



FreeTV
Australia

**Submission by
Free TV Australia Limited**

Department of Communications,
Information Technology and the Arts

Review of the Broadcasting Services Bands
Spectrum: Identification and Structural
Efficiency

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Executive Summary

- Free TV has worked closely and cooperatively with the Australian Broadcasting Authority (**ABA**) in relation to channel planning for digital terrestrial television broadcasting (**DTTB**). This process of consultation has led to efficient spectrum planning outcomes, which are consistent with the objects set out in the Broadcasting Services Act (**BSA**) for digital conversion and the overriding objects of the BSA.
- The cooperative planning that has been performed by the ABA has enabled a very efficient and successful deployment of digital television services in all metropolitan and the main regional centres of Australia. The Australian planning model has heavily influenced DTTB decisions made globally and Australia is considered a benchmark for implementation of the DVB-T standard.
- The DTTB planning process is not yet complete. Rollout is ongoing in regional areas and free-to-air broadcasters continue to work with the ABA to resolve technical digital planning issues such as equivalent coverage.
- The broadcasting services bands (**BSBs**) are reserved for primary use by broadcasting. It is imperative that spectrum planning decisions relating to the broadcasting services bands first focus on the current and reasonably anticipated needs of broadcasting.
- The disruption to viewers, the time to convert and cost of re-allocation services to make Channel 9A a full 7 MHz channel would provide no public benefit. It would be better to wait until switch-off of analog services and then allocate digital services on the new channel assignments. Alternatively, other compatible services should be encouraged which may employ the existing 6 MHz of bandwidth in the Australian channel plan.
- Free TV members have promoted the use of Single Frequency Networks (**SFNs**) where appropriate and have deployed SFNs to their practical limit.
- There is very limited scope for non-broadcasting uses of the BSB because of the high-risk of mutual interference and resulting loss of quality, coverage and viability of broadcasting services.
- It is premature for the Government to be considering “new spectrum usage” after the end of the digital television simulcast period.

Introduction

Free Television Australia (**Free TV**) is the peak industry body representing all 48 commercial free-to-air television licensees in Australia.

Free TV welcomes the opportunity to comment in response to the issues paper entitled "Review of the Broadcasting Services Bands Spectrum: Identification and Structural Efficiency" (**Issues Paper**) which was released by the Department of Communications, Information Technology and the Arts (**the Department**) in November 2004 (**the Review**).

This Issues Paper seeks comment on a range of issues regarding the identification and structuring of BSB spectrum for free-to-air television broadcasting and its conversion to digital.

Planning of spectrum for delivery of television broadcasting services requires consideration of a broad range of economic, social and cultural objectives set out in the BSA. Free TV has worked closely and cooperatively with the ABA in relation to channel planning for DTTB. This process of consultation has led to efficient spectrum planning outcomes, which are consistent with the objects set out in the BSA for digital conversion and the overriding objects of the BSA. However this cooperative planning process is not yet complete and there is further work still to be done, particularly in regional areas.

Already, the on-going deployment of DTTB in Australia has been the fastest in the world and covers a geographical area larger than any other deployment in the world. The Australian planning model has heavily influenced DTTB decisions made globally and Australia is considered a benchmark for implementation of the DVB-T standard.

This submission addresses the following topics raised in the Issues Paper.

Section 1: the planning, allocation and efficiency of spectrum use for television broadcasting services

Section 2: use of channel 9A

Section 3: use of single frequency networks

Section 4: use of the broadcasting services bands for non-broadcasting uses.

This submission does not address the last two sections of the Issues Paper that seek comment on use of spectrum after the simulcast period and whether there is any need to modify the ABA's spectrum clearance and compensation powers, having regard to the post-simulcast period.

These matters are beyond the scope of the Review as set out in Schedule 4 to the BSA:

- Whether all parts of the broadcasting services bands available for allocation for broadcasting or datacasting services *have been identified* (Clause 60(1)(e)); and
- Whether all parts of the broadcasting services bands *have been efficiently structured* (Clause 60(1)(f)).

Any consideration of post-simulcast issues is premature on the basis that:

- roll-out of DTTB is not yet complete¹;
- it is not clear when the simulcast period will end, either in Australia or overseas. In Australia, the BSA provides for a separate review of the issues associated with the length of the simulcast period before 1 January 2006;

¹ As the Discussion Paper notes at page 6: "Planning for regional repeater sites is expected to be completed by the end of 2006. As at 30 June 2004, 137 regional repeater sites remain to be planned"

- a number of technical planning issues with respect to DTTB are yet to be determined both domestically and internationally; and
- there are a number of digital television reviews currently underway. The outcomes of some of these reviews have the potential to impact on spectrum usage for digital television.

1 Planning, Allocation and Efficiency of Spectrum Use for Television

1.1 Broadcast spectrum planning

Any consideration of “efficient use of spectrum” by broadcasters can not and should not be considered in isolation. The starting point of any consideration of spectrum planning principles must be the overall public benefit derived from use of the spectrum². It can not be assumed that “public benefit” will flow from “efficient use” alone. Whenever spectrum is planned for broadcasting purposes, the range of economic, social and cultural objectives set out in the BSA must be taken into account³.

Broadcasting planning is a fundamental element of the scheme for broadcasting regulation, as planning effectively determines the style of content provided to audiences (depending on whether a national, commercial, community or narrowcasting service is planned), and where and how audiences can receive and decode that content.

The considerations which drive broadcasting planning can be contrasted with other communications uses of spectrum. Many other communications uses focus principally on the carriage of the service, or technical objectives, and the provider of the service is not expected to be responsible for fulfilling community or cultural objectives. As a result, the relevant objectives in the Radiocommunications Act are principally economic, and are solely concerned with the efficient use and allocation of the spectrum.

This fundamental principle (that is, that how the “overall public benefit” is approached in relation to broadcasting allocations will differ from the approach that is used in relation to other types of radiofrequency allocations) is essential in the ongoing planning of the BSBs.

1.2 Public benefit considerations

When considering the “overall public benefit” of spectrum used for broadcasting purposes, it is important to take into account factors such as:

- the long-standing bi-partisan regulatory policy concerning free-to-air television which has focussed on protecting every Australians right to receive high quality free-to-air television services, irrespective of who they are and where they live. Television services are supplied to 99 per cent of the Australian population and reach all population demographics and income levels⁴;

² This approach is consistent with the leading object of the Radiocommunications Act which requires the ACA “to maximise, by ensuring the efficient allocation and use of the spectrum, the overall public benefit derived from using the radiofrequency spectrum”

³ As explained in *The ABA’s General Approach to Analog Planning*, the ABA is required to balance objects including the promotion of economic and efficient use of the spectrum, the promotion of availability to audiences of a diverse range of radio and television services, the promotion of high quality and innovative programming, the encouragement of appropriate coverage of matters of local significance, and the facilitation of the development of a broadcasting industry that is efficient, competitive and responsive to audience needs.

⁴ There are approximately 7.1 million TV households. 99% of households have at least 1 set. Refer <http://www.aba.gov.au/tv/faqs/history.htm#7>

- the resulting strong expectations of the Australian public about the number, diversity and technical quality of the television they expect to receive;
- the reliance of Australian television broadcasters on use of the broadcasting services bands for delivery of services, as close to 90 per cent of homes have no other way of accessing free-to-air services⁵;
- the efficiency with which spectrum is used for television broadcasting compared to other radiocommunications purposes. Television is broadcast 24 hours a day, 7 days per week, whereas spectrum used for other radiocommunications purposes is often designed to be under-utilised (that is, designed for peak load); and
- the considerable direct economic benefit provided to the community through licence fees paid by commercial television broadcasters to the Government⁶. These licence fees are directly linked to the revenue-generating capacity of the spectrum.

Taking into account these factors, it is clear that there is high public benefit derived from use of spectrum for television broadcasting services.

1.3 Spectrum efficiency

When considering efficiency of spectrum use for television broadcasting services, there are a number of factors that must be taken into account.

- Broadcasters are required to deliver their services throughout their licence areas. Therefore the planning of broadcasting services needs to ensure a minimum level of signal (field strength) throughout a licence area to domestic receiving equipment.
- In practice, this means that the radiation pattern and radiated power of each television broadcasting service within a licence area must be planned to both maximise spectrum efficiency, to ensure adequate coverage, and to minimise interference.

ABA assumptions for television broadcasting spectrum planning rely upon the most efficient spacing of services (within a licence area and in adjacent areas) that will ensure appropriate coverage and to result in interference-free reception of services (within the relevant licence area). This approach is reflected in the *ABA's Broadcast Planning Manual*, and outlined in the *Broadcast Planning Instructions*, the *Technical Planning Guidelines* and the *Broadcast Planning Procedures*. Planning the location and characteristics of a broadcasting service assists to achieve these outcomes (for example, as noted below, directional radiating antennas reflecting directional technical specifications are often relied upon to achieve the desired coverage).

Planning for broadcasting services requires many more, and more complex, considerations than planning for other radiocommunications uses. For the reasons set out below, planning for other communications uses is much more simplistic.

- Many other radiocommunications services have vastly different coverage requirements, being delivered to specialised receivers and having very different

⁵ Cable covers only parts of even the major urban markets. Satellite provides almost universal physical coverage, but it is not possible to deliver scores of local services by satellite. In either case, consumers would need to subscribe to cable or satellite services to receive "free-to-air" services in this way. Reliance on spectrum in Australia, can be contrasted with the US and Canada, where over 80 per cent of homes can receive free-to-air services as part of their cable or satellite services.

⁶ Commercial free-to-air television broadcasters paid licence fees of almost \$200 million in 2002-03 and have paid more than \$2 billion over the last 20 years, in addition to other taxes.

frequency re-use criteria. As a result, planning for many radiocommunications services can use set “re-use distances” between sites before re-using a frequency, and often taking little account of topography. Unlike broadcasting systems, many other radiocommunications systems planning assume a fixed Effective Isotropic Radiated Power (eirp) for all transmitters in a particular class of service.

- Fixed and mobile services (telecommunications and radiocommunications) require highly directional transmission antennas designed to optimise point to point communications (in the case of telecommunications) or fixed design omnidirectional antenna (for mobile radiocommunications services) whereas broadcasting applications use individual tailored directional antenna array systems for each service, designed to provide coverage of an often irregular shaped coverage area for the service.

The broadcast spectrum planning procedures, techniques and tools used by the ABA facilitate a flexible approach in order to meet the outcomes required by television broadcasting services in particular geographic or demographic contexts (for example, applying directional radiation patterns depending on geography, quality requirements, population centres and required coverage areas).

Using these planning assumptions, the ABA decides what spectrum is required to ensure quality of coverage within a licence area. The ABA also decides which channels to allocate, and this determines how much spectrum will be required. In practice the spectrum allocated is not adequate to ensure coverage within the licence area, broadcasters may require additional spectrum (for translator services – used to increase or optimise the coverage of the broadcasting service to the required field strength). In some geographic areas a considerable amount of spectrum could be required to ensure optimization of television services to the viewing public. The decision of whether to allocate additional spectrum rests with the ABA.

The planning process of the ABA is a co-operative one. Free TV supports the continued application of the planning principles and is currently participating in a review of the ABA planning assumptions to the planning of spectrum in the BSBs for DTTB.

1.4 Other planning drivers

A number of additional matters must be taken into account when planning spectrum for television broadcasting services. These important matters must be factored into any consideration of ‘efficiency’ of spectrum use.

1.4.1 Interference management

Technical planning of the broadcasting services bands has traditionally adopted a “quality of service” approach to interference management (based on the ITU’s Radio Regulations and a long term conditioning of broadcasting audiences which has resulted in the Australian public not tolerating interference within their broadcasting services). Spectrum efficiency in the BSBs should not be about doing ‘more with less’. Protecting broadcasting services from interference is a paramount consideration.

1.4.2 Receiver efficiency

Broadcasting planning must take into account the capability of a “notional” television or radio receiver planning model. Interference levels predicated in television broadcast

planning have regard to receiver sensitivity. While “high-end” analog television receivers made specifically for the Australian market might be able to handle adjacent channel placements, or shorter protection analog distances, most receivers cannot.

During 2003-04, consumers buying new television receivers spent an average of \$518.⁷ Median spend would be significantly lower. That is, spectrum planning must accommodate the fact that most Australians do not own sophisticated television receivers. Also, it can not be assumed that consumers who upgrade their television receiver, no longer use the ‘replaced’ receiver. In many instances, the ‘old’ receiver is relocated to another area of the home. Most Australian homes now have more than one working television receiver.

1.4.3 DTTB coverage

The need to provide DTTB coverage, compared to analog mode is a continuing driver in the planning process. Free TV has worked closely and cooperatively with the ABA on the issue of DTTB coverage. However, the process of roll-out is not yet complete as the requirement for low-power transmitter channels to in-fill areas with limited coverage is continuing.

1.5 Implementation of DTTB in Australia

Free TV considers that application of the ABA’s planning principles has led to efficient spectrum planning outcomes, which are consistent with the objects set out in the BSA for digital conversion and the overriding objects of the BSA. The cooperative planning that has been performed by the ABA has enabled a very efficient and successful deployment of digital television services in all metropolitan and the main regional centres of Australia. Free TV will continue to work with the ABA on ongoing roll-out in regional areas, and to resolve technical digital planning issues such as equivalent coverage.

Planning for the deployment of DTTB in Australia was initially based on the expectations of DTTB planning, development and implementation arising in Europe. However, the scope and scale of the work done in Australia led to significant amounts of research and development being conducted by Free TV members and their suppliers. Without this work, the deployment could never have been achieved in the timelines and with the efficiency that were taken as a challenge by Australian television broadcasters.

This world leading research has become a model for DTTB deployment decisions on a global basis. Using internationally recognised television broadcasting standards such as Recommendation ITU-R BT.1368 and the ETSI / Digital Video Broadcasting transmission characteristics, Australian television broadcasters have further developed these standards and provided feedback to the ITU, the EBU DVB Project and other organisations to reflect the experience in the challenging environment in Australia.

The work done by Free TV members in Australia has meant that the Australian planning model has heavily influenced DTTB decisions made globally. To date visits by at least fourteen official delegations to Australia is evidence that Australia is leading the world in the roll out of DVB-T. Indeed, Australia is considered a benchmark for implementation of DVB-T.

The deployment of DTTB has also been environmentally efficient. In the majority of DTTB implementations and as a result of the co-siting principle of DTTB planning,

⁷ Information provided to Digital Broadcasting Australia by Panasonic, sourced from GFK and Infomark data.

commercial broadcasters have used the same sites and towers as are used for analog broadcasting. In addition, in the mainland state capital cities, digital transmission uses "hot standby" so that either of two transmitter sites can be considered the main site when the other is not available, either for planned maintenance or for equipment failure. This provides a continuity of service and improves the availability of television services to viewers.

Deployment of DTTB in Australia has had minimal adverse effects on viewers. Interference between analog and digital transmissions has been successfully managed by broadcasters and in the vast majority of cases, the transition to digital has not required the re-pointing of domestic television antennas and minimised retuning of television receivers, set top boxes or video cassette recorders.

2 Use of Channel 9A

2.1.1 Potential for the wider use of Channel 9A

All Channel 10 frequency assignments prior to 1996 were made with a nominal vision carrier frequency of 209.25 MHz as determined by a restriction by non-broadcast assignments above 222 MHz. A similar offset was created for Channel 11. This offsets the raster for Channels 10 and 11 by 1 MHz creating a unique Band III channel plan in the Australian consumer television receiver population.

In Australian television licence areas where Channel 10 has been assigned on this basis, Channel 9A is only 6 MHz wide. There are 65 assignments for Channel 10 where the offset has been applied. These include 9 assignments for major capital cities where four of these are for an alternative transmission site.

Channel 10 Assignments ⁸				
State	Digital	Analog		Total
		209-216 MHz	208-215 MHz	
ACT			0	0
NSW	1	1	15	17
VIC	1		4	5
QLD	1		20	21
SA			4	4
WA		3	16	19
TAS	1		3	4
NT			3	3
Total	4	4	65	73

Each of these analog assignments voids the use of Channel 9A for analog television as it is an adjacent “taboo” channel. These assignments have not prevented use of Channel 9A for all analog services. As the table below indicates, four analog assignments have been implemented on Channel 9A.

Channel 9A Assignments ⁹			
State	Digital	Analog	Total
ACT	1		1
NSW	2	1	3
VIC	2		2

⁸ ABA publication Radio and Television Broadcasting Stations June 2004

⁹ *ibid*

Channel 9A Assignments⁹			
State	Digital	Analog	Total
QLD	2		2
SA			0
WA	2	2	4
TAS	1		1
NT		1	1
Total	10	4	14

Neither have the existing assignments prohibited use of Channel 9A for digital television. As at June 2004, 10 assignments have been made for digital terrestrial television broadcasting.

2.1.2 Impact of Moving Channel 10

The Issues Paper notes that “the trade-off for releasing a potentially very useful channel would be a substantial (albeit one off) impact on broadcasters and viewers using these channels”. Free TV agrees that the impact would be substantial and submits that the disruption and inconvenience to viewers in addition to the cost of conversion would far outweigh any benefits of creating a clear 7 MHz Channel 9A at this stage.

Free TV has conducted the following impact assessment to demonstrate the magnitude of the disruption and cost, which would result from moving the radio frequency limits within the channel arrangement for the Channel 10 television service.

Changing a television channel frequency impacts at four key points: the main transmission infrastructure (i.e. the VHF parent transmitter), the secondary transmission infrastructure (i.e. translators of the parent VHF service), the tertiary transmission infrastructure (i.e. cabled distribution systems in multi dwelling units, large cabled estates or commercial redistribution in hotels, hospitals and schools etc), and consumer receivers in the home.

Channel 10 is allocated in the major capital cities of Sydney, Melbourne, Brisbane Adelaide and Perth, and in 56 regional or remote licence areas. Of these allocations, all capital city services and 26 of the 56 regional/remote services share a broadcast antenna with other VHF Band III television services. Retuning the antenna combiner at each of these sites will cause significant interruption to all services at the site. In the capital cities, this could cause interruption to analog Channels 7, 9 and 10 and digital Channels 6, 8, 11 and 12.

In changing the television channel frequency, 100% of the viewing audience would be impacted by the necessary changes to the main transmission infrastructure. The main transmitters would require retuning, which would necessitate new crystals or re-setting of synthesisers. Many of the Channel 10 transmitters are older valve transmitters which would require refurbishing before a successful retune could be performed. This refurbishment is likely to cause catastrophic failure in some transmitters and new systems would therefore have to be purchased. These systems could only be used until analog switch-off, which would occur well before the economic life of the product was reached.

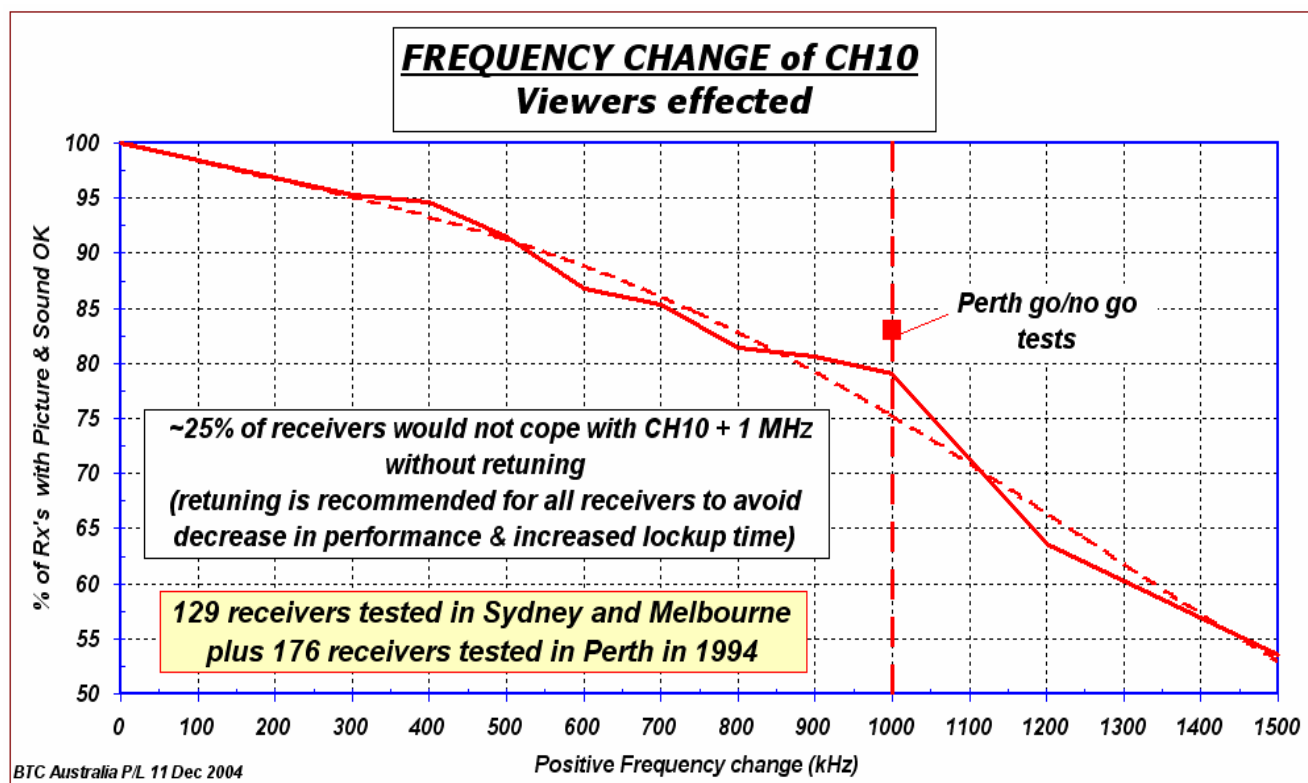
The complex task of retuning the vision – aural diplexer would also need to be carried out. Changes required to the secondary transmission system would impact on up to 20% of viewers in capital cities and a greater proportion in regional areas. Translators have fixed tuning and would require a crystal change of synthesiser as well as retuning of input filters. These tasks would need to be performed in conjunction with the change at the main transmitter. Additionally, the Government would need to manage migration of self-help and television black spot translators which fall outside of the broadcasters' control.

In capital city areas in particular, cabled distribution systems are used to reticulate free-to-air television in home units, apartment blocks and in new estates where all services are delivered on a fibre core. To carry out this change of frequency, each head-end would require a technician visit to retune the Channel 10 receiver and in some cases, the cable system would need a major overhaul. According to the 2001 Census information, 13% of occupied dwellings in Australia are multi dwelling units (MDUs). For example, in Sydney alone, 23.9% of occupied dwellings are MDUs and all would require technician visits. This represents over 50,000 technician visits.

The impact on consumer receivers of a 1 MHz change was studied by Network Ten in 1994. Tests on 405 receivers and video recorders indicated that 25% of receivers would not provide satisfactory reception without retuning the receiver. Network Ten found that receivers reacted in different ways by:

- (a) deteriorating vision quality (particularly colour); and/or
- (b) deteriorating sound quality.

Some TV receivers were eventually able to receive broadcasts after automatic circuitry retuned, but this took up to 10 seconds to provide a picture. Such delays in tuning are unacceptable to viewers and advertisers.



Disruptions to viewers' ability to receive broadcasters operating on Channel 10 would put those broadcasters at a distinct commercial disadvantage for the period of the changeover and could have a long term impact if viewers react negatively to the disruption and inconvenience caused by the frequency change. Minimising this disadvantage, would require a very large number of home visits employing all available antenna installers and electricians over a considerable period and at a considerable cost.

The cost of reconfiguring the transmission equipment (at transmitters and their associated translators) would be up to \$1m for a major capital city market, however this would be dwarfed by the corrective costs to the receiver community. Based on the need to modify 25% of the receiver community and most of the MDU systems, at \$40 per household and \$100 per head-end, the nationwide cost exceeds \$84m. In addition, there are many institutions which receive television services and then remodulate them for cable distribution throughout the premises. Similar measures to those described above would need to be implemented to realign any modulation equipment in MDUs, commercial buildings such as hotels, public buildings such as hospitals where the current channels are "shuffled" in some instances to other frequency/assignments in the broadcast bands and also where remodulated into the MATV non-broadcast bands channel numbers and frequency limits. This cost of replacement of re-modulation equipment which is not frequency agile is not known at this stage.

The costs and inconvenience to the substantial number of affected consumers would also be considerable. Because television reception equipment is universally deployed and most households have more than one television as well as one or more video cassette recorders, any change that requires viewers to re-tune would require an extensive education campaign and management scheme.

The processes outlined above would apply for any realignment of analog television assignments and radio frequency limits within the channel arrangement in the Australian BSBs. There is additional complexity if any realignment was considered for digital television assignments and radio frequency limits within the channel arrangement in the Australian BSBs. This arises within digital television due to the linkage between the television number, centre frequency assignment and the service information data referenced by a digital receiver in the DVB Network Information Table.

The duration of the changeover period would depend on the available "army" of antenna installers, television technicians and electricians, but represents a task of near 250,000 days of work (excluding administrative time).

Similarly, concepts of using unallocated channels for other services ("white space"), or mixing services such as UWB would impose a regime of home visits for corrective action. The ubiquitous nature of the receiving community would drive up any corrective costs.

Any change which "disconnects" viewers for any period of time strikes at the heart of a commercial broadcaster's business. In addition to the costs outlined above, compensation would have to be paid to the affected broadcasters. Again, this would be in the order of tens of millions of dollars nationwide for loss of business.

Due to the high level of disruption and substantial costs associated with reordering the BSBs and moving channel 10 or re-packing the spectrum post analog switch off, any such proposal must convey an unequivocal benefit to viewers and broadcasters. In Free TV's view there is no apparent public benefit in expanding Channel 9A in order to

release a new 7MHz channel at this stage of the digital conversion. Consequently such a proposal should only be considered in the lead up to analog switch off.

2.1.3 The Flow-On Effect to Channel 11

There are 49 assignments where Channel 11 is allocated a vision carrier frequency of 216.25 MHz. Assigning a digital service on Channel 9A in these areas effectively makes Channel 10 a 6 MHz channel, hence the same “inefficiency” problem would be created.

Further study as to the benefit of moving Channel 10 would have to consider the flow-on effect to Channel 11. Although Channel 10 and 11 cannot be assigned to analog television in the same area, there are areas where these channels are assigned in adjacent service areas where polarisation and channel spacing have been utilised as the interference minimisation tools. A study would have to be undertaken to determine if, having moved Channel 10 up by 1 MHz, the overlap with existing Channel 11 assignments would require Channel 11 assignments also to be shifted.

Channel 11 Assignments ¹⁰				
State	Digital	Analog	Analog	Total
		215-222 MHz	216-223 MHz	
ACT	1			1
NSW	3	1	8	12
VIC	3	2	2	7
QLD	4		19	23
SA	2			2
WA	3	6	11	20
TAS	1		5	6
NT			4	4
Total	17	9	49	75

2.1.4 Alternative Uses of Channel 9A

Free TV members have co-operated with Commercial Radio Australia (CRA) on the introduction of digital radio trials in Sydney. CRA have been particularly careful in establishing the trials to ensure that no interference has been caused to adjacent television services. This trial has proven that digital radio using the Eureka 147 system is compatible with adjacent analog television services.

Free TV supports the development of digital radio in Channel 9A as an excellent application for this channel. However, there are technical limitations that need to be applied to avoid interference between broadcasting services. Accordingly, consultation with Free TV would be essential before any new services are introduced.

¹⁰ ABA publication Radio and Television Broadcasting Stations June 2004

3 Single Frequency Networks

3.1 Introduction

The use of SFNs was considered during the planning of digital conversion. In order for commercial television broadcasters to meet the time scales set out in the BSA, each agreed a Conversion Plan with the ABA and these Conversion Plans were published by the ABA before broadcasting in digital mode commenced. SFNs have been deployed in accordance with those plans to the limits of their practical use in Australia. The opportunity for further deployment of SFNs in Australia is limited.

3.1.1 The DVB-T Standard and SFNs

The choice of DVB-T for Australia followed extensive testing and study by industry experts. One of the main reasons supporting DVB-T was its ability to suit a variety of requirements. Another was its ability to provide greater spectrum efficiency from the use of co-channel operation, including the use of SFNs. Free TV has always accepted that the latter feature is an important tool for planning DTTB and has promoted its use where appropriate. Free TV agreed to the use of SFNs and has demonstrated their practical limits in the regional roll-out of DTTB in Australia.

Australia has used SFNs on as large a geographic scale as any other country on a global basis. The imperatives of international coordination of spectrum use, which drove the use of SFNs in Europe is absent in this country. Nevertheless, Free TV members have deployed SFNs to (or maybe even past) their practical limit and have consequently been very efficient in spectrum use.

Free TV was also instrumental in creating the “1 + 1”¹¹ deployment model for SFNs. Again, deployment has reached its practical limit in Australia. The Australian deployment model has influenced the DVB standards deployed in the UK and Europe, to the extent technically applicable.

3.1.2 Australian television coverage requirements

Australian television coverage planning has provided for particular geographic and social characteristics, such as wide separation between cities and townships and low population to area ratios in regional and rural areas. Each area has been provided with PAL services designed and developed with specific needs to meet a given market. One common characteristic has been to provide a main wide coverage service that covers the extensive rural markets surrounding each main city. Translators have been used to provide coverage to the smaller townships and rural concentrations which in most cases are quite widely separated. Providing equivalent coverage for digital has necessarily followed a similar pattern.

The wide separation and rural signal coverage of some markets may not be realistically implemented by SFN operations. Where there is sufficient distance or obstruction to ensure that there is an adequate co-channel protection ratio then this would allow the same channel to be used without implementation of an SFN. Further, there may be cases where the SFN operation distance limit is exceeded but insufficient co-channel protection ratio is available for co-channel assignments to be

¹¹ Where the main frequency/channel is allocated in one band (VHF) an additional common frequency/channel is allocated in another band (UHF) for the SFN deployment.

made. Should that exist, in those areas co-channel digital assignments would not be viable unless some further measures are taken.

In more remote areas, where installations are of the “self help” category, SFN operation may be too restrictive for practical implementation.

In many situations SFN operations will effectively preclude off-air translation options, necessitating the use of microwave or other alternate delivery means to provide the input to the in-fill or coverage extension translators/transmitters. This can add considerable expense to the cost of covering sometimes small communities. It also would add further pressure to that already existing for fixed link spectrum and consequential loss of overall any overall spectrum efficiency.

3.2 Implementation

Australia was one of the first countries to implement SFNs (after the United Kingdom). As a result, some of the problems associated with timing artefacts in the deployment of SFNs over large areas and distances were discovered first by the Australian national broadcasters. These discoveries included the identification of digital “mush zones” in SFN deployment. The problem that arises from black spots in SFNs is that any solution based on “infill” defeats the objectives of using SFNs. That is, the translator used to provide infill must be on a separate frequency to the originating channel and this leads to a network consisting of originators and translators rather than a SFN.

The deployment of SFNs has been at a significant cost to regional commercial television broadcasters where additional spectrum has been required to feed the SFN with its input signal. One of the key characteristics of SFNs is that the programming carried is the same throughout the network.

Additionally, localism is an important facet of regional broadcasting in Australia and the ability to provide local programming is lost in SFNs if they are deployed over too wide a geographic area.

In the metropolitan areas, the number of UHF translator channels required in digital mode for each parent VHF channel is much lower than the equivalent analog deployment. In analog mode, each UHF translator uses a separate frequency. However, in digital mode, particularly in Sydney, the use of SFNs has ensured significantly more efficient use of spectrum than in analog mode.

4 Use of BSB for Non-Broadcasting Uses

4.1 Background

Free TV's submission is that non-broadcasting uses of the BSB should only be permitted where this has no adverse effects on the delivery of television broadcasting services, and does not impede future use of the spectrum for the purposes of digital conversion. In other words, such future non-broadcasting uses must be planned in the same way that they are at present. Certainly, there must be no suggestion that broadcasting services must compete with non-broadcasting services to access the BSB spectrum. Otherwise, this may lead to increased levels of interference to services and a loss of quality and viability of existing television broadcasting services.

Sharing of the BSB is already accommodated through a variety of regulatory instruments which include a Section 34 *drop through*, scientific licensing of test services and class licensing of low power devices. The ACA database lists more than 5,000 assignments in the band 520 – 820 MHz.

Australian regulatory agencies have obligations under ITU Radio Regulations & Recommendations and DTTB planning methodologies to ensure that broadcasting is protected from any interference from secondary fixed and mobile services in the BSBs.

4.2 Scope for other services

4.2.1 Interference to analog services

There is very limited scope for introducing other high power services to “unused” parts of the television broadcast bands because of the high risk of mutual interference to existing analog services. As set out above, the protection ratio required by analog television services is typically 40 dB and this means that analog television receivers are susceptible to interference from television services on the same channel. Further, older analog television receivers were designed in the knowledge that there would not be interference from other television services in adjacent channels. Whereas extensive work has been conducted (including by the Department) on the effects of adjacent channel digital television signals, this has not been the case for other sources of interference.

Co-channel interference (that is, interference on the same channel as the wanted service) to analog services is a problem even when services are co-located and power levels are carefully co-ordinated, as is the case with digital and analog television services. It would rule out the use of adjacent channel services with different topographies (for example, a multi-transmitter cellular service and a television-type service utilising a few higher-powered transmitters). Very low power class licensed services also run into difficulties when “vacant” channels are activated. Examples are class licensed medical monitoring equipment, wireless microphones and existing analog television signals affected by digital television transmissions which have been overcome from judicious spectrum planning and public awareness for spectrum coordination of class licensed devices where the introduction of digital services has caused interference to class licensed devices.

4.2.2 Interference to digital services

In particular, Free TV is concerned that low power spread spectrum devices and characterised by Ultra Wide Band propagation characteristics such as those class licensed for use in the Industrial Scientific and Medical bands (for example, WiFi and BlueTooth) should not be deployed in the BSBs. Whereas groups such as the Institute of Electrical and Electronics Engineers (**IEEE**) are considering the use of broadcasting services bands spectrum for wireless regional area networks (for example IEEE p802.22), such services are likely to raise the “noise floor” in the BSBs and have the potential to adversely affect broadcasters’ ability to provide services across the large areas which represent television broadcasting licence areas.

There is significant work in progress on the standardisation on Ultra Wideband (**UWB**) devices by the United Kingdom Office of Communications (**Ofcom**), the Federal Communications Commission (**FCC**) and the European Technical Standards Institute (**ETSI**)¹². If the proposed Ofcom mask, the current mask proposed by ETSI or the FCC mask were to be applied in Australia, then the BSBs could not form part of the core spectrum for UWB.

As set out above, the reference digital receiver assumes that the co-channel interference will be at least 20 dB below the carrier level of the wanted channel. The planning for DTTB coverage has assumed that the noise in the BSB is thermal (and, to a limited extent, man-made) noise. If the noise floor is raised by the introduction of significant numbers of low power devices (each of which contributes to the level of noise) then there is a risk that consumers will be denied digital broadcasting services. Planning for DTTB services based upon a COFDM television system, such as the DVB-T system implemented in Australia, requires recognition of a performance threshold for digital television receivers.

Each of Ofcom, ETSI and the FCC are concerned that UWB has the potential to raise the noise floor in the BSB (particularly UHF bands IV and V). Indeed the Ofcom consultation paper is concerned with respect to services below the UHF BSB at 406 MHz. The risk in getting UWB device regulation wrong is that broadcasting and other radiocommunications services users will be adversely affected but that this will only be realised if the assumed device density actually occurs.

4.2.3 Other interference to digital services

In addition to interference associated with other radiocommunications services, Free TV members are currently researching interference issues arising from:

- impulse noise (such as automotive and industrial interference); and
- the effects of multi-path propagation.

The results of these studies are ongoing and are likely to be similar to and require an approach to planning for this type of noise taken in some European countries.

Australian television broadcasters also have additional implementation responsibilities placed on them to protect television services including:

- DTTB into analog interference management scheme;
- industry funded technical awareness programs for promotion of improved cabling and antenna installations; and

¹² See, for example, Ofcom issued a consultation paper on Ultra Wideband devices. Available at <http://www.ofcom.org.uk/consult/condocs/uwb/uwb.pdf>

- industry participation in the development of transmission and receiving equipment standards.

This work has also shown that the implementation of high power DTTB immediately adjacent to other services in the VHF/UHF bands is not appropriate. In particular, Free TV has identified the issues that have affected Land Mobile radiocommunications services in spectrum adjacent to VHF Channel 6 in Adelaide and Brisbane.

4.2.4 No scope for expanded use

An underlying element of spectrum planning and management is the need to have an understanding and recognition of the international treaties and agreements on broad spectrum designations such as the ITU Radio Regulations¹³ that set out the international obligations and their impact on the design of television broadcasting and flow onto the design of consumer electronics equipment. These international agreements on spectrum use are continuously evolving and have longer-term implementation.

Currently the Regional Radio Conference (**RRC**) being undertaken in Europe involves the complete review of all previous planning agreements over the past 30 years for the VHF and UHF bands. This work involves spectrum planning, management and migration to DTTB. The statutes from the RRC will come into effect late 2006 and influence regulation of broadcasting in the VHF / UHF bands and the design of DTTB transmission equipment and digital television receivers. The ITU design elements of Digital Television Terrestrial Broadcasting are based upon systems described within ITU-R Recommendation BT.1368. The Australian Broadcasting Authority has drawn heavily on BT.1368 in planning the Australian DTTB system based upon the specification for planning DVB-T services in BT.1368. Already outcomes of the RRC are having an impact on revisions to BT.1368 as a result primarily of studies being undertaken by ITU-R Working Party 6E. These will have a flow on effect to the implementation of DTTB in Australia.

To ensure a true reflection of Australian interests and to gain detailed information it is essential to ensure participation by Australian broadcasting interests in the ITU forums and consultation with potentially affected parties. Much of the design of television broadcasting technology used in Australia comes from the developed countries of Europe and North America, both of which lie in different ITU regions; Europe in Region 1, North America in Region 2, while the majority of the consumer electronics imported into Australia is from Region 3 – the Asia Pacific. The differences are identified in the Regional allocations detailed in the Australian Spectrum Plan¹⁴. While Region 1, Region 2 and Region 3 have broadcasting as a primary service in the UHF BSB, they diverge in their allocations for broadcasting in the VHF band. Use of this spectrum for other services, such as Fixed and Mobile, are determined by the World Radiocommunications Conference. Australian broadcasters, the Australian Broadcasting Authority and its predecessor organisations have participated cooperatively to ensure Australia's interests are promoted in ITU forums.

Alignment with international spectrum designations has advantages in:

- (a) limiting interference;
- (b) improving the availability of economical equipment developed for specific applications; and

¹³ *Radio Regulations*, International Telecommunications Union, 2004.

¹⁴ *Australian Radiofrequency Spectrum Plan*, Australian Communications Authority, draft 2005.

- (c) enhancing the trade in consumer electronics and broadcasting equipment and technology between countries.

4.3 Emerging Technologies

Having standardised digital television in Australia on DVB-T, issues arising from emerging technologies are limited to some extent. There is currently work going on to plan for services adjacent to the BSBs. However, most planning is related to the delivery of DVB-T services and enhancement as they evolve to meet viewers' needs.

That is, the quality of service expectations of consumers that have been planned for by creating a model receiver must always be met. This requires that broadcasting remains the primary service in the BSBs.

Free TV is aware that there are proposals for the trials of DVB-H technology and would note that the timing requirements of this technology and the current development of its specification limit the use of SFNs. In particular, it cannot be assumed that a DVB-H service multiplexed with DVB-T services will be able to use any SFN deployed in Australia.