos-RSL, Q3 2004

¹¹ Source: BARB, TNS/Infosys, Q2 2004

¹² Source: TGI, April 2003 to March 2004

¹³ Source: Book Marketing Ltd, 2002

¹⁴ Source: RAJAR/Ipsos-RSL, Q2 2004

For over a decade, the BBC has believed that radio has a place in the changing digital world and we have substantiated that belief by investing in radio's digital future, assigning funds for DAB's infrastructure and services and their marketing. In our opinion, to do otherwise would be to consign radio to a slow but inevitable demise as an analogue medium withering at the edge of a dynamic digital media market, which would render it eventually irrelevant to much of the population.

2.1 The BBC's digital radio strategy

There are around one billion hours of radio listening in the UK every week, almost all of which are by analogue means and just over half of which are to BBC radio stations.¹⁵ For radio to survive as a medium, the BBC believes that this analogue listening must be converted to digital listening. For over 10 years, the BBC has advocated DAB digital radio as the means by which to do this and we have played a pivotal role in enabling the UK to lead the world in its adoption. For example, the BBC was the only UK member of the original Eureka 147 consortium¹⁶ that developed the DAB standard, and we were the first in the world to trial text and data enhancements. However, over this period, the internet and digital television have opened up unforeseen avenues to radio for its digital transition. Identifying these opportunities, the BBC has devised successful services for these platforms and leads the field in the multi-platform digital development of radio. This was noted by Tim Gardam in his review¹⁷ of our five digital-only radio services for the Department for Culture, Media and Sport (DCMS).

The BBC's digital radio strategy focuses on three areas: choice, enhancement and control. Choice is key: one of the principal benefits of moving from analogue to digital is the increase in available capacity, allowing a wider choice of listening and supplying the most compelling reason for audiences to convert to digital. In devising the BBC's five digital-only radio services, as well as offering more choice to our existing listeners, we set out to reach some of the audiences that we traditionally underserve in radio, such as ethnic minorities and people under 45 years of age. The line-up of services, launched in 2002, has also enabled the BBC to release additional value for money for licence fee investment in sports rights and our unique archive of music and spoken word material.

Enhancement is the second dimension of the BBC's digital radio strategy and is realised in many ways. On a basic level, it means better sound quality and ease of use as listeners can tune by station name rather than having to remember a frequency. However, other enhancements include our LiveText¹⁸ service on DAB digital radio sets and Freeview, which offers a variety of information, such as the music being played, contact details and even programme notes for the Proms. DAB data enhancements can offer visuals beyond basic text and the BBC has been experimenting with pilots since 1998.

¹⁵ Source: RAJAR/Ipsos-RSL, Q3 2004

¹⁶ The technical standard for DAB takes its name from this group. See also Appendix 7.2

¹⁷ Tim Gardam, Independent Review of the BBC's Digital Radio Services, October 2004; hereafter known as the "Independent Review". Available at

http://www.culture.gov.uk/global/publications/archive_2004/review_bbc_digital_radio_services.htm

¹⁸ The BBC's term for the Dynamic Label Segment (DLS) service of 128 characters of text scrolling across DAB digital radio sets. This term allows us to refer to this output generically across other digital platforms as well as DAB, e.g. digital television

Enhancement can move on a stage with on the internet, where a vast amount of information can augment radio output, as the BBC's award-winning¹⁹ radio websites demonstrate. The websites for Radios 1 to Five Live and the five digital-only services alone have over 1.7 million unique users a week²⁰ in total and provide information about programme content, such as features, uncut interviews and recommended links. Furthermore, the websites connect audiences and radio stations as never before: listeners can talk to one another about common interests on message boards or in chat rooms, and they can talk to the station and its presenters and contributors through live chats and message boards or by email. They can also supply content to be incorporated into broadcasts, from personal experiences to entries in a short story competition.

The BBC has begun to experiment with this richer content on television too, with a pilot service available to those listening through digital cable offering a condensed version of the Radio 1 website. We also produce LiveText to accompany basic branding for Radios 1 to Five Live, the five digital-only radio services and Radio Scotland on Freeview. The BBC was the first in the radio industry to exploit the big screens of television, which offer considerable scope for the visual enhancement of radio, and with 8.5 million adults listening to radio through the television every week,²¹ there is clearly an audience for these services. We are also exploring the interactive potential of mobile phones, which have become the preferred means of contacting our radio stations for some audiences. We are also keen to use data enhancements to complement our services on the DAB platform as we do on the internet and on digital television so that DAB listeners can enjoy the full benefits of our digital radio strategy.

The third element of this is control: putting listeners in charge of their listening. Using the BBC Radio Player²² on the internet, listeners can schedule their radio listening around their lives, rather than their lives around their radio listening. They can listen at their convenience to hundreds of BBC radio programmes streamed on demand for up to a week after broadcast. By making them available in this way, the BBC can extend the reach of many programmes broadcast at off peak times and thus deliver further value for money for the licence fee investment in them.

Although this service, which is usually tied to a computer, is not as simple to use as listening live on a conventional radio, there is clearly an appetite for "on demand" or timeshifted listening of this kind, as approximately 1.8 million programmes are requested every week.²³ The Sky+ personal video recorder²⁴ can store radio as well as television programmes and new generation DAB sets can record radio programmes for later listening. It is certainly feasible that, with a suitable electronic programme guide²⁵ allied to storage, the kind of

¹⁹ Awards include a BAFTA Interactive for Technical Innovation in 2004, four Webby awards since 2001, the Prix Europa in 2001 and three Sony awards in 2002, which recognised web elements as parts of the programmes honoured

²⁰ Source: BBC server logs, September 2004

²¹ Source: RAJAR/Ipsos-RSL, Q2 2004

²² The BBC's online listening console that presents live and on demand streamed audio from the BBC's radio stations. It is available from <http://www.bbc.co.uk/radio> and elsewhere on bbc.co.uk

²³ Source: BBC server logs, September 2004

²⁴ A personal video recorder (PVR) is a device that uses internal computer memory instead of manually inserted cassettes to store broadcast content

²⁵ Programme listings and additional information broadcast to receivers for on screen display

functionality offered by personal video recorders could be found in DAB digital radios with the added advantage of portability. As storage capacity expands and storage costs fall, we expect timeshifted listening to become even more widespread across several platforms. This has repercussions for measuring audiences, the content of radio programmes and the development of electronic programme guides for radio. There are also rights implications and we will continue our productive partnership with rightsholders to address these issues as they arise.

Within this multi-platform strategy, DAB digital radio remains pre-eminent. Neither the internet nor digital television can offer a robust broadcast technology that is mobile and capable of incorporation into a variety of devices at reasonable cost in order to replicate the radio listening experience that millions of people enjoy and value. These other digital manifestations of radio have not displaced DAB as the core technology that the BBC and commercial radio believe will replace analogue radio.

2.2 Why DAB digital radio?

DAB digital radio offers the radio industry the chance to heighten its ambition. It can use the increased capacity to launch radio services, provide text and data enhancements and improve the radio listening experience through better sound quality and sets that are easier to use. DAB embodies the familiarity of the current radio listening experience with receivers to suit listeners' needs, but enriches it with the benefits of digital technology to offer attractive functionality, such as the ability to timeshift radio. Its sound technical underpinning makes it a secure replacement for analogue in the long term and growing industry support and consumer awareness mean that DAB is starting to take off in the UK.

However, in a world of technological volatility, the UK radio industry's commitment to DAB digital radio is sometimes questioned. Such is the pace of technological advance and the relatively rapid changes in consumer behaviour that it precipitates or facilitates, there are those who have yet to be convinced that a definitive case for DAB has been established. This risks misunderstanding the nature of this technological volatility, which means that new systems are always on the technical horizon and that makes a definitive case for any technological route difficult to establish.

Whereas successful analogue standards were likely to see only minor enhancements over many years, digital technologies are developed, enhanced and often superseded during much shorter timescales. Computer based systems can cope quite readily with this turbulence, which forms part of the user expectation. However, broadcast systems demand technological stability, augmented by paced, compatible improvements, to achieve the high levels of access and appreciation from which the UK's radio services benefit. Regularly focusing on the delivery technology for radio would be disruptive for listeners, who value the technology almost entirely because of the content to which it gives access.

As the computer industry drives constant change in digital technologies, broadcasters find themselves contending with an environment at odds with their previous experience of the incremental change of broadcast technologies. To wait for a digital broadcast standard that embeds itself for decades in the way that analogue broadcast standards have would be to risk radio being stranded in an analogue world.

It might be assumed that some of the recent advances in audio compression technologies, which are enhancing internet delivery, could also enhance DAB, although this would not be compatible with existing receivers. Such technologies do hold the promise of even greater spectrum efficiency but it should be noted that the value of spectrum is not solely derived from maximising its theoretical capacity for content delivery. It is also derived from the use actually made of the content it carries and the commercial and public value placed upon this content by its users. Therefore, it would be misguided, in our view, to damage DAB's momentum and the growing value of the services it offers purely in pursuit of notional spectrum efficiency, which could only be attained by starting radio's digital journey all over again.

DAB is already a mature technology, which fully meets the core requirements of a broadcasting system and remains highly spectrum efficient in this fuller sense of the term. Therefore, the BBC believes the Eureka 147 DAB standard remains entirely suited to the delivery of radio in the 21st century. While supporting any backwardly compatible improvements that technology might yield in the future, the BBC believes that radical, incompatible changes would neither serve the interests of listeners, nor meet the aims of those who, like the BBC, seek to use spectrum efficiently.

However, the BBC will continue to take advantage of other delivery technologies alongside DAB where this would benefit licence payers. These technologies could also help to deliver the BBC's public purposes and could influence the environment within which DAB has to operate. The BBC welcomes all open, market-led standards that extend consumer choice and are relevant to UK services. We remain convinced of DAB as the practical choice for the medium's digital conversion because of its all round ability to build on radio's analogue strengths and enhance the radio listening experience that we know today.

3. The journey so far

3.1 Overview

The UK has continued its history as a broadcasting innovator with its adoption of DAB digital radio. It has played a leading role in the development of the DAB standard; it was the site of one of the world's first DAB transmitter networks in September 1995;²⁶ and it was the location of the world's first national commercial DAB transmitter network four years later. The story of DAB's journey from technological innovation to high street product has been one of unparalleled cooperation among its many stakeholders: Government, broadcasters, manufacturers and retailers. This cooperation has been a prerequisite for DAB's success and will need to continue if the medium's growth is to be consolidated.

DAB digital radio's evolution can be viewed in two distinct phases. The first was characterised by pioneering and often risk-taking moves to establish the technology; the second saw it begin to take off. During the first phase, Government allocated spectrum and licensed commercial multiplexes. To offer security for commercial investment, digital licences were awarded for 12 years, with any analogue radio service simulcasting on a digital

²⁶ Sweden also switched on its DAB transmitter network in September 1995

multiplex having its analogue licence automatically extended for eight years. The BBC broke out of the cycle that saw no broadcasts for sets to receive and no sets on which broadcasts could be received by building our transmitter network. Digital radio sets were difficult to find and very expensive, with manufacturers producing DAB tuners costing hundreds of pounds for the high end hi-fi market. Although some in-car sets were on sale, the situation had changed little by the time Digital One²⁷ launched its national commercial radio multiplex in 1999. Recognising their importance in persuading consumers to buy sets, Digital One launched seven new services between November 1999 and August 2000: Bloomberg talkMONEY, Core, Life, ITN News Radio, Oneword, Planet Rock and Primetime Radio. These were broadcast alongside simulcasts of the three national commercial stations: Classic FM, Talk Radio and Virgin Radio.²⁸ Of the seven new services, five of them remain.²⁹

The second phase was marked by Government approval³⁰ in 2001 for the BBC to start five digital-only radio services, and their launch the following year. New local commercial services went on air, the BBC and commercial radio extended their transmitter coverage and, in 2003, they embarked on extensive marketing activity. Significantly, this was combined with the arrival in the shops of affordable digital radios from a variety of manufacturers in a number of styles, including the breakthrough portable product that saw the market lift. 2003 proved to be the year that the digital radio industry had been waiting for as several salient factors combined to deliver what was then its best year: new services, reasonably priced receivers, plentiful promotion and clear consumer demand.

As digital-only stations establish themselves and the receiver market continues to develop, the industry is now poised on the brink of a third phase, the critical one if DAB digital radio is to enter the mainstream. This third phase could see the conditions for an eventual replacement of analogue delivery and a thriving all digital broadcasting environment but, if this is to happen, all DAB's stakeholders must remain committed to facing the task ahead.

3.2 DAB digital radio receivers

The DAB digital radio receiver market has developed considerably over the last seven years, from serving the audiophile niche with high-end products available from specialist retailers to its current position, where high street shops and supermarkets stock DAB products and the bestselling radios are digital radios. As of October 2004, there are 46 manufacturers producing 108 DAB digital radio product lines, starting at £50. There are DAB digital radios in every product segment, from personal stereos and micro systems to clock radios and "boomboxes". The only exception is the mobile phone market, where FM radio chips integrated into the latest handsets are becoming widespread but where DAB chips in mobile phones and handheld computers are still at the prototyping stage.

²⁷ A joint venture between radio company GWR Group and ntl, the media and telecommunications company

²⁸ Relunched as talkSPORT on 17 January 2002

²⁹ ITN News Radio ceased transmission on 1 July 2002; Bloomberg talkMONEY relunched as Bloomberg Radio before ceasing transmission on 15 December 2002

³⁰ The terms of the Government approval can be found at

http://www.culture.gov.uk/PDF/bbc_digital_schedule.pdf (Adobe Acrobat Reader software required)

The first digital radio receivers reached the market in 1997 as manufacturers were unwilling to commit to production until the transmission infrastructure was in place. In keeping with DAB's facility for mobile reception, in-car sets were the first to market, with products from Blaupunkt, Clarion, Grundig, Kenwood, Pioneer and Sony, priced around £800. Home tuners followed from 1999, with Arcam, Cymbol, Meridian, Panasonic's Technics and Tag McLaren releasing products at prices ranging from £500 to over £2,000.

Sets were slow to sell, partly because of their price, but also because of the coverage limitations and the lack of services exclusive to digital radio. New services have become the primary selling point for digital radios, proving to have wider consumer appeal³¹ than improved sound quality, which was the main message in the early days of DAB. Manufacturing activity at that time was experimental, with Panasonic playing a pivotal role in its development, producing the first generation DAB chip in 1998, demonstrating the world's first DAB rewind radio receiver in 2001 and developing the first battery-powered handheld digital radio in conjunction with Roke Manor Research.

There was little movement in the receiver market for some years but advances in chip technology and processing power eventually made portable DAB digital radios a realistic prospect. Seizing this chance to stimulate the receiver market, the Digital Radio Development Bureau (DRDB)³² and manufacturer VideoLogic³³ produced a limited run of three hundred portable "kitchen" radios for £99. The entire stock was sold in under an hour from eight outlets around the country and online on 12 December 2001.

With the consumer appetite for affordable digital radios thus demonstrated, manufacturers accelerated their plans for DAB products. Small British manufacturers led the way in launching sets and have been rewarded with an early foothold in this growing market: Goodmans, PURE Digital and Roberts Radio are the market leaders in the portable segment. Roberts Radio was a notable DAB pioneer, producing the first prototype portable in January 2000; its DAB product range has since expanded to 11 lines in 2004. Specialist audio retailers' faith in DAB represented a vital outlet for the medium in its early days and, recognising its market potential, high street retailers began to follow suit.

Digital One has been able to take advantage of the business opportunity this presents by investing in Frontier Silicon, which manufactures DAB chips, in 2001. Its Chorus FS1010 chip is a low cost, low power component, which enabled the production of affordable portable digital radios, including the first widely available £99 radio. The Evoke "kitchen" portable from PURE Digital, launched in July 2002, proved to be the breakthrough product for which the industry had been waiting and sold out within hours of reaching the first retailers. Radioscape is another British company that specialises in digital radio, creating products for the industry, including a low cost, low power DAB chip developed in collaboration with Texas Instruments.

³¹ Source: Claritas for DRDB, July 2004. New services are selected by 71 per cent of those who have bought sets as a reason for their purchase; sound quality is selected by 40 per cent of this group

³² A trade body consisting of the BBC and commercial radio multiplex operators formed to promote DAB take-up

³³ Now known as PURE Digital

In 2003, with the BBC's digital-only stations on air, two large cross-media BBC campaigns for digital radio and heightened promotional activity from commercial radio, the receiver market finally took off. 330,000 sets were sold in the 12 months to the end of January 2004, with DAB a sought after Christmas gift and DAB portables the three bestselling radios of any kind in December 2003.³⁴ The momentum has continued into 2004, with Sharp, Sanyo, Sony and Panasonic bringing products to market. Samsung has unveiled a home cinema product with an integrated DAB chip, which joins specialist lines including combined DAB/MP3³⁵ devices and combined DAB/DTT³⁶ set-top boxes.

DAB digital radio sales are showing sustained growth (see figure 1 below). Latest sales figures for June/July 2004 stand at a record 74,700. Set sales now total 682,000 and we are confident that they will reach one million by the end of 2004. The sales value of the DAB digital radio market from August 2003 to July 2004 totalled £54 million and prices have continued to fall so that the average cost of a DAB "kitchen" portable radio is £99. While this is still substantially more than the average £19³⁷ for an equivalent analogue radio, we are hopeful that prices will continue to drop as the range and volume of DAB receivers grow and the analogue radio sector declines.

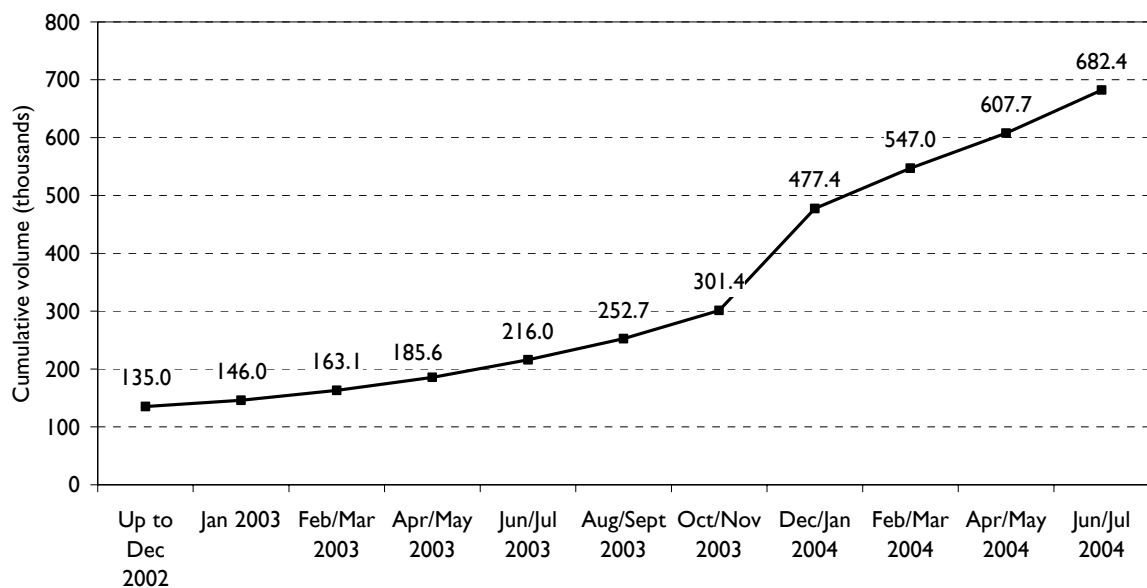


Figure 1 - Sales of DAB digital radios in the UK to date
Source: GfK Marketing Services, July 2004

2004 has also seen the arrival of sets offering the ability to pause and rewind live radio and record radio programmes for later listening, either on the sets themselves or on a computer

³⁴ Source: GfK Marketing Services

³⁵ MP3 is a digital compression format for audio files, making it easier to store and transfer them

³⁶ DTT is Digital Terrestrial Television, known in the UK as Freeview

³⁷ Source: GfK Marketing Services, July 2004 for all figures

or MP3 player by means of a removable memory card. This innovation has immense potential to refresh the medium and bring greater value to listeners as storage costs fall and storage capacity in devices expands. It could offer a further boost to DAB take-up, particularly if allied to an electronic programme guide. This reinvention of radio looks likely to continue as receivers adapt to the needs of data services, which could become the next major development in DAB digital radio.

The technology is well placed to make strides in 2005, especially if the large Japanese manufacturers can be persuaded to boost their investment in DAB. There are also renewed signs of movement in the in-car market, with Goodmans and Ministry of Sound introducing sets at £150 including installation, and the expected arrival at the end of the year of Revo. This adapter will reportedly convert any in-car radio to receive DAB for under £200 and, for extra charges, can be used as an adapter for a hi-fi or “boombox” or as a portable digital radio. However, the real breakthrough will come when DAB is fitted by car manufacturers in the factory because replacing existing car radios with DAB sets is often made awkward by the navigation systems installed in many of the latest models. Offering DAB receivers as an option at the time of a car’s purchase is on the increase but Vauxhall is the first manufacturer to factory-fit DAB, releasing the Astra SXI Digital in September 2004. This milestone for the industry was supported by a campaign on commercial radio.

Through the Digital Radio Development Bureau (DRDB), the BBC has been involved in drawing up a recently published five year forecast of DAB digital radio take-up, which has been independently audited by strategy advisors Oliver and Ohlbaum. The forecast is based on a take-up model that combines intelligence about manufacturers’ intentions with retailer and consumer behaviour and historical data from GfK Marketing Services, which measures sales of consumer electronics in the UK.

The forecast addresses cumulative volume (see figure 2 overleaf) and household penetration (see figure 3 overleaf) to 2008. By then, it predicts that there will be over 13 million DAB digital radios in UK homes, up from around one million at the end of 2004, and representing 29 per cent household penetration.³⁸

The radio industry believes that this forecast represents a realistic attempt to predict the growth of the DAB digital radio market. Although the rate of its growth has attracted adverse comparison with that of digital television from some quarters, the intrinsic differences between the two media and their paths to digital should be acknowledged.

³⁸ The forecast assumes that the average number of digital radio sets per household exceeds one, given that the average household owns between four and five analogue radios

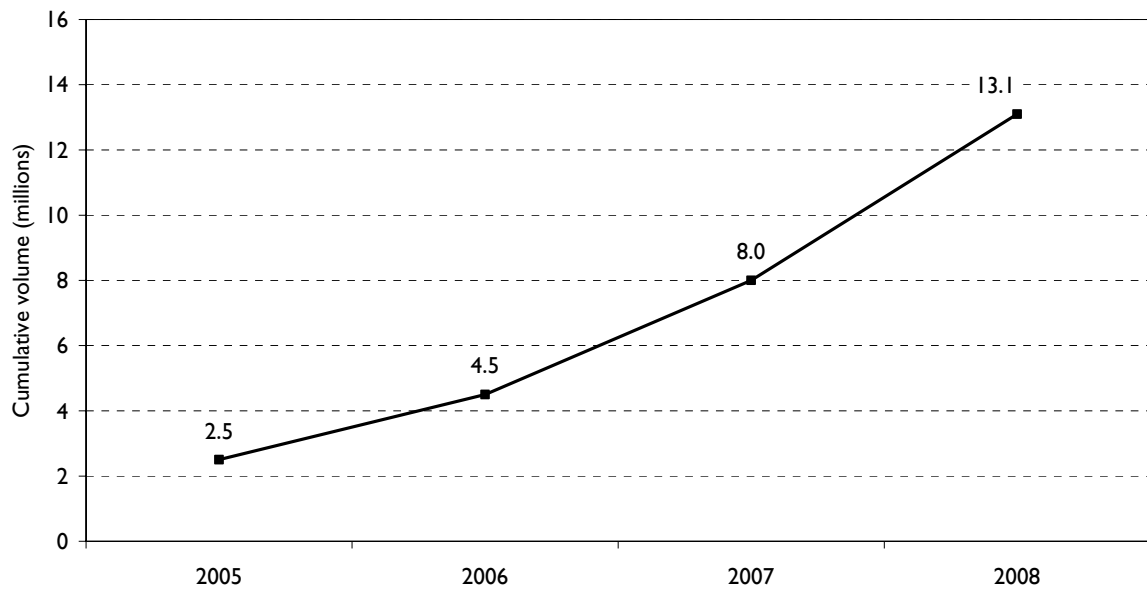


Figure 2 - Forecast of DAB digital radio sales in the UK, 2005-2008
 Source: DRDB, October 2004

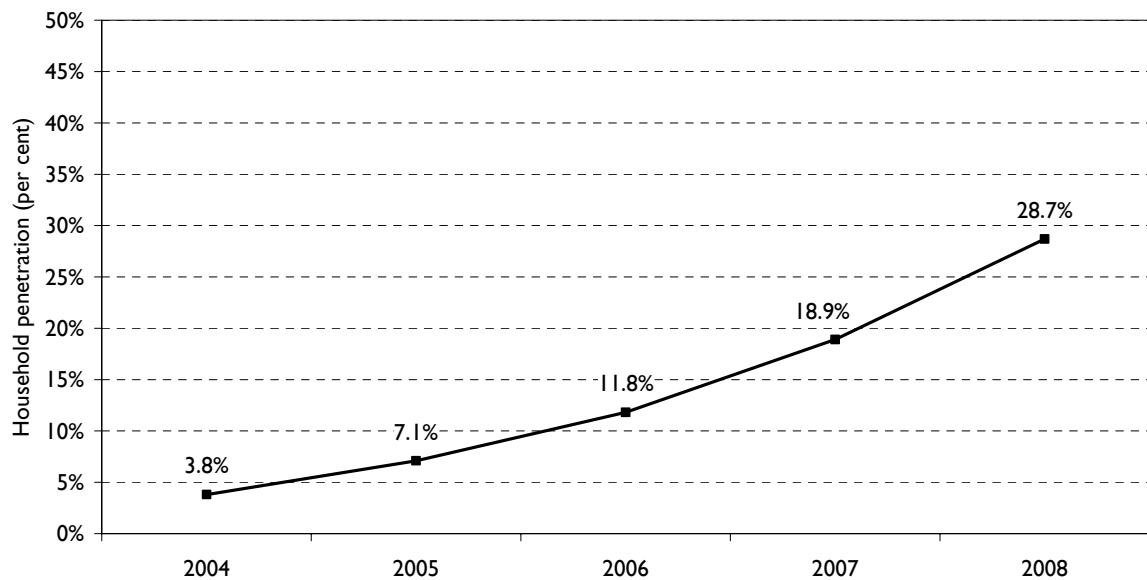


Figure 3 - Forecast of household penetration of DAB digital radio in the UK, 2004-2008
 Source: DRDB, October 2004

Digital television is delivered by means of three separate technologies, all of which were initially predicated on giving access to high value and exclusive pay services, such as sport

and films; two of these platforms still are.³⁹ Vertically integrated systems of this kind, with the high revenue streams that these premium services can generate, presented a clear business case for service providers to subsidise the cost of entry to the consumer. Supplying free or low cost set-top boxes at a time when economies of scale had yet to drive down their cost was a sound financial move given that the consumer already owned the most expensive part of the system: the analogue television set.

Radio content, however, remains free to access and lacks the premium editorial drivers of digital television. Analogue radios cannot be converted to digital with a set-top box so replacement hardware must be purchased by consumers. The average household owns between four and five analogue radios⁴⁰ so it will take some time for them all to be replaced with digital sets at current prices. There is no commercial player in the radio market able to subsidise digital radios in the way that BSkyB has been able to subsidise digital satellite receiving equipment, which served to accelerate take-up. Consequently, there is no promotional push for DAB digital radio of the sustained magnitude of digital television. A new system such as DAB can therefore be reasonably expected to follow the gradual rate of take-up associated with this type of horizontally organised market; our previous experience of the migration to FM supports this.

3.3 Digital radio services

One of the main benefits of DAB digital radio is its ability to extend choice in the radio market. The UK's experience has shown that this is fundamental to driving take-up of DAB, with wider choice consistently cited by digital radio owners as the main reason for buying sets.⁴¹ The technology has released fresh creative impetus into the radio industry whose expansion was stifled as it reached the limits of analogue spectrum.

Commercial radio was first to invest in national digital radio services and new local stations have been launching on commercial multiplexes around the UK since 2000. This has brought existing successful station brands and formats, such as Kiss and Xfm, to different parts of the country and has introduced new brands and formats to the radio market. The scope for growth has attracted investment into the industry, leading to the extension of other brands into radio, such as Heat, Saga and Disney, as well as the birth of brands, such as Abracadabra and The Arrow.

3.3.1 The BBC's new digital radio stations

The BBC devised our portfolio of new digital radio services to widen the choice for our existing listeners and, more importantly, to improve our offering to audiences with which BBC Radio has historically underperformed: people under 45 years of age and ethnic minorities. In so doing, we aimed to open up our unrivalled archive of music and spoken word material to give licence payers better access to the public asset that they have funded; we also sought to release improved value for licence fee investment in sports rights. The

³⁹ Digital cable and Sky Digital

⁴⁰ Source: RAJAR/Ipsos-RSL, Q2 2004

⁴¹ Source: Claritas for DRDB, July 2004

BBC's public consultation exercise,⁴² carried out in 2000, found that 70 per cent of respondents supported our proposals for digital-only radio services; Government approval to launch them followed in September 2001.

During 2002, we embarked on an unprecedented expansion of the BBC's network radio provision, investing some £20 million⁴³ in 1Xtra, 6 Music, BBC 7, Asian Network and Five Live Sports Extra, each supported by dedicated marketing activity. We also made the BBC World Service available to the UK for the first time. The digital-only services are still in their infancy (see figure 4 overleaf) but we are encouraged by their early achievements and the work that they are doing to experiment with production and presentation talent and to reach new audiences. Their quality and distinctiveness have been praised in the recently published Independent Review for the DCMS.⁴⁴

Since Quarter 3 2003, the digital-only services have been included in the RAJAR survey, which measures radio audience figures. Over the year, their weekly reach has climbed from 1.47 million people to 1.72 million. BBC 7 has seen the largest rise in audience of any of the services, adding 168,000 listeners, followed by Five Live Sports Extra with 112,000 new listeners. 6 Music's audience has grown steadily each quarter, with 74,000 listeners added over the year and, after a drop at the end of 2003, 1Xtra has won new audiences throughout 2004. The reach of Asian Network, which includes its analogue audience on local radio, dipped at the end of 2003 but has since recovered and now stands at over 470,000.⁴⁵

In accordance with both the BBC's multi-platform digital strategy and with the terms of the Government approval for their launch, each station is streamed online⁴⁶ and is carried on digital television⁴⁷ as well as being broadcast on DAB. In addition to a live stream of the output, each station's⁴⁸ website offers schedules, programme support material and interactive features, such as message boards; users are also able to listen to selected programmes on demand through the BBC Radio Player. These sites were praised by Tim Gardam in his Independent Review of our digital-only services,⁴⁹ who described them as "a tribute to the BBC at its most strategic and innovative" and "absolutely in keeping with the BBC's core purposes". He added that: "These sites must be considered a significant driver in the promotion of digital take-up. In a fragmented digital world, any future successful radio station will develop an intimacy with its listeners that will essentially turn the relationship into a conversation. The BBC websites are achieving this."

Usage of the digital-only services' websites has also shown encouraging growth. 1Xtra's website has added 242,000 monthly unique users since January 2003. The 6 Music website

⁴² Available at http://www.bbc.co.uk/consult/ns_results.shtml

⁴³ Source: BBC Annual Report and Accounts, 2003/04, available at <http://www.bbc.co.uk/annualreport/> The figure relates to the first full year of operation of these services and covers content and production spend

⁴⁴ Op. cit.

⁴⁵ Source: RAJAR/Ipsos-RSL, Q3 2004 for all figures

⁴⁶ <http://www.bbc.co.uk/1xtra> <http://www.bbc.co.uk/6music> <http://www.bbc.co.uk/bbc7>
<http://www.bbc.co.uk/asiannetwork> <http://www.bbc.co.uk/fivelive/sportsextra>

⁴⁷ See Appendix 7.6 for details of the BBC's radio services on digital television platforms

⁴⁸ Five Live Sports Extra has a minimal web presence as part of the Radio Five Live website and does not offer all of these features because it is a part-hours, commentary-only service

⁴⁹ Op. cit., p. 106

is averaging 382,000 unique users a month in 2004, up from 236,000 in 2003. BBC 7 recently eclipsed its previous monthly online usage record by over 55,000 users. Asian Network's online performance has improved steadily, averaging 28,000 more monthly unique users in 2004 than in 2003, with peaks in traffic around coverage of the mela season and international cricket. Five Live Sports Extra's coverage of the cricket Test matches produced a surge in traffic to the site, with a record 204,000 monthly unique users in June 2004.⁵⁰

	Audience proposition	Launch date	Weekly audience RAJAR Q3 2004	Website monthly unique users September 2004
Five Live Sports Extra	A part-time extension of BBC Radio Five Live, bringing a greater choice of action to sports fans and extracting more value from investment in sports rights	2 February 2002	424,000	161,000
6 Music	For listeners who are passionate about rock and pop music, featuring a rich mix of contemporary and classic artists and showcasing highlights from the BBC archives	11 March 2002	228,000	357,000
1Xtra	Dedicated to playing the best in contemporary black music for a young audience, covering all of the hottest urban genres such as UK garage, hip hop and RnB	16 August 2002	312,000	418,000
Asian Network	Music, news, sport, debate, entertainment and drama for a broad based audience of first, second and third generation British Asians	28 October 2002	473,000	131,000
BBC 7	Pure entertainment, featuring the best in BBC comedy, drama and books as well as daily live kids' show, <i>The Big Toe Radio Show</i>	15 December 2002	404,000	258,000

Figure 4 - Summary of the BBC's five digital-only radio services

Sources: RAJAR/Ipsos-RSL, Q3 2004; BBC server logs, September 2004

3.3.2 BBC local and national regional stations

The BBC began broadcasting our local and national regional radio services on DAB digital radio in June 2000 when BBC London Live⁵¹ launched on the Greater London II multiplex. We have taken up all of the capacity reserved for these services on local commercial multiplexes under the provisions of the Broadcasting Act 1996. The rollout of these

⁵⁰ Source: BBC server logs, September 2004 for all figures

⁵¹ Now BBC London 94.9

multiplexes is almost complete⁵² and 32 of the BBC's 46 local and national regional services will then be available on DAB.⁵³

However, this initial phase of local digital coverage falls significantly short of the coverage afforded by analogue provision. The situation is particularly acute when also considering those analogue listeners to BBC services who are disenfranchised by their digital migration because of discrepancies in analogue and digital transmitter footprints, which arise from the differing editorial areas of BBC and commercial stations. This represents a serious disadvantage for the BBC in trying to promote the benefits of DAB to our local and national regional audiences, especially when combined with a lack of near universal coverage. For example, the national regional services in Wales and Northern Ireland struggle to offer any promotional activity at all. This also causes confusion and adverse perceptions of DAB among listeners as it conflicts with their expectations of any successor technology to analogue. It is imperative that this situation is remedied if the digital conversion of radio is to be complete.

In line with the BBC's multi-platform strategy for radio, we announced in April 2004 that all of the English local radio stations would be streamed live on the internet, joining the national regional services,⁵⁴ Radios 1 to Five Live, the five digital-only services and the World Service.⁵⁵ This process is underway and we are aiming to have all of our local stations online by the end of the year. In addition to this, the national regional radio services are carried on digital television alongside the 10 UK-wide networks and the World Service.⁵⁶

3.3.3 Text and data services

In addition to audio, DAB also enables the broadcast of text and data. Text can augment the radio listening experience by offering complementary information which might easily be missed or for which there is no time on air. The BBC has been working on text enhancements since 1996, exploring the use of the scrolling display on digital radios. We offer a LiveText service for Radios 1 to Five Live, the five digital-only networks and the World Service, displaying schedule and programme information, such as sports results, helpline numbers and details of the guests being interviewed or the music being played. The BBC has a LiveText library of information about composers and artists, which we use to contextualise listening, and we are increasingly broadcasting SMS⁵⁷ messages from listeners on the DAB text display. The BBC's local and national regional LiveText is supplied by Unique Interactive and consists of news headlines, sports results, weather and travel news; most of this is sourced from existing BBC information feeds used elsewhere, e.g. for online content.

⁵² The last multiplex, on which both Radio Devon and Radio Cornwall have reserved capacity, covers Plymouth and Cornwall; it is due on air in November 2004

⁵³ See Appendix 7.5 for details

⁵⁴ Radio Scotland, Radio Nan Gaidheal, Radio Wales, Radio Cymru, Radio Ulster and Radio Foyle

⁵⁵ The streaming of all BBC radio stations is subject to available rights; almost all output is available, with the main exception being certain sporting events

⁵⁶ See Appendix 7.6 for details

⁵⁷ Short message service, also known as text messaging

Innovating with LiveText contributes to the distinctiveness of the BBC's radio output. We have experimented with real-time LiveText, such as general election results on Radio 4 in 2001, breaking news on Five Live, programme notes for the Proms on Radio 3 and the countdown of the Official Chart Show on Radio 1. Reaction from audiences has helped refine our provision and our LiveText output has grown in recent years: for the 10 UK-wide radio networks alone, we broadcast approximately half a million words a day on DAB. To bring the value of this enhancement to as many listeners as possible, we have been investigating the distribution of LiveText to other digital platforms and, in September 2003, we began offering it on Freeview. We are also exploring the infrastructure necessary to deliver it to the internet and the other digital television platforms.

Commercial radio's text provision varies, with some stations providing nothing or a few rotating labels featuring contact details and a marketing strapline. Other stations offer automatically generated information about the record being played now or next, news headlines, audience text messages and advertisements. Text services are clearly valued by those with digital radio sets, with 82 per cent of them rating the text as being excellent or good.⁵⁸

The BBC has been piloting DAB data enhancements since 1998. Their use has been limited owing to the lack of suitable receivers but we have derived valuable experience from these trials, which have been shaping our plans for data. Our traffic and travel service based on the cross-platform TPEG⁵⁹ standard, which the BBC initiated, aims to supply platform independent travel information using open standards and it is likely to play a part in our future data activities. Our broadcast website, Vision Radio, offers text-based news, sport, business and weather information, sourced from Ceefax with the addition of still images. This can be accessed on DAB devices with a monitor, such as a computer with a DAB PC card. This kind of proposition is in its infancy but has considerable creative potential, assuming that the necessary receivers come to market. The industry has learned from early work in this area, such as the Psion Wavefinder, a digital aerial connected to a computer that enables the transmission and reception of text, pictures, websites and sound through DAB rather than the internet.

The BBC's priority for data enhancements is an electronic programme guide (EPG) for radio. The EPG is, in our opinion, likely to become central to the way in which services are accessed in future. An EPG could become as valuable to digital radio listeners as it is to digital television viewers and, together with enlarged storage capacity in receivers, enable the automatic capture of content. The BBC is particularly interested in this functionality as it will extend the value of public service content by enabling more people to access it than are able to at the time of transmission alone. Consequently, the BBC has played an active part in its development and a technical standard to ensure full compatibility between broadcasters and the rest of the industry is in the final stages of implementation, with the prospect of a service operating early next year. We are also involved with associated initiatives such as the TV Anytime Forum, which has devised a standard for programme

⁵⁸ Source: Claritas for DRDB, May 2004

⁵⁹ Travel Protocol Experts Group. The standard enables the delivery of traffic and travel information to users in a form that is independent of the delivery mechanism itself. See also Appendix 7.2

metadata,⁶⁰ i.e. data describing the characteristics of a programme or items within it, such as the type of music played. This is indispensable for the automatic capture of content and subsequent easy access to it. We are also engaged in a dialogue with rightsholders to ensure that any concerns they have about timeshifted or disaggregated content can be addressed.

Commercial radio's DAB data activity has centred on the Digizone, an interactive service launched in November 2000, offering games, news and information about the music played on Core and Classic FM. The recent joint venture between Digital One and BT Wholesale to deliver multimedia data services to mobile devices is a welcome one that will bring a different dimension to radio in the digital world as well as extra value to listeners. Commercial radio has seen the potential of DAB data services to realise a new revenue stream; the BBC is interested in such enhancements for their ability to complement public service broadcasts. Our digital radio strategy has prioritised radio services because they are instrumental to driving DAB take-up and they will remain at the heart of our strategy. However, we will also be exploring opportunities to use data to enhance our radio provision in the coming years.

3.4 BBC DAB digital radio coverage⁶¹

The BBC's national DAB network was commissioned in 1995 and consisted of 27 transmitters reaching 60 per cent of the UK population. To deliver maximum value, transmitters were sited to cover the main centres of population and, given DAB's strength as a mobile medium, some of the principal road links between them. This represented a clear sign of broadcasters' commitment to DAB and was instrumental in giving manufacturers the confidence to invest in receivers. With the impending launch of our digital-only services and with promising moves in the receiver market, the BBC announced in 2001 that we would extend national DAB coverage. It rose to reach 65 per cent of the UK population by the end of that year, increasing to 80 per cent by the end of 2003 and around 85 per cent in 2004. This year, in our contribution to the Charter review debate, *Building public value*,⁶² we set out our intention to extend coverage of the BBC's DAB network to at least 90 per cent of UK homes during the next Charter period in partnership with commercial radio. National commercial radio coverage, which reached 69 per cent of the population of Great Britain in 1999, has expanded to reach 85 per cent of Great Britain in 2003.

The BBC's UK-wide services are delivered by means of a single frequency network⁶³ of transmitters, which is managed in line with our strategic objectives. However, English local

⁶⁰ Data describing the characteristics of a programme or items within it, such as the type of music played

⁶¹ See Appendix 7.3 for coverage maps

⁶² Available at <http://www.bbc.co.uk/thefuture/bpv/prologue.shtml>

⁶³ In a single frequency network, two or more transmitters that are carrying the same content can broadcast on the same frequency and in a way that reception in the area of overlap is improved by the contribution of each, rather than damaged. This technique can be used to establish coverage to meet the needs of local, regional or country-wide broadcasters. See also Appendix 7.2

radio and national regional services are delivered by means of capacity⁶⁴ reserved for them under the Broadcasting Act 1996 on local and regional commercial multiplexes. These are operated by commercial radio companies and broadly correspond to the analogue coverage areas of existing commercial stations. These tend to differ from those of the BBC's local and national regional radio services; the BBC's services are often county based and larger. This leaves sections of the analogue audience for certain BBC local or national regional stations unable to receive them on DAB. These coverage arrangements mean that 14⁶⁵ BBC local radio stations in England and Northern Ireland lack any presence on DAB.

3.5 Industry partnership

The story of DAB is one of partnership, from the development of the original technical open standard to its implementation and promotion, which have seen unprecedented levels of cooperation between the BBC and commercial radio. Collaboration among different industries in the UK and around the world has been the hallmark of DAB's progress and it will need to continue during this next critical phase in the technology's journey if DAB is to become a mass market proposition.

The BBC and commercial radio have a long-established constructive dialogue, both formal and informal. The UK Digital Radio Forum was set up by the Department for Trade and Industry (DTI) in 1995. It brought together broadcasters and manufacturers to promote DAB in the UK and operated till 2001. In 2000, the BBC and Digital One signed an agreement to collaborate on marketing, communication and audience research initiatives. As a result, both parties shared information; participated in promotional support and training activities with manufacturers and retailers; devised consumer marketing plans and had a joint presence at events, such as trade shows. Digital One also devised the "r mark" for DAB digital radio, a logo for use on sets and marketing materials to provide a readily identifiable symbol of DAB to consumers.

Partnership between the BBC and commercial radio took a notable step forward in 2002, when the BBC and commercial multiplex operators formed the Digital Radio Development Bureau.⁶⁶ It was established to express a unified radio industry voice advocating DAB digital radio to the public and other industry stakeholders, such as retailers and manufacturers. The DRDB joined representatives from the BBC, Digital One and WorldDAB for a trade delegation to Japan, supported by the DTI, in November 2003. The mission aimed to encourage Japanese manufacturers into the market by updating them on the success of DAB digital radio in the UK and highlighting its potential. Radio is a minority medium in Japan and manufacturers also had concerns about other technologies that might supersede DAB. While persuaded of the UK's success in launching DAB, the large manufacturers plan for

⁶⁴ This capacity ranges from 128 kbit/s on some multiplexes for one joint stereo audio service to 256 kbit/s on others for two joint stereo audio services. This accounts for between one-ninth and two-ninths of the total available capacity. The BBC has no local or regional DAB capacity of our own

⁶⁵ Radio Cumbria, Radio Derby, Radio Gloucestershire, Radio Guernsey, Radio Hereford & Worcester, Radio Jersey, Radio Lincolnshire, Radio Northampton, Radio Oxford, Somerset Sound, Radio Suffolk, Three Counties Radio, Radio York and Radio Foyle. This does not include the opt-out services on Radio Scotland. See Appendix 7.5 for details of BBC local and national regional radio stations' carriage on DAB

⁶⁶ Founder members were the BBC, Digital One, Capital Radio, Emap, Score Digital, Now Digital, Switchdigital and MXR; Switchdigital and Score Digital have since left

large markets and were looking for evidence of a European market for DAB beyond the UK. However, for the first time, they were convinced of DAB as the core digital radio technology for the UK and most have since announced their intention to enter the market.

Aside from the commercial radio sector, the BBC has worked closely with manufacturers and retailers during the early life of DAB. For example, we ran retailer roadshows around the UK to demonstrate DAB receivers and share our plans; we sent information packs to retailers including point of sale material and compiled a bi-monthly newsletter for a database of five thousand manufacturers, retailers, set owners and radio industry colleagues. To assist manufacturers' entry into the DAB market, BBC Research and Development supplied a product testing facility in 1994. We also collaborated with product designers in the mid to late 1990s to stimulate original thinking about receivers and reflect the transformational effect of DAB on the medium of radio. This resulted in prototypes from companies such as IDEO and Enigma; IDEO's "family radio" is now on loan to the Science Museum in London, where it is displayed as an example of innovative product design.

3.6 Marketing DAB digital radio

The BBC has always recognised the importance of explaining the benefits of going digital and of presenting DAB digital radio as an attractive proposition for consumers. Over DAB's lifetime, we have explored different ways of doing this, from on air campaigns to face to face consumer roadshows. We have also refined our promotional messages as the DAB proposition has changed, from an initial focus on improved sound quality to the present emphasis on a wider choice of stations, which is succeeding in driving awareness and take-up of DAB digital radio.

The BBC undertook extensive promotional activity for DAB in the late 1990s, working with journalists, manufacturers and retailers to raise its profile, as well as running occasional consumer campaigns on air. Together with our work in the press and at trade and public events, the BBC lent DAB an influential voice from the broadcasting industry although the lack of affordable sets and services exclusive to digital meant that its impact on take-up was modest.

The formation of the DRDB allowed the BBC to scale back our activity in relation to manufacturers and retailers in favour of consumer-facing marketing. Campaigns of this kind have proved essential in stimulating demand for DAB. In accordance with the Government approval for the BBC's digital-only radio services, their launch throughout 2002 was supported by marketing across television, radio, the internet and billboards. As the range of digital sets expanded and their prices fell, we followed this with two generic digital radio campaigns in June and November/December 2003. Both campaigns featured television, radio and internet promotion and the second campaign used billboards as well. The promotions were designed to highlight the appeal of wider choice and to show how to receive digital radio; their timing was coordinated with the DRDB, which ran parallel campaigns for DAB on commercial radio.

The June campaign prompted over 2,700 calls to the BBC digital helpline⁶⁷ and around 250,000 page impressions to the digital radio website.⁶⁸ The banner campaign across bbc.co.uk delivered 17,000 clickthroughs to the website, with promotion on the bbc.co.uk homepage resulting in around 80,000 clickthroughs. The November/December campaign saw over nine thousand calls received and around 600,000 page impressions generated. The online banner campaign secured around 24,000 clickthroughs to the digital radio website, with a further 90,000 user journeys to it resulting from promotion on the bbc.co.uk homepage.⁶⁹ The profile of DAB digital radio rose in the consumer and trade press and, in the run-up to Christmas, DAB sets were frequently the subject of features. These activities helped to deliver DAB's most successful Christmas yet in terms of set sales and Tim Gardam was unequivocal in his assessment of their impact in his Independent Review of the five digital-only services for the DCMS. He observed: "...there is no doubt that the BBC's impressive marketing skills have been a dominant reason for the growth of digital radio."⁷⁰

As part of our media literacy activities, BBC Radio has run a number of campaigns to promote digital technology, including digital radio. In 2004 alone, Radio 1 ran a "Digital Week" in June and Radio Five Live did so in October; Radio 2 held a "Going Digital" month in September. Cross-media campaigns for 6 Music in July, 1Xtra in August and Asian Network in October have again boosted digital radio's profile. In December, another generic digital radio campaign on television, radio, the internet and billboards will consolidate the year's marketing effort.

The BBC's audience research⁷¹ shows that awareness levels of DAB digital radio rise during campaigns of this kind but taper off soon afterwards, illustrating the need for broadcasters to promote digital radio consistently to sustain consumer demand. Radios 1 to Five Live have incorporated digital radio references into their promotional packages, such as station idents, and their websites offer information about digital listening. However, it has been much more difficult for local and national regional radio to participate in these initiatives because of the mismatch between commercial multiplex footprints and BBC editorial areas, which leave many services only partially available on DAB. Nevertheless, local radio in England has started to include references to DAB digital radio in marketing material and the launch of a local commercial multiplex is supported by a joint press release from the multiplex operator and the relevant BBC station. This is sometimes complemented by on air activity, such as interviews with the BBC's digital radio experts, who take questions from listeners about DAB.

Promotion of DAB on commercial radio has varied, with some stations, such as Virgin Radio, running dedicated campaigns featuring competitions and online support, while others have broadcast generic advertisements from the DRDB and Digital One, contributing millions of pounds of airtime. The establishment of the DRDB has resulted in better coordination of promotional activity with commercial radio and together we have raised consumer awareness of DAB to its present record high of 52 per cent⁷² from 16 per cent at the end of

⁶⁷ The helpline number is 08700 100 789

⁶⁸ <http://www.bbc.co.uk/digitalradio>

⁶⁹ Source: BBC server logs for all figures

⁷⁰ Op. cit., p. 29

⁷¹ Source: Pan-BBC Tracking Study

⁷² Source: Ipsos-RSL for DRDB, August 2004

2001.⁷³ Manufacturers and retailers, such as Roberts Radio and Argos, have run advertisements in the press and on television and radio, forming an invaluable addition to the broadcasters' efforts.

With an abundance of consumer messages about technology, the BBC acknowledges the continued importance of investing in the promotion of DAB digital radio to ensure that licence payers are aware of the ways in which their listening is being enhanced. We intend to build on the success we have had in driving take-up of DAB to ensure that this early progress is consolidated in the coming years.

3.7 The public response to DAB digital radio

The public response to DAB digital radio has been overwhelmingly positive among those who have bought sets. Research from this group, conducted for the DRDB, reveals that 80 per cent rate the benefits of DAB as either excellent or good, with new stations, ease of tuning, product design and sound quality being the most popular features.⁷⁴ Most people gain information about products from in-store displays,⁷⁵ underlining the essential role played by retailers. Most products are sold from electrical retailers such as Dixons, Comet and Currys, but supermarkets and department stores have been gaining share throughout 2004.⁷⁶ The most popular product segment is the "kitchen" portable, which accounts for over 70 per cent of sales.⁷⁷

BBC 7 has been cited consistently as the station providing the main reason for set purchase, with 23 per cent nominating it since its launch.⁷⁸ The 45 to 54 year old age group is the largest among current purchasers, although the 55 to 64 year old age group is close behind.⁷⁹ This is an encouraging situation, in some respects, as it demonstrates that older consumers are comfortable with this technology. However, the industry as a whole needs to target young consumers: awareness of DAB is at its lowest among people aged 15 to 24.⁸⁰ Appropriate promotion and suitable products at affordable prices are necessary for DAB to appeal to young consumers and to women, among whom awareness is also low. The highest awareness levels are among men, the 35-44 year old age group and those with access to the internet and digital television.⁸¹

In addition to research of this kind, the BBC also hears directly from licence payers at consumer and trade events around the UK, from motor shows to melas, where we showcase digital radio. We also handle correspondence on DAB digital radio and receive comments through our digital radio website and our digital helpline, which has answered over 10,000 calls on the subject over the last 12 months. Callers requesting information are sent leaflets explaining the digital-only radio services and the benefits of DAB. We receive

⁷³ Source: Ipsos-RSL for DRDB, December 2001

⁷⁴ Source: Claritas for DRDB, July 2004

⁷⁵ Source: *ibid.*

⁷⁶ Source: GfK Marketing Services, July 2004

⁷⁷ Source: *ibid.*

⁷⁸ Source: Claritas for DRDB, May 2004

⁷⁹ Source: Claritas for DRDB, July 2004

⁸⁰ Source: Ipsos-RSL for DRDB, August 2004

⁸¹ Source: *ibid.*

an average of 60 inquiries a week through the digital radio website, a quantity that rises steeply during promotional periods: over three hundred a week were received during the digital radio campaign in November/December 2003. Almost all of the generic DAB queries concern coverage, which have been useful in helping us to plan future transmitter sites, but the BBC also receives many positive comments about digital-only services (see figure 5 below).

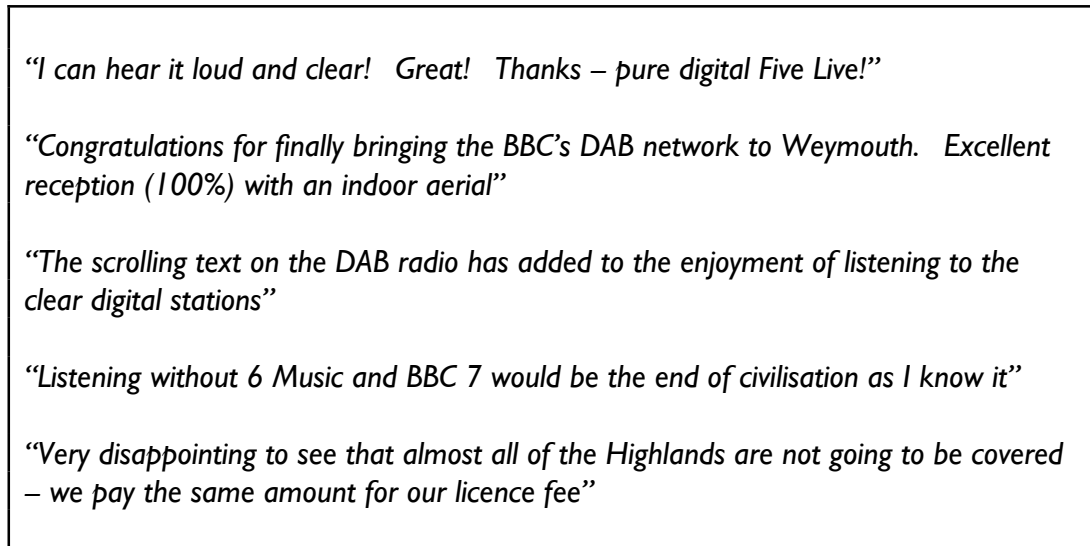


Figure 5 – A selection of comments from listeners received by the BBC

3.8 DAB digital radio across the world

Internationally, DAB is overseen by the WorldDAB Forum, which convenes a number of stakeholders, including sound and data broadcasters, manufacturers and network operators, to encourage joint action for the advancement of DAB worldwide. The BBC has been an active member of WorldDAB since 1994, when it was known as EuroDAB. Its Technical Committee, which the BBC chaired for several years, works on compatible enhancement to the core standard to ensure that it continues to meet the aspirations of broadcasters and their audiences; all parts of the industry have seen the value of this technical collaboration.

DAB is accepted as the technology standard for digital radio by the European Broadcasting Union, most European countries and others worldwide, including Australia, Canada and Singapore. The UK is the most advanced in the adoption of DAB digital radio because of a combination of factors unique to it. A supportive regulatory environment, a strong public broadcaster, sufficient funding, collaboration between public and commercial broadcasters, committed domestic manufacturers and retailers, significant promotional effort, a solid infrastructure and the availability of digital-only stations have together given DAB in the UK excellent foundations on which to build.

Elsewhere, the situation is variable. Most other European countries have a digital strategy and infrastructure in place but few of them are offering digital-only services so are struggling to drive consumer take-up. The rise in licence fee funding for digital expansion and the measures taken by the BBC to release resources to match this have put us on a surer footing than many of our counterparts in public broadcasting elsewhere in Europe. In some

European countries, regulatory restrictions make it difficult for the public broadcasters to take the lead in investment and thus offer some security for commercial expenditure on digital technology. The necessary infrastructure differs across the continent and the degree of partnership between public and commercial radio sectors that exists in the UK is unmatched elsewhere. Competition between the sectors, lack of funding or concerns about the impact of increased choice has hindered the establishment of a single industry position for radio's digital transition.

In discussing the significance of a European market for DAB with Japanese manufacturers, the importance of Germany has clearly emerged. As the biggest market for consumer electronics in Europe after the UK, it can play a decisive role in enabling the technology to move into the mainstream. However, although the quality of its infrastructure is comparable to the UK's, with around 80 per cent population coverage, DAB in Germany is becalmed. The commercial broadcasters are wary of the prospect of competition intensifying and are reluctant to invest in the technology; the public broadcasters are split, with the Länder in the south broadly in favour of DAB and the Länder in the north broadly unconvinced. The necessary regulatory framework is also lacking, with the public broadcasters unable to secure extra funds for investing in services exclusive to digital. Sets are scarce, making promotion difficult and inhibiting consumer demand for DAB.

France, another large market for radio in Europe, is undecided about DAB. The public broadcaster is apprehensive about taking the lead because of its concern that other technologies might supplant it and the commercial broadcasters are unwilling to face the competition that digital could bring. The regulatory situation has been in flux for some years and prospects are bleak for terrestrial digital radio in France.

The USA and Japan have not pursued DAB digital radio at all, leading some to question its practicability. However, both countries have settled on options that better suit their local environments. In the USA, Satellite Radio⁸² will duplicate analogue stations by fitting digital transmissions in at the edge of AM or FM broadcasts and thus requires no additional spectrum. However, although there is some scope for data services, it offers no large scale expansion of listening choice unless analogue services are switched off. This technology holds less appeal for Europe because the IBOC signal occupies spectrum twice as wide as a European FM channel so it would be difficult to accommodate within Europe's heavily used FM radio band. Digital satellite radio is also being explored in the USA but this has been targeted initially at the in-car market and offers subscription services with fewer or no advertisement breaks and is thus a departure from the existing US radio model. IBOC is best suited to open areas and outdoors, proving less reliable in urban areas and indoors unless terrestrial filler transmitters are erected. This makes it impractical in Europe, which has a higher population density and greater geographical diversity.

Japan has adopted its own approach to digital radio in a media environment substantially different from that in Europe and one in which radio plays a small role by comparison. Japan bases all digital broadcasting on a common ISDB⁸³ standard capable of delivering radio, television and data to fixed and mobile receivers; wide-ranging field trials have been in place

⁸² In Band On Channel. See Appendix 7.7 for details

⁸³ Integrated Services Digital Broadcasting. See Appendix 7.7 for details

since 1999. While different from Eureka 147 DAB, ISDB draws on many of the technologies that give both standards their core characteristics.

4. Risks to the continued progress of DAB digital radio

After a concerted effort from all of its stakeholders, DAB digital radio is starting to take off in the UK and is poised to build on that trajectory in the coming years. However, in considering its future, there are still some risks that could destabilise DAB and, in so doing, impede radio's conversion to a digital medium.

4.1 Spectrum limitations

The UK Government's prescient early allocation of seven blocks of Band III⁸⁴ spectrum to DAB digital radio in 1994 has helped the radio industry to begin its digital migration. However, the BBC believes that the limits of the current allocation are now being reached, despite some scope remaining for use of the spectrum already allocated to the commercial local and regional multiplexes. In our view, access to more spectrum in Band III for DAB digital radio is a prerequisite for the creation of a radio environment in the UK with an appropriate balance between BBC and commercial services, in which DAB take-up continues to rise and in which we can plan for the eventual withdrawal of analogue radio services.

The BBC faces three key constraints regarding our spectrum allocation. The most serious is the lack of spectrum for the full migration of our local and national regional radio stations to DAB. BBC local and national regional radio constitute a valued part of cultural and democratic life in the UK, contributing to communities with local news and information, supplying a platform for their discussion and, in so doing, influencing the news agenda across the UK. They also serve many audiences neglected by other media outlets: one in five of the 10 million listeners to BBC local and national regional radio stations tunes in to no other radio service.⁸⁵ Given the importance of these services to the fulfilment of the BBC's public purposes, the current situation concerns us as it leaves this element of our audience proposition without the clear path to digital that its significance demands.

The second constraint on the BBC relates to a lack of flexibility on our national multiplex.⁸⁶ Convinced that choice is at the heart of DAB's appeal, the BBC allocated the bulk of our multiplex for the provision of five digital-only radio services, alongside our five existing networks and the BBC World Service. Through careful management of our multiplex, we can offer enhanced audio quality as well as choice, although trade-offs are required at certain times. Such trade-offs free up capacity to enable additional valued services to be introduced, either by reducing the bit rate⁸⁷ used by an existing service or by reducing an existing stereo service to mono. For example, when Five Live Sports Extra is on air, Radio

⁸⁴ A group of frequencies higher than those used for FM broadcasting (Band II) but lower than those used for television (Bands IV and V). DAB in the UK uses frequencies between 217.5 MHz and 230 MHz in Band III. See also Appendix 7.2

⁸⁵ Source: RAJAR/Ipsos-RSL, Q2 2004

⁸⁶ See Appendix 7.4 for details of the BBC's multiplex configurations

⁸⁷ The number of discrete digital bits (1s and 0s) of information per second used to represent the content. See also Appendix 7.2

3 must sacrifice some of its bit rate or Radio 4 has to be broadcast in mono.⁸⁸ Prioritising extended choice has, in our view, been in the best interests of licence payers, as borne out by the rising take-up of DAB and research among owners of sets. 72 per cent of those who have bought digital radios cite station choice as the main reason for their purchase and 89 per cent of them rate DAB sound quality as good or excellent.⁸⁹ However, in considering DAB's position in the long term, now seems to be an opportune moment to obviate such trade-offs.

The third constraint also arises from the BBC's focus on maximising programme choice. In order to deliver the new radio services so central to the success of DAB, it was only possible to allocate about two per cent of capacity on our multiplex to exploratory data enhancements. This was a difficult decision, but one that we believe to have been appropriate for the early life of DAB digital radio. However, in the light of the experience gained from pilots and as the receiver market has developed, the BBC would like to devise a suite of data enhancements, which entails greater capacity than is currently available without imposing stress on core radio services. Without this, our ambition to explore the potential of DAB data to deliver services that enhance our radio programmes would be severely diminished, as would the overall appeal of DAB as a platform for digital radio.

4.2 DAB digital radio receivers

Despite impressive progress in the receiver market as a whole, the in-car segment lags behind. There is a limited choice of receivers with few manufacturers in the market and available sets tending to be expensive and difficult to install. Although the arrival of an in-car adapter for existing radios may help, car manufacturers have yet to be persuaded to factory-fit DAB digital radios, primarily because of cost. This is the single biggest factor restricting the growth of the in-car sector and it results in a worrying gap in radio's digital provision long term, given the importance of in-car listening.

Mobile phones have emerged as a potentially valuable platform for digital radio as their penetration has soared and their functionality has improved rapidly in recent years. FM chips are becoming commonplace in the latest handsets and research shows that 1.25 million adults claim to listen to radio using their mobile phones at least once a week.⁹⁰ The integration of DAB chips into mobile phones and other wireless devices, such as handheld computers, would considerably extend the penetration of DAB, particularly among younger audiences.

Radio in mobile phones makes interactivity even easier, providing a "back channel" or "return path" from the listener to the broadcaster for sending instant reactions to the output, e.g. voting on a given issue. This could move a stage if a DAB chip were integrated into a third generation (3G) mobile phone. For example, listeners could request content to be sent to their phones using DAB data capacity or register preferences with a broadcaster for content to be sent to them, which could be stored on their phones for

⁸⁸ The simplest representation of audio content, where the sound comes from a single source. See also Appendix 7.2

⁸⁹ Source: Claritas for DRDB, May 2004

⁹⁰ Source: RAJAR/Ipsos-RSL, Q2 2004

subsequent access at the listeners' convenience. However, integrating DAB chips into mobile phones has not moved past the prototyping stage, with manufacturers having a number of concerns. These include cost, battery consumption, the European market for DAB and the possible competition that some handset manufacturers perceive DAB as posing to 3G itself.

4.3 Competing technologies

An environment of technological turbulence poses occasional challenges to DAB digital radio's position as the replacement technology for analogue. There are many other digital systems capable of delivering radio, from two-way telecommunications based technologies, such as the internet and 3G, to broadcast technologies, such as Digital Video Broadcasting (DVB). However, none of them has the same combination of attributes possessed by DAB, which makes it the UK radio industry's technology of choice.

DAB is a robust broadcast technology offering reception of audio and data in static, mobile and portable environments, capable of incorporation into a variety of devices, and enabling mass, cheap production. It offers consumers a recognisable radio experience and enjoys the benefit of the technical maturity that arises out of its development and use over several years. These advantages, along with large scale stakeholder investment, have allowed DAB to build a strong base in the UK, with growing consumer acceptance and industry support.

All this considered, it would be difficult to mount a serious challenge to the primacy of DAB in the UK, abandon these achievements and start again with a different technology. However, the radio industry recognises that continual technological advance is one of the characteristics of the digital age and we remain open-minded about the consumer benefits that this brings. Although our assessment⁹¹ of the technological landscape does not dent our belief in DAB, it is clear that this uncertainty is unsettling the market in some other countries, such as France, and affecting the formation of a pan-European market for DAB.

4.4 A pan-European market for DAB

The BBC has worked extensively with broadcasters around the world for many years to share our experience about taking radio digital. We have recently focused considerable effort on two big radio markets in Europe: Germany and France. In both countries, there is a lack of consensus about how to move forward and a lack of impetus to do so, which is holding back digital radio in Europe as a whole. Although the UK is sufficiently advanced to encourage the large Japanese manufacturers into the DAB digital radio market, a pan-European market for DAB would stimulate increased investment from them. There are some promising signs in the Scandinavian countries, such as Denmark, where coverage is widespread, sets are available and new services have launched. Other countries will need to follow this lead if a substantial European market for DAB is to be established.

⁹¹ See Appendix 7.7 for a technical analysis of other digital delivery technologies

5. The role of Government

The BBC believes that Government remains a pivotal member of the coalition of stakeholders in DAB digital radio over the coming years. Having acted decisively to enable the UK to establish a world leading position in DAB digital radio, Government can take some important steps to ensure that this momentum is sustained into the future. Cross-industry collaboration will remain vital for DAB's continued progress and for the growth of a pan-European market for DAB. Government could promote this by becoming a consistent advocate for DAB digital radio on the European stage and in its liaison with Japanese trade partners. Within the UK, there could also be scope for Government to assist small British manufacturers, for example, and thus give a practical boost to a fledgling industry.

Government will again have the chance to play a decisive role in securing DAB's future. Alleviating spectrum scarcity is essential, as is working with interested parties to ensure that any future allocation recognises the needs of both public and commercial participants and enables them to thrive. Audience need lies at the core of this as the digital radio offering must include the entire analogue radio offering if digital switchover is to be feasible.

A decision on digital switchover calls for Government to reconcile the differing perspectives within the digital radio industry. Listeners, manufacturers, retailers, commercial radio in all of its forms and the BBC need to reach a consensus. In our assessment of the necessary conditions for switchover, namely affordability, accessibility and take-up, the BBC takes the view that a workable date cannot be set at this point; there is still a great deal to be accomplished. However, we recommend that Government review the situation in three years, with a view to setting a realistic date for switchover to enable all stakeholders to work towards it with confidence. In the intervening period, the entire radio industry will be able to devise a plan with Government to surmount the obstacles to switchover and take account of developments in the market affecting it.

5.1 The case for additional spectrum

The BBC and commercial radio are united on the benefits of making more Band III spectrum available for DAB digital radio. By ensuring a suitable allocation at UK, regional and local levels for audio and data services, the UK radio industry can bring the maximum benefits of DAB digital radio to audiences and to all participants in the public and commercial sectors. This will both constitute the most efficient use of spectrum and lay the foundations for the longer term replacement of analogue services.

The limited amount of spectrum for DAB digital radio is restricting the growth of the DAB market and jeopardising digital switchover. The use of the current five frequency blocks for local services is insufficient to cater for the demands of existing analogue provision and there is also pressure on spectrum for UK-wide services, such as data enhancements. The lack of digital spectrum for local radio is a problem for commercial providers as well as the BBC. There are almost 150 local commercial radio stations that are not yet on DAB and, under current arrangements, have not been able to secure carriage on local multiplexes, principally because such multiplexes have not been licensed for their areas. The limited capacity available from the spectrum used so far has been directed towards giving access to the larger players better able to meet the challenges of early entry and to develop a service proposition conducive to initiating consumer take-up.

While this was undoubtedly the right approach during the early life of the medium, in considering the use of any future spectrum, finding a way for smaller services to migrate to digital is critical. There are also no plans in place for the digitisation of community radio. If radio is to become a fully digital medium, it cannot leave any part of the industry behind in an analogue world that is set to become obsolete.

The release of new spectrum for DAB would enable it to fulfil its potential, extending its consumer appeal, supporting innovative data services, generating revenue for commercial providers of such services and attracting investment in the receivers to access them. These factors would combine to drive take-up of DAB digital radio.

Extra capacity for DAB could be made available in either Band III, where existing UK DAB services are provided, or in L-Band,⁹² which is not currently used for DAB in the UK, or by some combination of the two. Although there is one good L-Band frequency for each area of the UK,⁹³ which could be used to supply suitable capacity for small scale local services, there are inherent problems with its use. Most DAB digital radio sets in the UK cannot receive L-Band and it would also be an expensive means of distribution for broadcasters, unlikely to win as much investment as more Band III spectrum would. L-Band requires a higher number of transmitters than Band III to give the same level of coverage and L-Band is subject to greater signal loss through the fabric of buildings. Thus broadcasters might be discouraged from investing in the very improvements that more spectrum would allow.

While there could be a future role for L-Band services, the BBC believes that the next phase of DAB development should use Band III spectrum (see figure 6 overleaf). In preparation for the Regional Radiocommunication Conference (RRC),⁹⁴ the International Broadcast Planning Group⁹⁵ is upholding the case for sub-band III⁹⁶ of Band III to be used for DAB; the BBC supports this. Use of sub-band III of Band III spectrum for DAB could provide for five more multiplex frequencies in the UK, which could be used to offer a combination of UK-wide, regional and local services from the public and commercial sector.

Recognising that it might be difficult to acquire further spectrum for DAB after this, the UK would need to use this second allocation judiciously to create the conditions whereby switchover to an all digital environment becomes possible and an appropriate balance between BBC and commercial services is secured. There are several ways in which five more blocks of Band III could be used. Each has advantages and disadvantages that include the degree of "localness" it is possible to offer and the need for international coordination to ensure that the UK's use of spectrum does not interfere with that of other countries.

⁹² Frequencies around 1.5 GHz, used by DAB in some countries, e.g. Canada. See also Appendix 7.2

⁹³ Sub-areas of counties

⁹⁴ A forum of the International Telecommunications Union, an agency of the United Nations which coordinates the use of spectrum worldwide. The RRC in 2006 will revisit the use of frequencies in the VHF (FM and DAB) and UHF (analogue and digital television) bands to reflect the change in their use arising from the development of digital services

⁹⁵ A UK group consisting of BBC and Ofcom spectrum planners, which is developing a strategy to protect the UK's access to Band III spectrum by contributing to the UK submission to the RRC

⁹⁶ 209.2 to 215.2 MHz

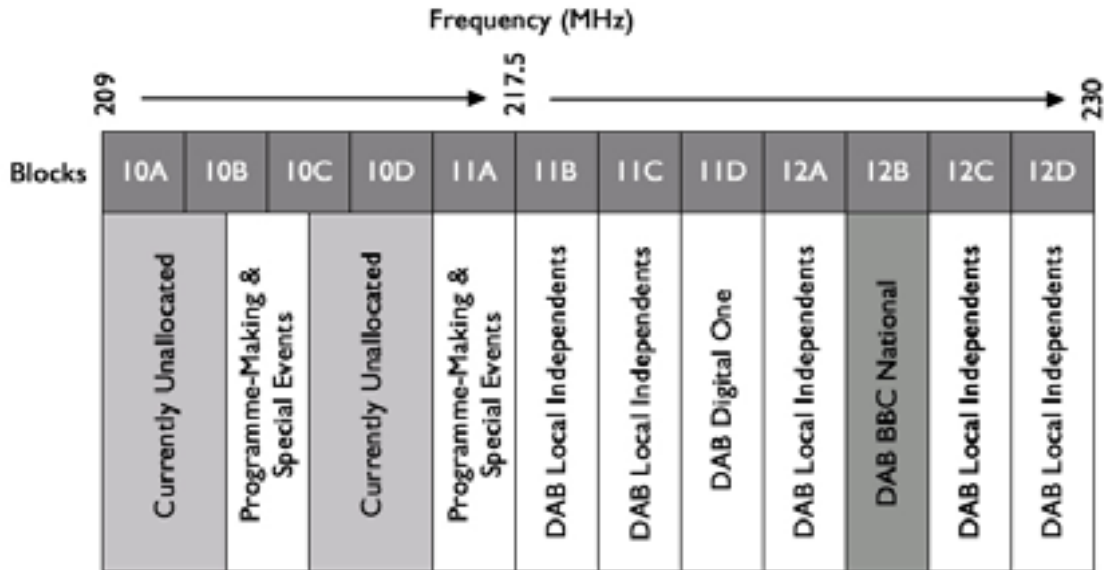


Figure 6 - Band III spectrum in the UK: channels 11B to 12D are used by the BBC and commercial radio for UK-wide, regional and local DAB digital radio services; channels 10A to 11A could also be made available for this purpose at the 2006 RRC

To ascertain the best way forward, the BBC has been identifying the principal limitations of the digital radio environment that arise from the current shortage of spectrum. We have also been working on an outline plan for the use of the proposed spectrum to address all of these limitations. Aside from our own needs, we have made the focus of this activity the formulation of a plan that meets those of community radio and commercial stations to try to arrive at a solution that works for the entire industry and not just the BBC.

The BBC believes that to create an all digital radio environment in the longer term, the UK should use this spectrum to enhance current provision in a number of ways, itemised below:

- The BBC needs to be able to deliver UK-wide, regional and local digital services that are equivalent to those we offer in analogue and that create an appropriate balance between BBC and commercial services
- The UK needs to give small local commercial radio services and the community radio tier the means to progress by giving them access to the spectrum that they lack
- We recommend that additional spectrum be used to supply increased capacity for audio quality enhancements to UK-wide services provided by the BBC and commercial radio
- We advise that capacity be used for the provision of richer BBC and commercial data enhancements, in which there is a growing interest, and which could be a valuable driver of take-up

The BBC is in discussion with Ofcom to find a mutually acceptable way forward for the UK submission to the RRC and we will share our plans, which are in their final stages, with both

Ofcom and Government as part of this process. The BBC would welcome a joint industry approach to allocating and managing spectrum so that both public and commercial services could take full advantage of any new capacity. Whatever approach is ultimately decided upon, we strongly recommend that it meet the objectives outlined above.

5.2 Advocacy abroad

Given the importance of establishing a wider European market for DAB digital radio, the BBC would encourage Government to uphold this objective in its dealings with other governments. The UK's impending presidency of the European Union might offer a platform to explore the issue of radio's digital transition in Europe and, with regular attention thereafter in inter-governmental affairs, DAB digital radio could benefit from heightened momentum at this juncture. We would also welcome Government sharing its regulatory experience with its European partners.

Following the DTI's assistance with the UK radio delegation to Japan, the BBC believes that Government could also bring its influence to bear in industry, capitalising its trade links with Japan and other countries with large consumer electronics and automotive interests. We would also recommend that commercial radio redouble its efforts with its continental counterparts to complement the BBC's work with overseas broadcasters. These activities taken together would help to raise the profile of DAB and underline its importance to radio in the UK.

5.3 Encouraging innovation and enterprise

DAB digital radio in the UK is a budding British success story and the BBC would recommend that Government investigate ways in which it could assist the expansion of a market that is forecast to be worth £500m in 2008.⁹⁷ Small British manufacturers, some of which have never made audio products before, have taken financial risks by investing in DAB in its infancy; commercial radio has diversified into hardware manufacture and other British companies are identifying the potential of DAB to boost their businesses, e.g. the independent production sector and advertisers. Commercial radio has recognised DAB data as a potentially significant revenue generator in the coming years, which could also attract investment into the medium.

The BBC welcomes the emergence of a vibrant audio manufacturing sector in the UK, which could be well-positioned to take advantage of opportunities as they arise in the rest of Europe; Government may be able to facilitate this. For example, DTI schemes to encourage exports or offer technical support could help small manufacturers distribute their products across the rest of Europe or advance their research and development programmes.

5.4 The BBC's position on digital switchover

The BBC has carefully considered the question of a digital switchover date for radio. As DAB digital radio has begun to take off in the UK and with a switchover date for television agreed the issue has become widely debated. Furthermore, some in the commercial radio

⁹⁷ Source: DRDB forecast, October 2004

sector have already called for a date for analogue switch-off to be set by Government. As with digital television, the BBC would cite three criteria by which to assess digital switchover: accessibility, affordability and take-up. The BBC's assessment of these criteria finds that none of them has been satisfied to the point where a realistic switchover date can yet be set. While we recognise the value of a target date, which consumers, broadcasters, retailers, manufacturers and Government can work towards, the BBC believes that to set such a date now would be premature when there is still a sizeable task ahead.

Regarding accessibility, we have pointed out the shortcomings of the current spectrum and coverage arrangements that we believe are impeding digital switchover. Although prices are falling, affordability is still militating against mass penetration of DAB as the average portable "kitchen" radio costs £99.⁹⁸ On the issue of take-up, we are still only at the start of the penetration curve.

The BBC contends that analogue switch-off cannot be countenanced at this stage. DAB coverage is not yet near universal; a workable plan for the digital migration of all sectors of the radio market is lacking; sets are not yet available in sufficient quantity or at suitable prices; penetration is minimal and as many as five sets per household need to be replaced. To set a date while the market is still maturing risks presupposing the major part of its development and could cause consumer confusion, especially while there is insufficient spectrum to offer a guarantee that the full extent of analogue provision would go digital.

The BBC proposes that the route to setting a date for digital radio switchover be mapped out by all interested parties collectively. A joint approach to issues such as spectrum, coverage, consumer awareness and sets could be formulated that would enable all stakeholders to plan securely and cost-effectively. Such an approach takes time and a switchover date set imminently could destabilise a nascent market. However, a switchover date set at the right time would be of enormous benefit to DAB digital radio so the BBC recommends that Government review the situation again in three years, with a view to setting a switchover date supported by a set of realistic targets. This three year period would give time for clarity to emerge about some of the key issues affecting switchover: the availability of extra DAB spectrum, the impact of the major manufacturers on the market, and progress against set penetration forecasts. Aside from spectrum, two other issues that would benefit from this joint approach are set out below.

5.4.1 DAB digital radio coverage issues

In planning the expansion of DAB transmitter networks, there are a number of factors to account for, particularly as we move nearer to universal coverage. In common with all services delivered by means of terrestrial transmitters, population coverage in urban areas can be achieved with a relatively small network of moderately high power transmitters. As the network is extended to give fuller coverage, investment in it starts to show a diminishing return in the coverage achieved. For example, it took the BBC 27 transmitters to yield coverage of 60 per cent of the UK population, but a further 51 to extend it to 85 per cent,

⁹⁸ Source: GfK Marketing Services, July 2004

which is approximately where it now stands,⁹⁹ following a period of considerable investment by the BBC.

In *Building public value*,¹⁰⁰ the BBC stated our intention to extend coverage to at least 90 per cent of households during the next Charter period. The BBC is devising an outline plan to deliver this but, as more work is necessary to determine the most cost effective way to proceed, it is yet not possible to supply a timescale or rollout plan. The exact number of transmitters needed to reach a given level of coverage is dependent on several considerations. For example, international agreement that permitted higher power from existing sites would have a bearing on this, as could revisiting planning standards.

The BBC is examining issues relating to coverage that affect audience satisfaction. For example, given that the network was designed with outdoor mobile use paramount, we are encountering some concerns over indoor reception that merit investigation. Reception within buildings can be problematic for some listeners, even in areas nominally within coverage. Receiver sensitivity varies and there is no obvious way for consumers to predict the nature of reception in their homes and this can adversely affect their perception of DAB. Consequently, we are examining the planning criteria carefully to see if they should be refined. It would also be beneficial if receiver performance criteria, including receiver sensitivity and thus indoor reception, were accepted across the industry with a commonly agreed means of signifying conformance.

Improving access to the BBC's national DAB multiplex would undoubtedly entail substantial new investment. The possibility of extending the coverage of the local and regional multiplexes is difficult to predict as this is beyond the BBC's purview. None of them has extended its coverage beyond its original plans and any investment in other transmitters would require the cooperation of all of the radio services on a given multiplex.

The effective planning of transmitter networks involves reconciling certain interrelated elements that become increasingly acute as universality of provision approaches. As costs and technical complexity escalate, a greater degree of skill and cross-industry cooperation is needed to ensure that the maximum value is delivered to listeners at each stage of progress. The BBC believes that all sections of the industry and audience are best served when all services are equally accessible and listener choice is made exclusively on the basis of the content proposition rather than the access to it.

Therefore, the BBC will maintain a close working relationship with Ofcom and all of those involved in the provision of commercial services so that all parties can take advantage of the benefits that may arise from collaboration on coverage expansion. We would propose that interested parties now work together to address these issues, which are obstructing a clear path to near universal digital radio coverage in the UK.

⁹⁹ The launch of the transmitters at Kendal and Tunbridge Wells has been delayed while adjacent channel interference rules are revised with Ofcom. The transmitter at Carmel in South Wales is due to be commissioned in the next few months

¹⁰⁰ The BBC's contribution to the Charter review debate, available at <http://www.bbc.co.uk/thefuture/bpv/prologue.shtml>

5.4.2 The role of analogue radio

Analogue radio has come to assume a role of national significance quite apart from the role it plays in the daily lives of its listeners. National emergency planning has cited the importance of long wave radio for communication *in extremis* to almost the entire UK population from just one transmitter. DAB, in common with FM and medium wave broadcasts, entails a network of transmitters to cover the UK so could not, on its own, fulfil this function should such extreme conditions arise.

The BBC would welcome a dialogue with Government and other interested parties to make proper provision for analogue radio in all of its forms to convert to digital, including a collective approach to considering the role of long wave radio in the event of a national emergency. Any recommendation now on the future of long wave would be premature but it may be that, as communications technologies proliferate, the traditional role for long wave can be revisited.

6. Conclusion

DAB digital radio has made a remarkable journey from research to reality. Despite setbacks, its achievements are impressive: it has already transformed the BBC and commercial radio and the relationship between them; it is now transforming the receiver market and consumer perceptions of radio. By the common endeavour of DAB digital radio's stakeholders, the medium has established itself in the UK and could grow around the world.

DAB digital radio now stands on the brink of a future full of opportunity. As digital-only stations establish themselves, their audiences will rise and their creative influence will be felt by existing stations, thus refreshing radio across the UK. As new entrants from manufacturing, retail and the media arrive, the digital radio industry will form new partnerships and consolidate existing ones. As the functionality, range and quantity of receivers proliferate, their consumer appeal will grow and the medium will reinvent itself.

For DAB digital radio to realise its potential, the coalition of stakeholders encompassing broadcasters, manufacturers, retailers and Government will need to demonstrate continued leadership and a willingness to take the fundamental decisions on which radio's future depends. If it does, audiences will benefit from a richer radio experience than ever before and the medium will be able to face the future with confidence.

7. Appendix

7.1 Terms of reference for the Secretary of State's review

Section 67 of the Broadcasting Act 1996 requires the Secretary of State for Culture, Media and Sport to keep under review the development of digital radio, for the purpose of considering for how long it would be appropriate for sound broadcasting services to continue to be provided in analogue form.

The Act requires the review to look at:

- the provision in the UK of radio multiplex services
- the availability in the UK of digital sound programme services and existing analogue services in digital form and the sound broadcasting services of the BBC, and
- the ownership or possession in the UK of equipment capable of receiving digital sound services

The review should also look at the likely future extent of such provision, such availability and such ownership or possession.

For this purpose, the Secretary of State asked the Radio Authority (now Ofcom) and the BBC for reports on these matters. The report has to be submitted by 31 October 2004, although the Secretary of State has requested that it be submitted before that time.

The Secretary of State has also requested that the BBC takes due account of the progress of the digital radio review and that any necessary cross-reference be made.

7.2 Technical glossary

<p>Band III</p>	<p>A group of frequencies higher than those used for FM broadcasting (Band II) and lower than those used for television (Bands IV and V). DAB (q.v.) in the UK uses frequencies between 217.5 MHz and 230 MHz in Band III and access to frequencies just below this for future DAB development will be part of the UK's submission to the next Regional Radiocommunication Conference. It is a band that can provide good coverage but that needs more transmitters to achieve it than Band II, e.g. FM transmissions</p>
<p>Bit rate</p>	<p>The number of discrete digital bits (1s and 0s) of information per second used to represent the content. Any transmission system is limited in the number of bits of information per second that it can accommodate so there is an interest in reducing the bit rate used for each service to be carried in order to fit in as many services as possible. Compression techniques are used for this purpose. They work by discarding data that is deemed to make no perceptible difference to the received signal, although the greater the reduction in bit rate, the greater is the possibility that perceptible impairments are introduced. This presents broadcasters with the challenge of reaching the right balance between the quantity of services offered and the level of assurance of technical quality achieved for each of them. In DAB (q.v.), a digital audio signal that in its uncompressed form is likely to be delivered at a bit rate of 1.41 million bits per second, equivalent to CD delivery, may be compressed to 128,000 bits per second or 128kbits/s</p>
<p>Capacity</p>	<p>The amount of data that can be accommodated within a given transmission. For example, a DAB digital radio (q.v.) multiplex (q.v.) has a robustly protected usable data capacity of just over one million bits of information per second</p>
<p>Coverage</p>	<p>A term used in planning services such as DAB (q.v.) that relates to areas in which the broadcast signal meets specific technical criteria. DAB services have been planned to deliver a defined signal strength outdoors at 1.5 metres above the ground at 99 per cent of locations for 99 per cent of the time. These criteria primarily reflect the original design objective for DAB of serving the mobile listener</p> <p>It is important to note that meeting these criteria does not necessarily guarantee good reception but it is a key element in enabling it. The quality of the receiver and where and how it is used in relation to the planning assumptions are also relevant. In the case of DAB reception indoors, the signal strength may be lower than that outside due to a loss through the fabric of the building, known as "building penetration loss". This can sometimes make reception problematic even where adequate formal coverage has been provided; this is a matter for further study to inform future network development</p>
<p>DAB/ DAB digital radio</p>	<p>A digital radio system based on the standard developed by the Eureka 147 (q.v.) consortium and adopted in the UK and many other parts of the world primarily for the delivery of audio and data services (q.v.) to fixed, portable and mobile receivers</p>

	<p>At its core are two technologies: MPEG layer 2 and coded orthogonal frequency division multiplexing (COFDM). MPEG layer 2 encodes audio so that the amount of data needed for each service is reduced without any perceptible impairment in audio quality by removing those parts of the signal that the human ear would not detect; this enables between six and 10 services to be delivered in a multiplex. COFDM is a modulation system that enables the robust delivery of the signal even in difficult conditions, such as urban environments, where signals reflected from buildings tend to cause interference to many other types of system, such as FM</p>
Data services/ enhancements	<p>An umbrella term for any service, other than a continuous audio or video stream. Data services include broadcast web pages, text services, still images, programme guides and audio/video in a “file” format</p>
Eureka 147	<p>Eureka 147 was the name of the European collaborative project that developed the European digital audio broadcasting (DAB) standard for fixed, portable and mobile reception. The project involved a consortium of manufacturers, broadcasters, network operators and research establishments, with the BBC playing an active role. The standard uses techniques that enable many more services, both audio and data, to be carried in a given amount of spectrum (q.v.) than afforded by traditional analogue techniques. It has been designed for robust reception even in urban environments where reflections of the signal from buildings cause reception difficulties for systems such as FM</p> <p>Eureka 147 is an agreed European standard (ETS 3000401, March 1997) adopted by the European Telecommunication Standards Institute (ETSI). The standard has been accepted by many countries and the term “Eureka 147” is often used to differentiate this particular well established digital radio standard from other digital radio technologies</p>
L-Band	<p>Frequencies around 1.5 GHz, used by DAB in some countries, e.g. Canada, and which could be used for DAB (q.v.) in the UK after 2007. L-band is less effective than Band III (q.v.) for achieving good coverage, particularly of larger areas</p>
Mono	<p>Monophonic sound is the earliest and simplest representation of audio content, where the sound comes from a single source and no spatial element of the original sound can be conveyed to the listener</p>
Multiplex	<p>Two or more services technically configured together before transmission as a single broadcast entity. With DAB (q.v.), the multiplex generally contains between six and 10 services of audio, data or both, broadcast as a single transmission within a frequency block allocated to those services. In the receiver, a “de-multiplexing” process takes place to extract the desired service from the group. It is a technique of significant value in digital transmission, where many services will be integrated into a common multiplex before being broadcast. One important requirement of transmitting services as part of a multiplex is that the area covered is the same for them all</p>
Single frequency network	<p>Two or more transmitters carrying the same content broadcast on the same frequency and in a way that the resulting overlap between transmitter coverage</p>

	<p>areas</p> <p>improves reception. In analogue radio systems, e.g. FM, it is necessary to ensure that transmitters operating near to one another use different frequencies to avoid mutual interference. Systems such as Eureka 147 (q.v.) DAB (q.v.) however, have been designed to exploit techniques that permit “single frequency networks” to be established</p>
Spectrum	<p>The full range of electromagnetic radiation or electromagnetic waves. In the context of broadcasting, spectrum refers to a limited number of bands of frequencies within the much wider electromagnetic spectrum used for transmitting the broadcast signal; as a limited resource, spectrum requires careful management</p>
Stereo/ Joint stereo	<p>Stereophonic sound enables audio content to be presented to the listener, by means of two loudspeakers in a way that enables spatial information from right to left to be conveyed and thus a more realistic quality of sound</p> <p>Joint stereo is an element in the range of compression techniques that exploits the similarity between the right and left hand side of the channels of a stereo signal to reduce the bit rate needed to represent it</p>
TPEG	<p>Travel Protocol Experts Group. TPEG is a standardised format designed to allow travel and traffic information to be delivered to users in a form that is independent of the delivery mechanism, e.g. the internet, DAB or digital television</p> <p>TPEG was initiated by the BBC and led by the European Broadcasting Union, which created an Open Forum for its development and promotion</p>

7.3 BBC DAB digital radio coverage maps

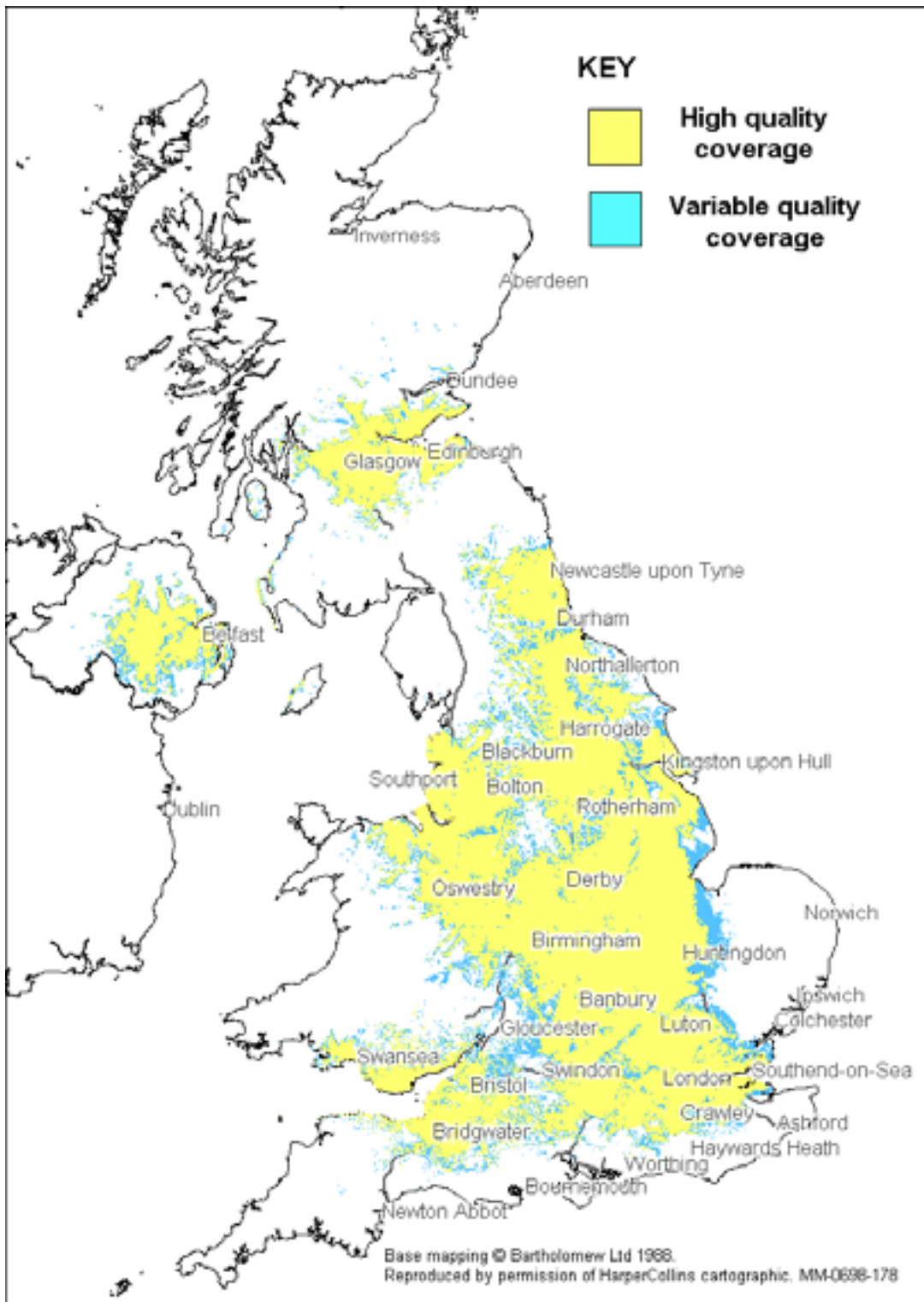


Figure 1 - 32 transmitter sites representing 65 per cent UK population coverage, attained in 2001

Source: BBC Spectrum Planning

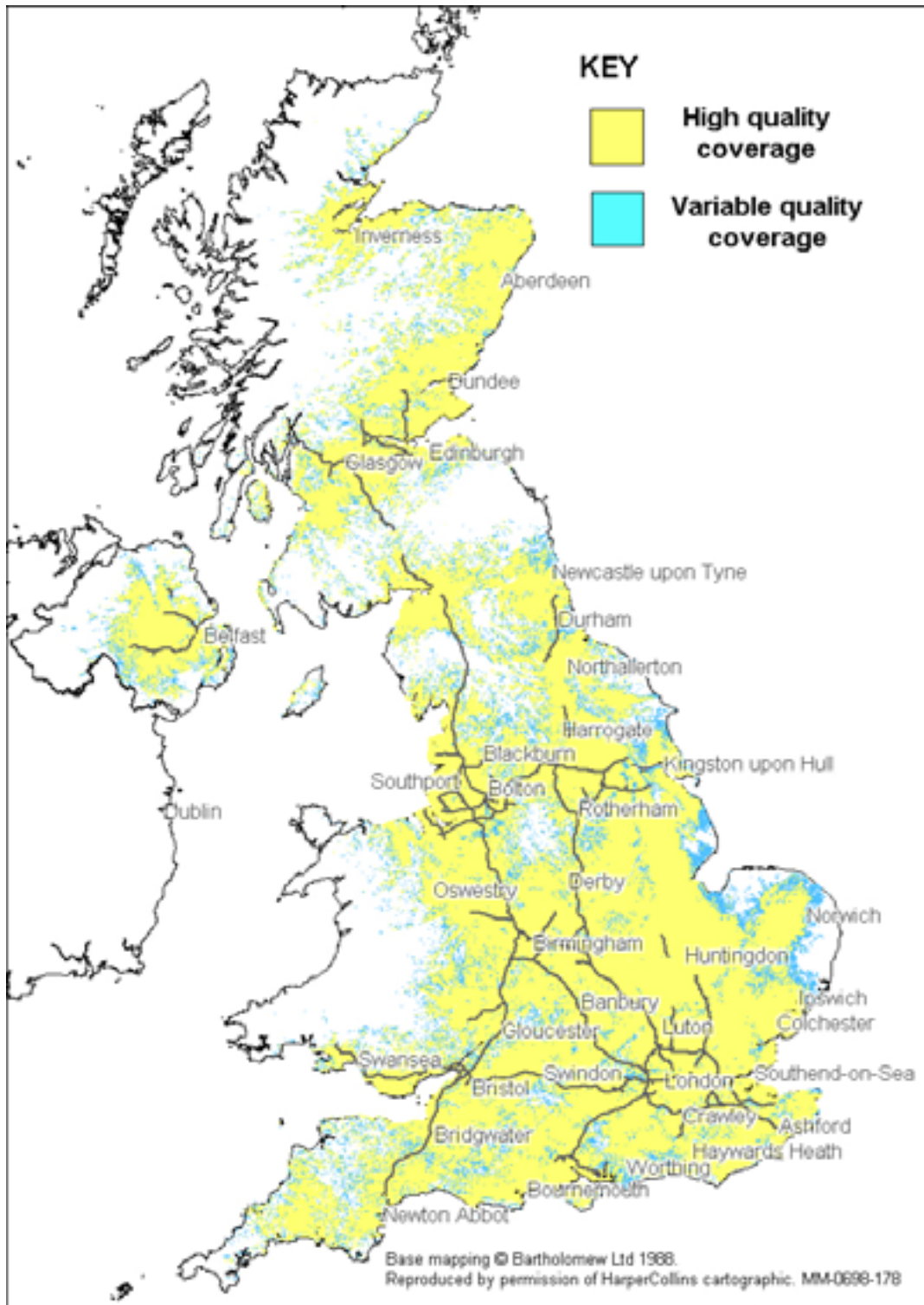


Figure 2 - 75 transmitter sites representing approximately 85 per cent UK population coverage, attained in 2004

Source: BBC Spectrum Planning

7.4 Configurations of the BBC's national DAB digital radio multiplex

	Time of day 0000 – 0059	Time of day 0100 – 0459	Time of day 0500 – 0859	Time of day 0900 – 2359
Radio 1	128 JS ¹⁰¹	128 JS	128 JS	128 JS
Radio 2	128 JS	128 JS	128 JS	128 JS
Radio 3	192 S ¹⁰²	192 S	192 S	192 S
Radio 4	128 JS	128 JS*	128 JS	128 JS
Radio Five Live	80 M ¹⁰³	80 M	80 M	80 M
1Xtra	128 JS	128 JS	128 JS	128 JS
6 Music	128 JS	128 JS	128 JS	128 JS
BBC 7	80 M	80 M	80 M	80 M
Asian Network	64 M	64 M	64 M	64 M
World Service	64 M	64 M	64 M	64 M
Data	24	24	24	24

All values measured in kilobits per second (kbits/s)

* BBC School Radio is broadcast on Radio 4 on DAB and digital TV at 0300 – 0500 from Tuesday to Friday

The multiplex departs from the above configuration to account for special circumstances. The principal changes, for Radio 4 and Five Live Sports Extra, are outlined below.

Radio 4 split for *Yesterday in Parliament* and *Daily Service*

	Time of day 0800 – 0900	Time of day 0944 – 1000
Radio 4	80 M	80 M
(R4) secondary	64 M	64 M
Data	24	24

All values measured in kilobits per second (kbits/s)

BBC Five Live Sports Extra

Five Live Sports Extra is a part-time service. To accommodate it, Radio 3 or Radio 4 gives up some of its capacity; Sports Extra is transmitted at 64 kbits/s mono. Two options exist depending on the time of day that Sports Extra is active in the multiplex: either Radio 4 drops to 80 kbits/s mono or Radio 3 drops to 160 kbits/s joint stereo.

¹⁰¹ Joint stereo. See also Appendix 7.2

¹⁰² Stereo. See also Appendix 7.2

¹⁰³ Mono. See also Appendix 7.2

7.5 Carriage of BBC radio stations on DAB digital radio

11 BBC UK-wide radio stations

	Available on DAB	DAB multiplex	Launch date
Radio 1	✓	BBC National	September 1995
1Xtra	✓	BBC National	August 2002
Radio 2	✓	BBC National	September 1995
Radio 3	✓	BBC National	September 1995
Radio 4 FM + LW	✓	BBC National	September 1995
Radio Five Live	✓	BBC National	September 1995
Five Live Sports Extra	✓	BBC National	February 2002
6 Music	✓	BBC National	March 2002
BBC 7	✓	BBC National	December 2002
Asian Network	✓	BBC National	October 2002
World Service	✓	BBC National	September 1995

6 BBC national regional radio stations

	Available on DAB	DAB multiplex	Launch date
Radio Scotland	✓	Glasgow, Edinburgh, Ayr, Dundee & Perth, Aberdeen, Inverness	August 2000
Radio nan Gaidheal	✓	Central Scotland, Ayr, Dundee & Perth, Aberdeen, Inverness	July 2001
Radio Wales	✓	Cardiff, Swansea	November 2001
Radio Cymru	✓	Cardiff, Swansea	November 2001
Radio Ulster	✓	Northern Ireland	September 2001
Radio Foyle			

40 BBC local radio stations

	Available on DAB	DAB multiplex	Launch date
Radio Berkshire	✓	Reading & Basingstoke	July 2004
Radio Bristol	✓	Bristol & Bath	November 2001
Radio Cambridgeshire	✓	Cambridge, Peterborough	November 2002
Radio Cleveland	✓	Teesside	September 2001
Radio Cornwall *			
Radio Cumbria			
Radio Derby			
Radio Devon #	✓	Exeter & Torbay	October 2002
Essex	✓	Southend & Chelmsford	May 2002
Radio Gloucestershire			
GMR	✓	Manchester	December 2000
Radio Guernsey			
Hereford & Worcester			
Radio Humberside	✓	Humberside	November 2001
Radio Jersey			
Radio Kent	✓	Kent	April 2004
Radio Lancashire	✓	Central Lancashire	October 2001
Radio Leeds	✓	Leeds, Bradford & Huddersfield	September 2001
Radio Leicester	✓	Leicester	December 2002
Radio Lincolnshire			
London 94.9	✓	Greater London II	June 2000
Radio Merseyside	✓	Liverpool	September 2001
Radio Newcastle	✓	Tyne & Wear	November 2001
Radio Norfolk	✓	Norfolk	March 2003
Radio Northampton			
Radio Nottingham	✓	Nottingham	April 2004
Radio Oxford			
Radio Sheffield	✓	South Yorkshire	September 2001
Radio Shropshire	✓	Wolverhampton	November 2001
Radio Solent	✓	Bournemouth, South Hampshire	September 2002
Somerset Sound			
Southern Counties Radio	✓	Sussex Coast	January 2004
Radio Stoke	✓	Stoke-on-Trent	April 2004
Radio Suffolk			
Radio Swindon	✓	Swindon	March 2003
Three Counties Radio			
Radio Wiltshire	✓	West Wiltshire	March 2003
WM	✓	Birmingham, Wolverhampton	December 2000
WM (Coventry)	✓	Coventry	November 2001
Radio York			

* Radio Cornwall is due to launch on the Cornwall multiplex in November 2004

Radio Devon is due to launch on the Plymouth multiplex in November 2004

7.6 Carriage of BBC radio stations on digital television platforms

	Freeview	Satellite	ntl	Telewest	Wight Cable	KIT	Home Choice
Radio 1	✓	✓	✓	✓	✓	✓	✓
1Xtra	✓	✓	✓	✓	✓	✓	✓
Radio 2	✓	✓	✓	✓	✓	✓	✓
Radio 3	✓	✓	✓	✓	✓	✓	✓
Radio 4 FM	✓	✓	✓	✓	✓	✓	✓
Radio 4 LW		✓		✓	✓	✓	
Five Live	✓	✓	✓	✓	✓	✓	✓
Five Live Sports Extra	✓	✓	✓	✓	✓	✓	✓
6 Music	✓	✓	✓	✓	✓	✓	✓
BBC 7	✓	✓	✓	✓	✓	✓	✓
Asian Network	✓	✓	✓	✓	✓	✓	✓
World Service	✓	✓	✓	✓	✓	✓	
World Service Extra		✓					
Radio Scotland	✓ <i>Scotland only</i>	✓	✓	✓ <i>Scotland only</i>	✓		
Radio Nan Gaidheal	✓ <i>Scotland only</i>	✓	✓	✓ <i>Scotland only</i>			
Radio Wales	✓ <i>Wales only</i>	✓	✓		✓		
Radio Cymru	✓ <i>Wales only</i>	✓	✓				
Radio Ulster	✓ <i>N. Ireland only</i>	✓	✓		✓		
Radio Foyle	✓ <i>N. Ireland only</i>						

Freeview is digital terrestrial television; satellite includes free to air satellite as well as Sky Digital; ntl, Telewest and Wight Cable are digital cable television; KIT and Home Choice are DSL based broadband

7.7 Technical assessment of other digital delivery technologies

3G

Third generation is a term applied to wideband mobile telecommunication services and applications. In this context, “wideband” usually means systems enabling the delivery of between 64 kbits/s and 2 Mbits/s.¹⁰⁴

In common with the internet, 3G and successor technologies are essentially telecommunication technologies in which content is delivered to the end user on an individual basis. Theoretically, if large numbers of people wish to receive the same content at the same time, which is a typical broadcast situation, the content provider must send that content to each person individually. While the cost of doing so has fallen and technologies are emerging that cope better with this “multi-cast” environment, 3G is likely to remain much less effective than DAB for delivering widely accessed broadcast services. It could, however, be used alongside broadcast technologies such as DAB to form a return path to the audience in interactive applications.

Digital satellite radio

Until recently, delivery of services by satellite to anything other than a carefully positioned fixed satellite dish was not practical. However, aerial and other technologies have now been developed that enable satellite reception on portable and mobile devices using aerials whose position in relation to the satellite is far less important. Either geostationary satellites¹⁰⁵ or a set of satellites in elliptical orbits¹⁰⁶ can now be used to transmit services over wide areas to mobile receivers.

Satellite delivery to portable and mobile devices can work well outdoors and in fairly open areas, but indoors, and in city streets, the “urban canyon effect” means that line-of-sight to the satellite is often obscured. In these situations, terrestrial filler transmitters are needed to provide coverage. These terrestrial transmitters pick up the satellite signal and re-transmit it into the obscured area. Depending on the relative size of the population served by the satellite(s) and by land-based filler transmitters, such networks can be regarded as either satellite delivery systems with terrestrial augmentation, or terrestrial systems in which the signal is distributed to terrestrial sites by satellite, with some users managing to pick up the “distribution” feed from the satellite directly.

In the USA, the Federal Communications Commission in 1997 awarded two licences to operate digital radio services by satellite in the 2.3 GHz band. Two operators are involved, Sirius, whose partners include BMW, Ford and Daimler Chrysler, and XM, whose partners include General Motors and Honda. Both are subscription services offering a level of programme diversity that is unusual in the USA, with fewer or no advertisement breaks. As

¹⁰⁴ Megabits (a million bits) per second

¹⁰⁵ Those satellites positioned at a specific height over the equator that appear at the same position in the sky throughout the day

¹⁰⁶ Those satellites moving in the sky but arranged so that at least one is always “visible”

their principal backers indicate, their main aim is to reach the in-car audience. In Europe, a consortium of Alcatel and Worldspace is preparing to offer a digital satellite service.

DMB

Digital Multimedia Broadcasting is a delivery system that can work equally well for audio, video and text, enabling a flexible combination of services to be supplied. In Korea, for example, multimedia broadcast services based on the highly robust “delivery” layers of the Eureka 147 DAB standard have been launched.

The system differs from DAB primarily in the encoding method used for the content. With DMB, MPEG-4¹⁰⁷ or other encoding technologies are used, which give higher degrees of compression for the same minimal quality impairment than is achieved using the earlier MPEG compression technology of DAB. The recent adoption of the same delivery technology as DAB further underwrites the ability of this standard to provide a highly robust means of getting content to the user. The content encoding technology is not, however, compatible with existing DAB receivers but MPEG-4 or other content could be delivered as data alongside audio in the future. Were DMB to take off in the UK, its service proposition would be unlikely to centre on radio but, as it would be capable of delivering radio services, the BBC would have to consider its possible impact on DAB and its potential role in service provision.

DRM

Digital Radio Mondiale is an important technology that the BBC has actively supported since its inception. It is managed by a consortium of over 80 members worldwide. DRM is an open standard (ETSI – ES201980) optimised to deliver good quality digital radio in the frequency bands below 30MHz, i.e. HF,¹⁰⁸ long wave and medium wave. It is therefore complementary to DAB digital radio. DRM offers good audio quality at the low bit rates that need to be accommodated within the low overall capacity of between 11 kbits/s¹⁰⁹ and 24 kbits/s available within channels in these bands, using MPEG-4 AAC¹¹⁰ with Spectral Band Replication.¹¹¹

The principal application for DRM is international broadcasting in the HF band. The long distance propagation characteristics of this band have been used by broadcasters for many years but analogue services are highly prone to distortion, fading and poor audio quality. The BBC is contributing to its development because of the benefit it could bring to the World Service. DRM addresses the limitations of the band and offers good audio quality, ease of tuning and automatic selection of the desired content whichever channel is being

¹⁰⁷ An international standard for audiovisual content developed by MPEG (Moving Picture Experts Group) and used in some more recently developed systems as the successor to MPEG-2, which is used by digital television

¹⁰⁸ High frequency. Also known as short wave, this is a band of frequencies below 30 MHz, which have good long distance propagation characteristics and are used for international broadcasting, in particular

¹⁰⁹ Kilobits per second

¹¹⁰ AAC stands for advanced audio coding, which is the core audio element of the MPEG-4 encoding system

¹¹¹ A technique that enables the bit rate transmitted to be further reduced by not sending the higher frequencies within the audio signal; these are effectively regenerated by processing in the receiver based on the lower frequency information which is transmitted along with some additional information to aid the process

used for its delivery at any given time. As with DAB, DRM supports single frequency network operation and uses COFDM¹¹² modulation. Although at a much earlier stage of development than DAB, DRM is well placed to offer services in the narrow channel, wide-area coverage bands for which it has been designed.

DVB-H

DVB-H (handheld) is part of the Digital Video Broadcasting family (see DVB-T below), recently specified to address the requirements of handheld devices, such as mobile phones and handheld computers, particularly their need for low power consumption. The standard typically delivers 15Mbits/s in an 8MHz television channel. DVB-H services can share a multiplex with DVB-T services or be delivered on their own and are seen predominantly as an efficient means of delivering a multimedia broadcast element to devices largely centred on point to point applications. Digital radio services could form part of such applications, in theory.

Still at an early stage of development, DVB-H is an open standard technology that the BBC will monitor closely. Except in some cases with its demand for spectrum, it is unlikely ever to be in direct competition with DAB digital radio because it is focused on video applications and expensive to implement so likely to seek high revenue generating services. DVB-H is only now reaching final standardisation and is about 10 years behind DAB in implementation. However, should the conditions ever be met in the UK that enable DVB-H to grow into a widely used technology, the BBC would need to assess its ability to enhance core public service provision alongside DAB.

DVB-T

The Digital Video Broadcasting standard can deliver sound programme services alongside television; the BBC makes its digital radio services available through the DVB-T platform that is used to receive Freeview services. While this gives access to these services at a fixed point in the home and builds public awareness of what digital radio has to offer, it does not meet the flexibility demanded by portable and mobile reception.

DVB-T can technically be used to achieve mobile reception if an appropriate transmission mode is adopted, one that trades capacity for reception robustness. However, even in such a mode, unused in the UK, the power demands of all DVB-T compliant receivers make battery operated portable reception impractical. There was, however, a requirement expressed within Europe to be able to deliver DVB services including, but not principally, audio streams to battery operated handheld devices such as mobile phones and handheld computers. This has led to the creation of another in the suite of European digital television standards: DVB-H (see above).

¹¹² Coded orthogonal frequency division multiplexing. A technique used in digital radio and television terrestrial broadcasting which conveys the data to be transmitted on a large number of closely spaced carriers, rather than one, as in analogue broadcasting. It improves reception in environments where analogue signals can be disrupted by reflections of the signal affecting the quality of the broadcast signal itself

IBOC

IBOC (In Band On Channel) is a digital radio broadcast system developed by iBiquity in the USA, which has approval from the Federal Communications Commission. IBOC fits digital transmissions at the edge of AM or FM broadcasts, ostensibly within the same channel as the analogue transmission, and therefore places no demands for additional spectrum. IBOC is, however, initially only intended to duplicate the analogue transmission in digital form, as well as offer some data services. Consequently, it offers no initial expansion of service choice. Only when it is possible to switch off the analogue component of the broadcast can any significant level of new services be introduced. The IBOC signal occupies spectrum twice as wide as a European FM channel, 400 kHz rather than 200 kHz, and coverage of IBOC services is limited by the need to restrict power to minimise interference to analogue services so is not suitable for use in Europe.

ISDB

Japan bases all digital broadcasting on a common Integrated Services Digital Broadcasting (ISDB) standard capable of delivering radio, television and data to fixed and mobile receivers; wide-ranging field trials have been in place since 1999. In late 2003, a radio trial was introduced in a number of areas in band 7 (188MHz to 192MHz) supported by the national broadcaster, NHK, and commercial radio operators.

While being a different system from Eureka 147 DAB, ISDB draws on many of the same technologies that give both standards their core characteristics. Like DAB, ISDB uses COFDM making it well suited to terrestrial delivery in urban environments. It uses the same time interleaving¹¹³ technique as DAB to lend the system greater immunity to interference. It does, however, use a more recent and more efficient audio coding standard, AAC, that enables a bit rate of 144kbits/s to deliver a sound that approximates CD quality. Planned data services include programme related information, news, weather, traffic and an electronic programme guide.

MHP

Multimedia Home Platform is part of the suite of DVB (see above) European open standards. It defines an application program interface (API) and other features that enable enhanced and interactive television applications to run on DVB MHP compliant receivers. It was developed after enhanced television services were launched in the UK, where proprietary APIs are used in the case of digital cable and digital satellite and a different open standard, which is simpler but related to MHP, is used on the terrestrial platform used to receive Freeview services.

¹¹³ This technique results in a highly robust signal in the presence of impulsive interference, e.g. unwanted electrical signals from thermostats, electric motors etc