



Digital audio broadcasting

The Digital Audio Broadcasting (DAB) system is one of several competing digital radio broadcasting technologies. It is, however, one of only a few that has been proven to work. A number of radio stations in Europe and Canada have been using the DAB system for some years. DAB uses an encoding method called Eureka147 to digitise an audio signal and create a stream, or pipe, of digital information which the receiver then recreates as the original audio signal. The Eureka147 system allows much more data to be broadcast to a radio receiver than the conventional analog system. It also allows the broadcaster to transmit, amongst other things, CD or near-CD quality sound in real time.

The Minister for Communications Information Technology and the Arts, Senator Richard Alston announced that both digital television and digital radio services would start broadcasting by 1 January 2001.

Although the planning for the introduction of digital television services is well under way in Australia, planning for digital radio is not as far advanced. Digital television planning enjoys an advantage over digital radio planning at present because the digital encoding process for television services has been decided. The analogous encoding process for digital radio in Australia is not yet finalised, although planning will proceed on the basis that the Eureka147 system will be chosen.

Fourth International DAB Symposium

DAB implementation issues were the focus of the Fourth International DAB Symposium held in Singapore from 13–15 January. Not all of the implementation issues discussed were technical in nature. Some delegates were also concerned about program material, or lack of it, which would persuade consumers to migrate to a new DAB service. This information is extremely important for consideration by the Australian authorities involved in the introduction of digital

radio broadcasting in Australia. The following summary discusses the main topics of interest for Australia when considering DAB as a viable digital radio broadcasting technology.

1. Receivers

Despite several years of DAB broadcasting in Canada and Europe, there is still a dearth of DAB receivers in the marketplace. Some delegates predicted that it would be another five years before DAB receivers will reach five per cent market penetration! However, there have been several receivers on the market since mid 1998, ranging from mobile (car) receivers, portable (Walkman type) to home stereo units. Manufacturers include Grundig, Blaupunkt (Bosch), Clarion, Kenwood, Pioneer, Hitachi and Sony. The cost of a receiver is in the range A\$1200–\$2000 — still very expensive.

No explanation seemed to be available as to why there are so few DAB receivers, although it may be because there is a lack of enhanced radio program material that would encourage consumers to switch from analog radio to DAB.

The hybrid satellite/terrestrial DAB receiver is particularly relevant to the Australian situation for achieving DAB coverage in our remote locations but no manufacturer has plans to introduce such a receiver. However, a presentation by the Canadian Communications Research Centre discussed their plans for a device that would allow a terrestrial DAB receiver to be used in conjunction with a satellite receiver for the reception of satellite DAB services.

So what does this mean for Australia? Even with a start date of 1 January 2001, based on the above information we can still expect a shortfall of DAB receivers for at least another two years beyond that.

Also, the role of DAB hasn't clarified yet. Is it merely digital radio or is it something else entirely?

The DAB system has the in-built potential to be more than simply near-CD sound, but how will this be standardised so receivers can be mass-produced at a reasonable price? These are some



Innovations

of the issues the government will need to consider when determining a digital radio broadcasting plan for Australia.

2. DAB programming and multi-media capability

The DAB system has the potential to provide an array of data delivery services many times greater than the existing analog networks. Commercial DAB operators in the UK were very advanced in their design and development of a network model of how they see DAB working for them and their clients, including receiver design. However, it may be this very feature that may be holding back the mass-production of receivers.

The DAB system has several ways of packaging data, or the digital information it is broadcasting to receivers. This is because there are several different types of data the receiver needs to have from the transmitter. The most important data that is transmitted is intelligence for the DAB network, for example so receivers know what channel to tune to so the listener can stay on the same service across several transmitters (similar to mobile telephone networks). The second and most common type of data that is sent over a DAB network is Program Additional Data (PAD). PAD allows the programmer not only to broadcast a song but also send the song title and artist's name, or any other information about the current audio program that the listener is enjoying. PAD can include pictures if the receiver has a suitable display unit, but initially most of this information would be sent in text form.

The last type of data that a DAB network could broadcast is non-PAD information. For example, this could be a weather forecast, stock price information, news releases or even software updates for the DAB receivers. The list is virtually endless. This last feature assumes DAB receivers are capable of receiving and storing this type of information. There is also an issue of safety, particularly if mobile DAB receivers require the driver to look at a screen instead of listening.

These are not all necessarily issues that the ABA or the Australian Government need to make decisions upon, for example some are commercial marketing schemes. However, these are issues that the Australian Government needs to be aware of when determining a digital radio broadcasting plan for Australia.

3. Signal penetration of DAB vs analog services

One of the most interesting and relevant technical debates that occurred during the symposium

was the issue of how well a DAB signal penetrates into man-made structures, particularly concrete high-rises and tunnels. There were no conclusions about this, except that further research was required.

It has been well known for many years that AM radio signals do not penetrate into tunnels, or underground car parks as easily as FM signals. This phenomenon is called a 'waveguide effect'. Put simply, the frequency of the signal limits where the signal can penetrate and the lower the frequency, the less likely it will be able to penetrate any enclosed space. The higher the frequency, the easier that signal can penetrate a small space such as a window. This is why FM signals, which operate around 100 MHz, can be picked up in tunnels but AM signals, which operate around 1 MHz, usually fade out until you get to the other end.

In the case of DAB signals, the spectrum that has been internationally agreed for use is the so-called 'L-Band'. The DAB signals use part of the L-Band with a frequency around 1500 MHz.

Unfortunately, frequencies this high suffer from a related phenomenon called the 'skin-effect': they are more easily absorbed into the physical structure of a building than an FM signal. They can, however, penetrate through windows with ease. The question to be answered is how significant is the lack of penetration of DAB signals into office blocks, large buildings and suburban homes.

Australian engineers have been aware of this issue for some time. In particular, engineers from the Communications Laboratory of the Department of Communications Information Technology and the Arts are investigating this phenomenon. An analysis of the results has not been finalised, but they will be considered when the Australian Government determines a digital radio broadcasting plan for Australia. The ABA has also been researching the potential use of VHF Band 3 spectrum for DRB use in remote areas. This is still under investigation.

Conclusion

DAB is a viable technology for providing digital radio broadcasting for Australia, however it is still maturing in some areas. Of key interest to the ABA are the development of hybrid satellite receivers for remote Australia and the mass production of DAB receivers. The ABA will be keeping a close eye on the development of DAB as well as other potential digital radio broadcasting technologies, as 1 January 2001 is not that far away.

