

The digital dividend: opportunities and challenges

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■ For several years, the digital dividend has been a hot issue extensively discussed by broadcasters and operators of telecommunication and other services. Apparently, there is a lot at stake for these industries and, therefore, also for end-users. The crucial role of governmental bodies in this process is also evident. Some important choices have been already made; however, further decisions are still to be taken.

This article considers hopes and concerns that have been voiced in regard to the digital dividend and looks at the activities of telecommunication administrations on this issue.

What is the digital dividend?

Digital compression systems now available for digital television systems allow the transmission of several (up to six, depending on the coding and modulation techniques) standard digital television

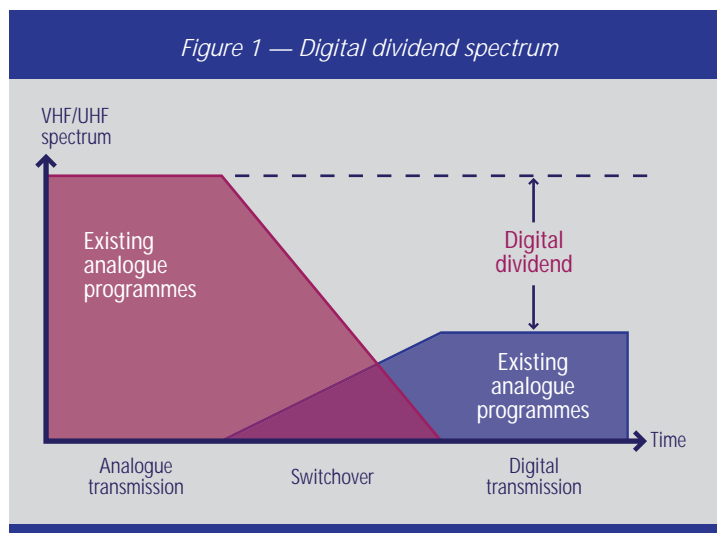
channels of acceptable quality in the radio-frequency spectrum previously used by a single analogue channel. Typically, there are four or five terrestrial analogue services in a given region, so their digitization into a single digital television channel will considerably reduce the overall use of spectrum.

A number of Recommendations from ITU's Radiocommunication Sector (ITU-R) dealing with coding, compression and modulation techniques for digital terrestrial television broadcasting have indirectly contributed to the process that is finally yielding the digital dividend. For example, the pioneering Recommendation ITU-R BT.798 stipulates "that digital television terrestrial broadcasting should fit in the channels (6, 7 and 8 MHz) intended for analogue television emission in the VHF/UHF bands". This Recommendation, forbidding the bandwidth used for digital programmes to go beyond the analogue



channel bandwidth, paved the way for the development of sophisticated digital compression techniques.

The amount of spectrum in the VHF and UHF bands that is above that nominally required to accommodate existing analogue programmes, and that might be thus potentially freed up in the switchover from analogue to digital television, is defined as the digital dividend. This is illustrated in Figure 1.



How can the dividend be used?

The amount of spectrum to be released in the switchover depends primarily on national peculiarities such as the geography and topography of a country, the degree of penetration of cable and/or satellite television services, requirements for regional or minority television services, and spectrum usage in neighbouring countries. The amount also depends on the digital television technology being implemented to replace analogue services. Therefore, the size of the digital dividend will vary from region to region, and from country to country.

The range of users to which the digital dividend spectrum can be opened is wide and includes additional terrestrial broadcasting services, mobile multimedia applications, mobile communications, and wireless broadband access systems. Broadcasters can significantly expand their services to potentially include delivery of new interactive and high-definition television programmes. Mobile television, being a good example of a convergent service, is also a promising potential user of the digital dividend spectrum.

New potential users that do not belong to the broadcasting family of applications consider the dividend spectrum as an opportunity to respond to the growing demand for new wireless communication services. These would include delivery of ubiquitous broadband Internet access to areas not yet reached by landlines, thus helping to overcome the digital divide. Moreover, there might also be a possibility for broadband access in the empty spaces between television channels in a particular region, for example in white spaces (temporally and/or geographically unused television channels).

The digital dividend spectrum is located between 200 MHz and 1 GHz. These frequencies possess superior signal propagation characteristics to those at, for example, 2.4 GHz. The industry has expressed interest in using these lower frequencies to facilitate provision of coverage and thus to achieve an optimal balance between transmission capacity and operational range. This would mean that less infrastructure would be required to provide wider mobile coverage, all resulting in lower costs for communication services, especially in rural areas.

Spectrum issues in accessing the benefits of the digital dividend

If the digital dividend is to be utilized by mobile services, a worldwide (or at least region-wide) frequency harmonization is a required condition. Such harmonization would create enormous benefits in terms of social impact and increased productivity. In particular, mobile operators and equipment manufacturers would be able to address a large market, leading to economies of scale and preventing high costs for handsets.

The possibility of harmonization depends primarily upon the timing and coordination of the analogue-to-digital switchover process; the digital dividend spectrum will be fully available only after analogue switchover. In this respect, the GE06 Agreement (adopted in Geneva at the ITU Regional Radiocommunication Conference 2006) calls for the transition to be completed by 17 June 2015 for the countries in Region 1 (except Mongolia) and the Islamic Republic of Iran. In Europe, many countries will close down their analogue television transmissions by 2012.

The situation is quite different in Region 3, where some countries have made their plans for the analogue switch-off, while others are only considering this possibility. Moreover, different analogue standards and different channel raster are used across Region 3. Another constraint is that broadcasting channels are scattered on a non-contiguous basis across the whole UHF band. Though digital terrestrial television services have been introduced in some countries of Region 3, they are based on different standards (DVB-T, ATSC, ISDB-T, DMB-T), all using a different channel raster. In contrast, a single standard (DVB-T) is chosen in the countries that are contracting members of the GE06 Agreement.

It should be noted here that parts of the UHF band are also allocated to primary terrestrial services other than broadcasting. Protection of other primary services may limit the ability to use the digital dividend in some countries.



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ITU activities

The World Radiocommunication Conference 2007 (WRC-07) allocated the upper part of the UHF band (790–862 MHz) to the mobile service in Region 1 as from 2015, and allowed some countries of this region to use this allocation immediately, under certain conditions. These conditions include protection of the GE06 Agreement and all its future developments. Countries that wish to implement mobile services in the band 790–862 MHz are required to protect broadcasting services against harmful interference. Also, before putting mobile services into operation, agreements from neighbouring countries must be obtained.

These ITU allocations open up the possibility (but not the obligation) of choosing for the digital dividend up to 72 MHz of spectrum (18 per cent of the UHF television band) currently allocated to the broadcasting service. It should be said that 320 MHz (82 per cent of the UHF television band) is being reserved predominantly for the broadcasting service in Region 1.

Furthermore, WRC-07 identified the UHF frequencies allocated to the mobile service on a primary basis in all three ITU regions for use by administrations wishing to implement International Mobile Telecommunications (IMT). This can be considered as a signal to industry to develop equipment for world-wide use.

However, recognizing the potential for interference between the mobile service and other primary services in the band 790–862 MHz, WRC-07 decided that ITU would conduct technical studies on sharing among the mobile and other allocated services in the band in Regions 1 and 3. The results of these studies will be reported to the World Radiocommunication Conference 2012 (WRC-12) under Agenda item 1.17, in order to ensure the adequate protection of serv-

ices to which this frequency band is allocated, and take appropriate action.

In view of the complexity and importance of the issues related to Agenda item 1.17, a dedicated Joint Task Group 5-6 (JTG 5-6) was established. It studies how the mobile service can share the relevant band with the broadcasting, aeronautical radionavigation and fixed services. Recognizing that there is a lot at stake with respect to the future of the digital dividend, administrations are attaching much importance to the activities of the group, whose work is scheduled for completion in May 2010.

End of the story — or a new beginning?

The digital dividend arises from the ability of digital compression systems to allow the multiplexing of several television programmes and their transmission over the spectrum previously used by a single analogue television channel. It means that the process of gaining access to the digital dividend spectrum is still progressing, as more advanced digital terrestrial television standards for infrastructure and for compression (e.g. the second generation of digital terrestrial television broadcasting transmission systems), offering higher bit rate capacity per Hz than existing systems, are being gradually developed and introduced.

The digital dividend spectrum can be used for innovative services, from improved and new interactive television broadcasting to mobile communications and wireless broadband Internet access. Only a fair and well-balanced distribution of this spectrum among different information and communication technologies will deliver the full social and economic benefits of the digital dividend, thus maximizing its value for all users. This can only be achieved by efficient and effective spectrum management. All concerned sectors need clarity on this issue when developing their strategies for the coming years. ■