Submission by Free TV Australia Limited

Spectrum reallocation in the 700 MHz digital dividend band

Australian Communications and Media Authority

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- **(A)** Decisions regarding the configuration, allocation and use of the Digital Dividend spectrum adjacent to restacked UHF free-to-air broadcasting services below 694MHz must be made in a way that ensures a continuing interference-free broadcasting platform into the future.
- **(B)** Free TV notes ACMA's preference for a harmonised Region 3 conventional duplex band plan that provides only a total of a (4+5) 9 MHz guard band adjacent to UHF television broadcasting, compared to 42 MHz frequency gap under the reverse duplex arrangement chosen in Europe.
- **(C)** Extensive studies have demonstrated conclusively that without significant mitigation strategies, conventional duplex band mobile services will interfere into adjacent digital television services.
- **(D)** The ACMA must ensure that best practice interference management strategies are employed to protect broadcasting services from potential interference from new services operating in the Digital Dividend.
- **(E)** The ACMA must pursue with urgency its commitment to participate in user equipment out of band emission studies in AWF. The specification of appropriate user equipment out of band emission limits will be crucial to ensuring the long-term protection of broadcasting services below 694 MHz.
- **(F)** To help facilitate the development of robust protection strategies, Free TV requests ongoing involvement in the Technical Liaison Groups the ACMA proposes to convene prior to the formulation of Spectrum Licence conditions for the Digital Dividend spectrum.
- **(G)** Free TV supports the retention of some Digital Dividend spectrum for migration to future broadcast technologies to safeguard the future of the free-to-air television platform.
- **(H)** The commencement of new services in the 2.5 GHz band must be contingent on conclusive and operationally comparable alternative spectrum for ENG being finalised.

2 Introduction

Free TV Australia represents all of Australia's commercial free-to-air television broadcasters. Free TV welcomes the opportunity to comment on the Australian Communications and Media Authority's (ACMA) Discussion Paper *Spectrum reallocation in the 700 MHz digital dividend band*.

The importance of free-to-air television broadcasting services to the Australian public remains high. Consumers continue to expect high levels of quality Australian and local content, free access to news and current affairs and free coverage of major sporting events.

On any given day, an average of more than 13.4 million Australians watch free-to-air terrestrial television. Free-to-air television reaches 99.7% of Australian households and over 70% rely exclusively on free-to-air television. Virtually all Australian households rely on free to-air-television for some of their television services. The majority of households (68%) have two or more TVs.

Free-to-air television is highly valued by viewers and continues to deliver a range of public interest outcomes.

The overwhelming majority of Australians rely exclusively on free-to-air services for their television. They will be disadvantaged if the Digital Dividend design and allocation process does not ensure a strong digital free-to-air platform that is equal to or better than the quality as the current analogue system.

Australia has one of the highest levels of reliance on free-to-air terrestrial television (70%), meaning that the impact of any disruption to or restriction of the free-to-air television platform will be much higher in Australia than in countries such as the UK (52% reliance) or US (5%).

It is therefore vital that decisions regarding the configuration, allocation and use of the Digital Dividend spectrum continue to support a strong, robust and competitive broadcasting platform into the future.

However, there will be an inevitable disruption to all viewers when receiver retuning and in some cases possible antenna change is needed to accommodate restack transmission frequency shifts.

Given this disruption, we must avoid further long-term reception impacts on the free-to-air broadcasting platform that could arise from inadequately controlled new services placed in the Digital Dividend. The ACMA must ensure stringent interference protection strategies to ensure that new services above 694MHz do not interfere into digital television services operating below that spectral boundary.

A failure to do so, resulting in reduced utility of the spectrum in channel 51 and below, will be equivalent to a further reduction in broadcasting spectrum in addition to the spectrum already lost to the Digital Dividend.

The new mobile telecommunications technologies which are to be introduced immediately adjacent to DTTB (digital terrestrial television broadcasting) services must take account of the protection of the DTTB services below. Where there may be a possibility that out of band emissions from the new mobile telecommunications technologies would interfere with DTTB reception, ACMA should mandate the relevant electromagnetic compatibility (EMC) standards for any 700 MHz band transmitting capable equipment to ensure protection of the DTTB services below 694MHz.

Free TV supports the use of technical licence conditions to implement these protection strategies and requests membership of the proposed Technical Liaison Group during the consultation period prior to the spectrum auction and into the future. This forum will provide the opportunity to address interference concerns via technical conditions to be applied to Spectrum Licences.

Whilst the design of the Digital Dividend allocation is crucial to the protection of highly valued broadcasting services, Free TV notes that mobile/IMT technologies change over time. We note that ITU-R Working Party 5D is now working on IMT Advanced and LTE Advanced.[1] The interference characteristics of these future IMT technologies is unknown and hence Free TV requests ongoing participation in relevant ACMA-facilitated technical groups to ensure that protection measures remain current and appropriate

Free TV also believes the Government should retain some spectrum in the Digital Dividend to enable viewers to continue to receive the latest technologies for free. The current proposal for a 126 MHz Digital Dividend has not specifically taken into consideration an allocation of spectrum to allow broadcasters to migrate to new DTTB delivery applications such as DVBT-2 and MPEG-4. As an example broadcasters would be limited in their ability to provide new technologies such as 3D TV. These constraints will not apply to competing platforms such as pay TV and IPTV. Free-to-air television viewers should not be forced to pay for these enhancements.

As most of the specific questions raised in the ACMA Discussion Paper relate to the future allocation of the digital dividend spectrum, this submission addresses the following key issues relevant to broadcasters:

- Configuration of the Digital Dividend (refer to questions 1 – 2 in the Discussion Paper)
- The technical framework (questions 1 – 2)
- Studies to date – evidence of the interference impact of mobile services (question 24)
- Timing of the Digital Dividend allocation (questions 17-20)
- Allocation of the 2.5 GHz band (questions 26 – 30)

Please refer to Attachment 1 for a summary of Free TV's answers to the questions raised in the Discussion Paper.

3 Configuration of the Digital Dividend

Free TV recognises that in order to ensure the maximum return from the spectrum and the most intensive and efficient use, most countries are moving toward the designation of the Digital Dividend for new, high-speed communications services.

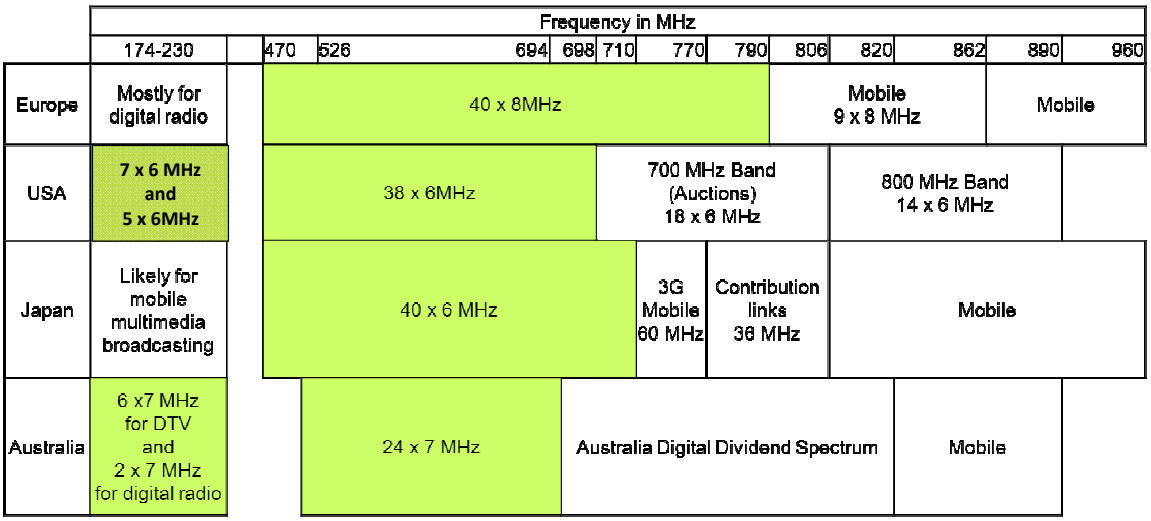
However, as noted in its submission to the Government's *Digital Dividend Green Paper*, and to ACMA's consultation on *Temporary trials of 3D TV and other emerging technologies*, Free TV supports the retention of some Digital Dividend spectrum for migration to future broadcast technologies to safeguard the future of the free-to-air television platform. The ACMA Paper acknowledges that there may be potential for different uses within the 126 MHz Digital Dividend.

If the broadcasting services bands are redefined with an upper limited at 694 MHz, there will be no remaining spectrum available to permit future technology migration, as there was for the conversion from analogue to digital television.

Broadcasters would not be able to trial or simulcast new technologies without disrupting existing services. Because of the impact on households with legacy reception equipment, a transition to new standards, such as 3D TV, DVB-T2 and MPEG-4 cannot occur without a reasonable period of simulcast. Otherwise many viewers face a loss of, or unacceptable interruption to, free-to-air television services. Under the Government's 126 MHz Digital

[1] Refer to Attachment 2 for a series of outstanding issues with respect to characteristics of IMT Advanced and LTE Advanced that are yet to be resolved either in the ITU-R or the AWF.

Dividend, broadcasters will have no capacity to simulcast. Refer to the diagram below for an indicative comparison of spectrum (green) retained for broadcasting.



These constraints will not apply to competing platforms such as pay TV and IPTV. Viewers should not be forced to pay for these enhancements.

The ability of Australian broadcasters to provide programming in 3D, and other innovative new formats will be severely constrained unless some spectrum is retained for future technology migration (including simulcast).

Free TV urges the ACMA, in planning the future use of the Digital Dividend, to consider retaining a small amount of spectrum to allow free-to-air broadcasters to transition to future technologies and compete with the ever expanding range of media options. A transition to new technologies in future will allow more consumer choice, increased diversity, extra business opportunities and, over time, more efficient use of spectrum.

This approach would be consistent with the approach taken towards spectrum planning for other communications services, such as telecommunications and mobile broadband, where spectrum has been planned according to the need to develop and transition to new technologies.

4 The technical framework

Free TV notes that a key part of the reallocation process will be the development of a technical framework for the new spectrum licensees, including the technical requirements for operating radiocommunications equipment in the Digital Dividend spectrum.

Extensive studies, internationally and in Australia have demonstrated conclusively that without significant mitigation strategies, there is clear evidence that mobile services will interfere into adjacent DTTB services (refer to section 5 of this submission).

Given the substantial reduction in broadcasting spectrum which will arise from the 126 MHz Digital Dividend, the ACMA must ensure that best practice interference management strategies are employed to protect broadcasting services against potential interference from new services operating in the spectrum above 694 MHz.

In order to protect the strength and viability of the digital terrestrial television platform, broadcasters will require unconstrained operation within the redefined BSBs. This includes

the ability to use full broadcast power on Channel 51 and below, with no restrictions imposed on broadcasters by the new mobile licensees in the adjacent band above 694 MHz.

A failure to secure adequate protection of digital television reception through the Digital Dividend design process, with a resultant loss in utility of broadcasting channels near the Digital Dividend boundary, would be equivalent to a further loss of spectrum.

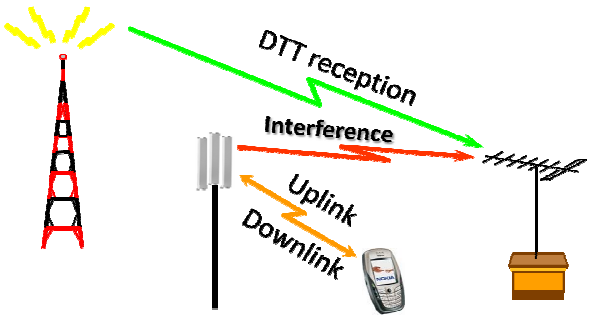
This section of the submission sets out Free TV's recommendations for best practice protection of existing broadcasting services from new services in the Dividend spectrum. Free TV has previously put forward these recommendations to ACMA as part of preparations for the recent AWF meeting in Seoul.

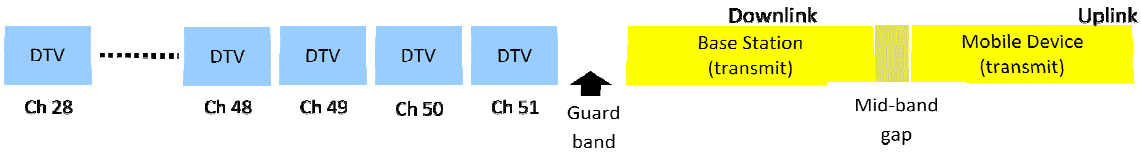
4.1 Best practice protection requirements for Digital Television

4.1.1 FDD with Reverse Duplex Mode

Consistent with the EU's preferred approach and based on the results of studies in the ITU-R (set out below), if reverse duplex is pursued for an FDD band plan, Free TV recommends a minimum guard band of 9 MHz (5 MHz above and 4 MHz below 698 MHz) in order to minimise interference from UMTS/LTE mobile base stations. This would institute a sizeable frequency gap between broadcasting services and the uplink transmission from the mobile handset.

FDD with Reverse Duplex Mode

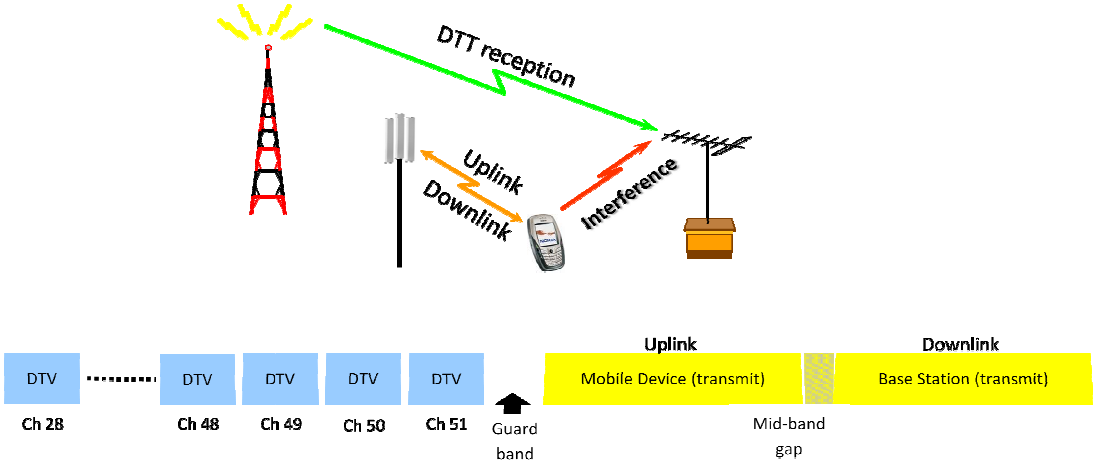




4.1.2 FDD with Conventional Duplex Mode

Free TV has also proposed that, if "conventional" duplex is chosen for an FDD band plan, a minimum of 11 MHz guard-band (7 MHz above and 4MHz below 698MHz) should be nominated as a potential conventional duplex solution along with a 2 x 45 MHz paired band plan. Improvements in transmit filtering of mobile handsets, or otherwise known as User Equipment (UE) must also be mandated.

FDD with Conventional (or Normal) Duplex Mode



Free TV is aware of arguments against the use of sizeable guard bands as spectrally inefficient. However, Free TV submits that the public would expect the ACMA to allocate spectrum resources in such a way that ensures the services they currently enjoy, for free, are protected from new, user-pays services. The 70% of Australians who currently rely exclusively on free-to-air television services would likely see adequate protection measures as an efficient use of public spectrum resources.

4.1.3 TDD

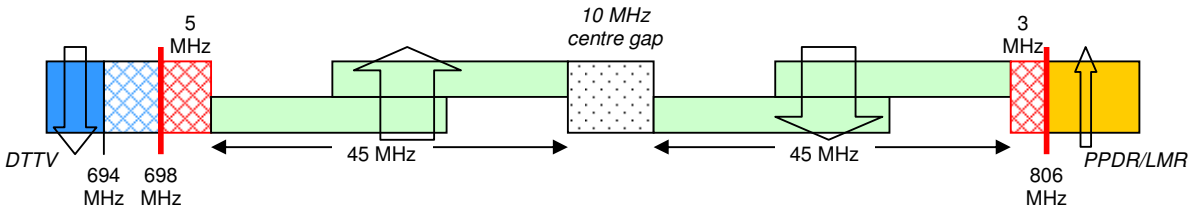
TDD is essentially a full duplex configuration of both uplink and downlink signals. The mobile network separates uplink and downlink signals at different times. Hence, the interfering signal could occur adjacent to digital TV reception in either an uplink or downlink signal at any time.

If a TDD band plan is pursued, the ACMA must therefore consider the worst case interference mitigation requirements (eg, guard band and filtering) on both base stations and mobile handsets, similar to a concurrent application of FDD with Reverse and Conventional Modes.

Free TV notes there has been little study into the impact of TDD on digital TV reception and that there is little interest in Australia for an unpaired TDD band plan in the Digital Dividend spectrum.

4.2 ACMA's preferred approach

Free TV notes the outcome of the recent AWF meeting in Seoul towards a conventional duplex band plan with a 9 MHz guard band adjacent with UHF television broadcasting, and ACMA's "preferred approach ... to commence domestic planning work with the harmonised ITU Region 3 plan."[2]



Harmonised FDD Arrangement of 698-806 MHz band

Free TV notes that this would result in a 9 MHz guard band only - a very minimal frequency distance between the mobile uplink and DTTB compared to 42 MHz under the reverse duplex arrangement chosen in Europe.

Given the significant interference issues identified in the conventional duplex arrangement in the European studies (see section 5 of this submission), the specification of appropriate user equipment (UE) out of band emission limits to ensure the coexistence of mobile services with adjacent broadcasting services below the 698 MHz spectral boundary will be a vital aspect of any conventional duplex arrangement in the 698-806 MHz.

These mitigation strategies should focus on UEs and terminal devices having embedded duplex filters that conform to a specific roll-off characteristic (filter mask). It would appear that the filters with 15 – 25 dB roll of performance (cited in recent contributions to the AWF) are by no means the best available.

4.2.1 AWF studies to date

Free TV notes that in AWF modelling to date, the interference scenario is over-simplified and assumes only one interferer (whether a base station or mobile handset). However, multiple interferers will likely exist, particularly in conventional duplex, given that Australian households are likely to have 2.7 mobile devices on average.

In some of the studies of the conventional duplex environment, (Contribution to AWF UHF Correspondence Group (Doc CG-01, and CG-02)) looking at the effect of IMT mobile handset transmission interfering into the digital TV receivers, it was assumed that a mobile handset would be equipped with a duplexing filter that provides 15 – 25 dB out-of-band suppression. However, there is no commitment in the 3GPP specifications or other relevant EMC standards that any mobile handset would have such filter performance.

These shortfalls make it particularly pressing that ACMA pursue with urgency its commitment to participate in the UE out of band emission studies in AWF. The development of such studies into mandated UE filtering requirements will be

[2] Discussion Paper p 20

crucial to ensuring the long-term protection of broadcasting services below 698 MHz.

4.2.2 Technology flexibility

In its Discussion Paper, ACMA acknowledges that the most likely configuration of the Digital Dividend spectrum will be for the deployment of mobile telecommunications services and has indicated its "preferred approach is to commence domestic planning work in line with the harmonised International Telecommunications Union Region 3 plan" (FDD band plan in Conventional Duplex Mode).[3]

In light of these statements clearly favouring a particular family of technologies, it is not clear what is meant in the Discussion Paper when ACMA states "it would aim as far as practicable to develop technology flexible technical frameworks that would permit the deployment of other services in the band."[4]

Free TV believes it would not be feasible to adopt a technology flexible technical framework given that the protection requirements for adjacent broadcasting services will vary according to the preferred configuration of the spectrum for the particular technology or family of technologies to be deployed.

As demonstrated by overseas studies (refer to section 5 of this submission), any variation in the preferred configuration of the spectrum would create different interference impacts.

Hence, Free TV supports a well-defined spectrum planning framework configured for current mobile systems, accompanied by robust mechanisms which ensure the long-term protection of broadcasting services against unwanted interference.

5 Studies to date – evidence of interference impact of mobile services

This section of the submission outlines key studies and investigations undertaken to date which demonstrate the interference impact of mobile services in the Digital Dividend band into adjacent broadcasting services.

The studies also address the protection requirements needed to ensure the coexistence of broadcasting and mobile services and form the basis of Free TV's recommendations in section 4 (above).

Whilst the majority of these studies are drawn from Europe where (as a result of the demonstrated interference under a conventional duplex arrangement) a reverse duplex arrangement has been pursued, they nonetheless provide the best available information regarding the co-existence of mobile and digital television services. They also provide detailed guidance regarding the impact of various protection strategies.

[3] Discussion Paper p 20
[4] Discussion Paper p 19

Free TV strongly recommends ACMA to have detailed regard to these studies when developing the technical licence conditions for new services in the Digital Dividend.

5.1 European studies

Consumer electronics manufacturers completed studies in conjunction with the EBU into UMTS signal interference into DTTB receivers (ECC report 138). A second report updated these findings with reference to LTE (ECC report 148). This is the most extensive work undertaken so far into the impact of mobile signals into DTTB receivers.

There are also six further studies submitted by the consumer manufacturers addressing the impacts of interference from LTE and UMTS into digital television reception. These studies will contribute to the revision of an ITU-R recommendation BT.1368 that comprises protection ratios for the DTTB receivers.

There will be ongoing work to refine the protection requirements in this recommendation and ACMA should make reference to this work and the protection ratios it recommends when considering the technical framework for new services above 694 MHz.

5.2 CEPT Report 23

This early study assessed reverse and conventional duplex impacts on DTTB. The preliminary results showed that for conventional duplex, the interference from the uplink (handset) would cause significant adjacent interference to digital television. "Even with 8 MHz guard band, the interference probability would be about 1% to 1.4% … That corresponds to up about 5% to 10% loss in broadcast coverage area."

Hence, CEPT Report 23 concluded that even with a guard band, there is no guarantee against interference.

As a result of these findings, the EU looked towards reverse duplex, to allow the downlink to form an effective separation between DTTB and mobile handset.

Further measurements also indicated that the 8 MHz suggested guard band would not be adequate to protect indoor reception or a situation when the television receive antenna is at a close proximity (2.5 – 4 metres) to an interfering mobile handset.

Although the interference into portable and mobile receivers could be considered domestic problems, this report noted that unlike the case of interference from downlink, it is not possible to mitigate the interference by network planning as mobile handset's movement is unpredictable and there is no way to control its radiation characteristics (this was another factor in the EU's move towards reverse duplex).

<u>Suggested mitigation techniques for conventional duplex</u>

- Reduce the out of band emission limits of the mobile handset given that the current specifications for UMTS user equipment are not stringent enough and without further refinement, there would be a need for a guard band of up to 48 MHz. With sufficient reduction of these out of band emissions the required guard band could be reduced down to 16 MHz, subject to confirmation by further studies.
- To limit the maximum transmit power of the mobile handsets to a level which minimises the risk of overloading the front end of the television receiver. This also requires further studies in order to determine the acceptable maximum transmit power with regard to the protection of DVB-T reception.

- To improve the receiving characteristics of future DVB-T receivers. The only possible solution would be to add a rejecting filter in the front end of the DVB-T receiver in order to reduce the interfering signal level received in the channels used for the mobile uplinks. However such a solution could not be applied to existing set top boxes but only to new set top boxes manufactured from a certain date after the final channelling for the uplink transmissions is known.

Suggested mitigation techniques for reverse duplex

- Use cross-polarisation between the DVB-T and mobile base stations.
- Use critical spectrum masks for the mobile base station. These masks may need to be more stringent than the spectrum mask specified for the mobile system (subject to implementation of the specific mobile system).
- Adjust the power of interfering mobile service base stations.
- Adjust the antenna height of the interfering mobile base station with regard to the surrounding DVB-T receiving antennas.

5.3 Free TV / EBU Report to the ITU-R Joint Task Group 5-6 (Document 5-6/84-E)

This report reaffirmed the study outcomes found in the CEPT Report 23.

For reverse duplex the study confirmed that in addition to the measures identified in CEPT Report 23, there was a need to reduce the out-of-band radiated signal spectrum from the base station. The study also confirmed the need for a guard band of 1 - 5 MHz between the wanted DVB-T channel and the mobile service downlink transmission from the base station. The size of the guard band may help reduce the number of interference cases.

For conventional duplex, the interference on portable DVB-T reception from a real UMTS mobile handset with insufficient guard band has been verified and recorded on video footage. The study indicates that a guard band of at least 7 MHz would be required between the wanted DVB-T channel and the mobile service uplink transmission from the mobile handset. A larger guard band of up to 21 MHz may be required to DVB-T reception near the edge of the coverage area.

5.4 CEPT Report 30

Following the ECC's decision to adopt reverse duplex, it determined a need to find common and minimal (least restrictive) technical conditions for fixed mobile communications networks in the EU's Digital Dividend band (790 -862 MHz) whilst enabling the protection of broadcasting operation and other applications.

The CEPT Report 30 introduced the concept of 'block-edge mask' (BEM), which consists of in-block and out-of-block components as a function of frequency. The out-of-block component of the BEM itself consists of a baseline level and, where applicable, intermediate levels which describe the transition from the in-block level to the baseline level as a function of frequency.

The different sets of studies show that the impact of interference cannot be arbitrarily reduced through a reduction of the base station out of band emission alone due to

finite TV receiver selectivity. Therefore other mitigation mechanisms beyond the BEM could be required.

Free TV notes that these reports considered the impact on indoor reception and that Australian DTTB planning caters for fixed rooftop reception. However, these reports show that those Australian viewers who use indoor reception could be affected by conventional duplex interference in the same ways as identified in these European studies.

5.5 CEPT Report 31

This report developed Europe's preferred harmonised frequency arrangement for FDD reverse duplex with a guard band of 1 MHz between downlink and broadcasting.

Hence, the frequency separation between broadcasting services and the uplink will be 42 MHz (consisting of 1 MHz guard band above 790 MHz, 30 MHz for downlink and 11 MHz for mid-band gap).

The ECC Decision of 30 October 2009 was to recommend:

- The block edge mask concept (refer to CEPT report 30)
- The need for protection of broadcasting services below the spectral boundary.
- Possible adoption of additional measures at the national level to mitigate possible remaining interference cases.

5.6 Ofcom – consideration on the impact in the UK of interference from mobile base stations in the 800 MHz DD band to DTV services below 790 MHz

Following the European decision to pursue reverse duplex, Ofcom consulted on the design of the Digital Dividend award and found that even with a Block Edge Mask and the guard bands proposed in CEPT 30 and 31, there was still some harmful interference from base stations into DTV reception in some parts of the UK (especially where television broadcasts were in channels adjacent to mobile channels).

Ofcom therefore commissioned studies with the aim of defining the appropriate protection clause to be included in mobile licences, to ensure full protection of broadcasting and apply stringent mitigation techniques. Free TV would support ACMA undertaking a similarly extensive and intensive investigation into the potential technical and non-technical protection clauses that will be required in the design of the Australian Digital Dividend.

Ofcom's work aimed to apply the earlier CEPT studies and recommendations to the UK. In doing so, it aimed to develop modelling to assess the level of interference which might be experienced by digital TV reception and to assess the number of households which might be affected. The modelling would also explore the impact of any further mitigation measures.

Ofcom concluded that even with the recommended protections derived from CEPT 30 and 31, there will be harmful interference to services operating at the band edge. This supported the need for a large guard band.

Ofcom found that the harmful interference can be largely eliminated via appropriate RF filtering at the digital television receiver. However, filtering alone will not be sufficient to

mitigate interference in coverage areas where broadcast services are operating in the highest 3 broadcast channels. This supported a guard band of 24 MHz.

The study also acknowledged there will be cases where despite the use of all reasonable technical mitigation measures harmful interference to certain digital TV receivers cannot be eliminated. In such cases the only way to restore services would be to provide an alternative platform for reception.

OFCOM CASE STUDY

A case study was undertaken using real DVB-T transmitters tuned to channels at the DD band edge.

The aim was to employ various mitigation techniques and evaluate the potential number of affected households. Ofcom's intermediate results for Oxford showed around 34,000 households affected by interference.

When cross-polarisation was applied (vertical at the base stations versus horizontal at the DTTB fixed reception), the number of affected households was reduced to around 13,000. Installing rejecting filters at all affected DTTB receiving installations would reduce this figure to 23,000. A combination of both reduced the number to 10,000 households.

This is a far from negligible impact and clearly justifies further investigation and study.

5.7 Latest EU developments

Further to the studies already undertaken, the EU Commission handed down a further decision on protection issues on 6 May 2010 (2010/267/EU):

- The Commission gave a mandate to the CEPT to define common and minimal technical conditions and to determine the most appropriate way to arrange the spectrum.
- It recognised that the block edge mask should be applied as an essential component of the technical conditions necessary to ensure coexistence between services at the national level. However, consistent with Ofcom's findings, it emphasised that the BEMs do not always provide the required level of protection for victim services and thus additional mitigation techniques would need to be applied in a proportionate manner.

DigiTAG, the EBU, BNE (Broadcast Networks Europe) and the Association of Commercial Television in Europe have come forward with joint recommendations for European administrations in designing and allocating the Digital Dividend:

- Endorses the Commission decision above, and the results published in the CEPT Reports 30 and 31.
- Recommends the same measures as identified in the CEPT reports.
- Further recommended that when granting frequencies in the 800 MHz band the following additional measures should be considered:

- To make appropriate information on the licences awarded available to consumers so that those suffering interference know why it is happening and to whom they can complain.
- Setting up an entity as a point of contact to which cases of interference or loss of DTT services can be reported, to ensure a prompt and effective resolution in a timely manner.
- Ensuring that consumers experiencing loss of DTT services even after mitigation measures mentioned above have been implemented are promptly provided with adequate equipment to allow continued reception of DTT services.
- Such equipment may include filters connected in the front of the DTT receiver or receiving antenna amplifier system to eliminate harmful interference stemming from emissions in the adjacent frequency band. Such measures must not unduly impair reception of broadcast channels at the DD band edge. The associated costs of these necessary remedies should not be borne by broadcasters, broadcast network operators or the viewers.

The University of Twente released the findings of its analysis of the interference of mobiles in the Digital Dividend into cable television.

Although this study only looks at co-channel scenario between cable TV (set top boxes and receivers) and LTE/mobile applications, it verifies that poor cabling/plug/connections and the proximity of LTE mobile handset to the weakest point of these connections would contribute to interference being picked up by TV tuners regardless of whether they are cable or terrestrial.

This study intuitively implies that even households with fixed rooftop antennas, there is still a likelihood that their terrestrial digital TV reception could be affected due to poor cabling and/or loose plug/connections while mobile handsets are operating within proximity.

6 Timing of the Digital Dividend allocation

Free TV considers that the timing for the commencement of new services in the band is primarily an issue for comment by potential new users of the Digital Dividend spectrum.

However, Free TV notes that ACMA has sought feedback on the possible staged release of Digital Dividend spectrum as switch off and restacking completes across the country.

Before this is considered as an option, ACMA must be able to demonstrate that new mobile services could operate in the cleared spectrum without interfering into adjacent broadcasting services where restacking is yet to complete.

Restacking and switch-off will be a time of major disruption for broadcasters and their viewers. It would not be acceptable for broadcasters and television audiences to also have to deal with interference from new users of cleared spectrum in adjacent spectrum above 694 MHz at this time of significant upheaval.

Milestones for band clearance can only be achieved if decisions by the ACMA regarding the BSB restack model are completed as soon as practicable. However Free TV views aspects of the current timetable to be near or on the “critical path” while aspects of the restack are still being reviewed by government, which has meant the restack has not yet been able to

commence. Free TV notes that constructive work continues between the industry and the ACMA on this important matter.

7 Allocation of the 2.5 GHz band

The ACMA Discussion Paper seeks feedback on the importance of holding allocations for the Digital Dividend 700MHz and 2.5 GHz bands as a separate or combined process.

Whilst Free TV expresses no view on this matter, it is vital that ACMA first ensures there is adequate planning for migration out of the 2.5 GHz band for Electronic News Gathering licensees. This must include the identification of sufficient bandwidth in all areas and this should take place before the reallocation of the spectrum in order to ensure certainty for all stakeholders.

Access to adequate spectrum for ENG is vital to broadcasters continuing to serve the Australian public with free access to high-quality news and current affairs, coverage of sport and major events and Australian and local content. This content is highly valued by viewers and delivers a range of public interest outcomes.

Discussions are still continuing between ACMA and ENG licensees regarding a migration plan and there is as yet no conclusive and operationally comparable solution for alternative ENG spectrum

A distinction must therefore be made between the timing of any re allocation and the timing of the commencement of new services in both bands.

Attachment 1 – Answers to questions raised in the discussion paper

Digital Dividend Spectrum Configuration Questions

1. Should the ACMA align its configuration of the digital dividend spectrum with the harmonised Region 3 arrangements? If not, what configuration arrangements should the ACMA put into place for the digital dividend spectrum?

Evidence of studies is provided in this submission that demonstrates use of reverse duplex offers the least risk to interference between services and provides the most cost-effective mitigation strategies

The technical framework set by ACMA must ensure that broadcasters have unconstrained operation within the redefined BSBs. This includes the ability to use full broadcast power on Channel 51 and below, with no restrictions imposed on broadcasters by the new mobile licensees in the adjacent band above 694 MHz and no interference to television is caused by the new services. However, from examination of studies detailed within this submission, Free TV contends that this is best achieved by use of reverse duplex.

2. What are the benefits and risks of the ACMA's preferred approach? Is there evidence to support the stated benefits or risks?

Evidence of studies is provided in this submission that demonstrates use of reverse duplex offers the least risk to interference between services and provides the most cost-effective mitigation strategies for adjacent broadcasting services.

Remote Area Questions

3. Should remote parts of Australia be excised from spectrum licensing of the digital dividend band? Why?

Free TV offers no comment

4. If not, how much digital dividend spectrum should be made available in remote areas of Australia? Should different amounts of spectrum be made available for spectrum licensing in different areas, for example, metro versus rural?

Free TV offers no comment

5. What services would potential licensees of digital dividend spectrum expect to deploy in remote Australia?

Free TV offers no comment

6. What level of demand do potential service providers expect in remote parts of Australia for services that are likely to be operated in the digital dividend spectrum?

Free TV offers no comment

7. How should the boundaries of remote parts of Australia be determined when reallocating digital dividend spectrum?

Free TV offers no comment

Radio Quiet Zone Questions

8. Would any of the three alternative scenarios described above provide suitable protection to the RQZ? Which one and why?

Free TV offers no comment

9. Is there a different method of protecting the RQZ in the reallocation of the digital dividend band that would be preferable? Why?

Free TV offers no comment

Geographic Dimension Questions

10. Over what geographic region or regions are interested parties planning to deploy a service?

Free TV offers no comment

11. What is the best way to define the geographic dimensions of lots in the digital dividend band?

Free TV offers no comment

Digital Dividend Use Questions

12. What services are interested parties planning to deploy in the digital dividend band? What are the technological requirements in terms of spectrum usage? Will these services require paired or unpaired spectrum?

Free TV offers no comment

13. If spectrum in the digital dividend part of the 700 MHz band is configured as paired spectrum, how will it affect the costs of providing the proposed service? Would this affect be the same or different if the digital dividend band was configured as unpaired spectrum?

Free TV offers no comment

14. What is the minimum bandwidth required to deploy the proposed technology in the digital dividend part of the 700 MHz band? Is there an optimal bandwidth for deploying the same technology for this service?

Free TV offers no comment

15. Would the cost of delivering the proposed service within a single region be affected by whether the spectrum acquired by an interested party is within a single (contiguous) block or spread across a number of smaller blocks (non-contiguous)? How would any difference impact on service delivery costs?

Free TV offers no comment

16. Would the cost of delivering the proposed service in multiple areas (for example, coverage in several capital cities) be affected if the spectrum acquired by an interested party is in the same frequency block in each area, or is broken up into a different spectrum block for each area? How would any difference impact on service delivery costs?

Free TV offers no comment

Commencement Date Questions

17. Should all the spectrum licences commence on the same date? Should spectrum licences in a particular licence area commence on the same date? If so, what should the ACMA consider when selecting this date?

Free TV offers no comment on commencement dates but the issues raised in section 6 should be noted

18. Would it be preferable to make the commencement date flexible? How flexible should the commencement date be? What benefits or disadvantages might result?

Free TV offers no comment

19. Should the ACMA consider staggering the commencement date of licences in accordance with the availability of spectrum under the restack process?

Free TV submits that before this is considered as an option, ACMA must be able to demonstrate that new mobile services could operate in the cleared spectrum without interfering into adjacent broadcasting services where restacking is yet to complete. Please refer to Section 6 for more details.

20. Are there any other considerations that the ACMA should take into account in determining the commencement date for the digital dividend spectrum licences, such as the availability of spectrum in other bands, for example, 2.5 GHz?

Whilst Free TV expresses no view on this matter, it is vital that ACMA first ensures there is adequate planning for migration out of the 2.5 GHz band for Electronic News Gathering licensees. This must include the identification of sufficient bandwidth in all areas and this

should take place before the reallocation of the spectrum in order to ensure certainty for all stakeholders.

Licence Duration Questions

21. How long should the spectrum licences operate? Is it preferable to have as long a term as possible, that is, 15 years? Are there reasons why a shorter term might be preferable?

Free TV offers no comment

22. Should all the spectrum licences have the same term or should the ACMA be flexible in the term of the licence?

Free TV offers no comment

Core Conditions Questions

23. Should the ACMA consider incorporating either of the optional core conditions in the digital dividend spectrum licences? Why or why not?

Non-core Conditions Questions

24. Are there any optional conditions that the ACMA should consider including in the digital dividend spectrum licences? Why?

Free TV submits that digital dividend spectrum licensees should have a condition added to their licence to pay the full cost of providing an interference management regime for at least 12 months after commencement of their services in any area and remedy any interference to television services.

2.5 GHz Questions

25. If the digital dividend spectrum is available, when would interested parties expect to deploy a proposed service using this spectrum?

Free TV offers no comment

26. If there was a delay in the availability of either the digital dividend or the 2.5 GHz band spectrum, when would this start to affect plans to deliver services to consumers? How would this affect investment or operating plans of interested parties?

Free TV offers no comment

27. What is the expected cost to interested parties of a change in investment or operating plans arising from a delay in the availability of the digital dividend or the 2.5 GHz band?

Free TV offers no comment

28. How is the planned use of the digital dividend dependent on access to other bands, including for example the 2.5 GHz band?

Free TV offers no comment

29. If the 2.5 GHz band spectrum is available, when would interested parties expect to deploy a proposed service on the 2.5 GHz spectrum?

Free TV offers no comment

30. What is the preferred approach to the timing of the digital dividend and 2.5 GHz band auctions? Should the timing of these two allocations be coordinated?

Free TV offers no comment on the timing of the auction process, but notes that discussions are still continuing between ACMA and ENG licensees regarding a migration plan and there is as yet no conclusive and operationally comparable solution for alternative ENG spectrum. In our view, there needs to be an agreed solution and transition plan before the spectrum is offered for auction.

Attachment 2 – LTE System and Signal Characteristics toward Determining Protection of DTTB

As a result of the recent studies and tests on a real LTE system discussed in the October 2010 meeting in the ITU-R Working Party 6A, a liaison statement (Document 5D/874-E) was sent from ITU-R Working Party 6A to ITU-R Working Party 5D seeking information on the following:

1) What frequency arrangements will be used by IMT?

2) What channel sizes will actually be deployed under typical operating conditions?

3) What is the maximum absolute instantaneous emission power levels to be expected from UEs and BS both inside and outside the band (OOB)?

4) Will UE's have an external antenna connection in accordance with the 3GPP standard?

5) What impact will MIMO or adaptive antenna techniques have on IMT power levels. Including more detailed information on the potential risk of beam forming from BS to individual UEs that might cause power variation on the received TV signal if the TV antenna falls in and out of the beam path at different times. How likely is this to occur given the likely beam widths, BS heights etc, and how frequent and with what amplitude is the power variation likely to be under different traffic loadings?

6) Can WP 5D confirm that the analysis of the LTE BS signal characteristics in Document 6A/432 is realistic for the three different traffic loading conditions of 0%, 50% and 100%?

7) Noting receiver tests have shown degradation in some receivers against LTE time varying signals of a specific periodicity. Further different receivers have sensitivities to different periodicities in the LTE signal.

a) What are the temporal characteristics of the power envelope, e.g., power saving and variations with system loading?

b) Is there a mechanism in the base station to restrict the range of time periodicity to certain limits in order to assist the design of future receivers?

c) Whether operators will implement mitigation methods to reduce the time variation degradation in DTV receivers such as dummy data transmission in the empty slots.

8) Can WP 5D provide the latest information on the unwanted emission masks given in Recommendation ITU R M.1580 and Recommendation ITU-R M.1581?

9) Will the transmission characteristics for LTE Advanced be the same as LTE?

10) What are the transmission characteristics for FEMTO cells?