Regulatory framework distribution of high definition television channels in the western Balkan countries

Zaklina Spalevic[1], Zoran Trajcevski[2], Zeljko Bjelajac[3], Milan Pocuca[3], Dusko Dimitrijevic[4]

[1] Faculty of Entrepreneurial Business,, University Union Nikola Tesla, Belgrade, Serbia,
[2] Broadcasting Council of The Republic Macedonia, Skoplje, Republic of Macedonia,
[3] Faculty of Law for Economy end Justice, University Business Academy, Novi Sad, Serbia,
[4] Institute of International Politics and Economics, Belgrade, Serbia.

Abstract

The paper includes an analysis of the distribution of HDTV channels in the countries of the former Yugoslavia: Serbia, Montenegro, Croatia, Slovenia, Bosnia and Herzegovina and Macedonia. An overview of the number of channels is made based on the different types of distribution: DVB-T, DVB-S, DVB-C and IPTV. Furthermore, the presence of the HDTV channels of national and foreign production is presented, as well as the presence of channels by genres. Comparison is made between the presence of the HDTV channels and the SDTV channels in different types of the distribution.

Key words: Law Framework, Abuse, Digitalization, *SDTV* channels*, HDTV* channels*, DVB-T, DVB-S, DVB-C, IPTV*.

1. Introduction

HDTV (High Definition Television) is a technology that offers video and audio quality significantly higher than the traditional video and audio technology (analogue PAL, NTSC, SECAM, and digital SDTV)[1].

Considering the higher resolution, the image is clearer, less blurry and generally closer to the reality.

HD offers smoother motion, more detailed and vivid colours, and a very high quality multi-channel sound that makes the viewing experience even better.

HDTV offers two types of signal quality: 720 and 1080 are the basic codes to which either letter "i" or letter "p" is added, which indicates the method of image scanning (i = *interlaced* – scanning of every other line, and then the other lines; p = *progressive* – line by line scanning). 720 and 1080 represent the "height" of the image, and the width is 1280, or 1920 pixels).

Table 1. Primary DTV standards

DTV	Resolution	Aspect ratio	Frames per second
HDTV	1920 x 1080	16:9	24p, 30p, 60i
	1280 x 720	16:9	24p, 30p, 60i
SDTV	704 x 480	16:9	24p, 30p, 60i, 60p
	704 x 480	4:3	24p, 30p, 60i, 60p
	640 x 480	4:3	24p, 30p, 60i, 60p

The number of frames by second (FPS) is indicated next to the code, for ex. 720p60, which shows the resolution 1280×720, a progressive way of image scanning and 60 frames per second.

Transmission of television / video signals in its uncompressed form requires a very high bandwidth that is beyond the bandwidth supported by the modern VDSL technology.

In particular, HD (*High definition)* and 3D video signals require a high bandwidth.

Transmission of uncompressed HD video signal at full resolution 1920x1080 in 4:2:2 format, requires a bandwidth of about 3 Gb/s, and for 3D image even more. Therefore, different algorithms are used for compression of video signals.

The level of compression depends on the algorithm that is used for the compression (MPEG 2, MPEG 4,...) and may vary.

The required bandwidth, when MPEG2 standard is used for broadcasting of HD signal is about 20 Mb/s, whereas for SD (standard digital television) standard with a resolution of 720x576 lines - about 4 Mb/s. If the MPEG4 standard is used, then for the same image quality it requires half the bandwidth.

The MPEG2 standard is mostly used in the European televisions, although recently the MPEG 4 standard is more often used [1,2].

In order to broadcast as many signals to the end users by different TV studios, multiplexing of video/audio signals is used. The sound is embedded in the image, so it is transmitted along with the image.

For the HD signal, the so-called surround sound is also transmitted, which will give an illusion that the viewer is in the midst of the events seen on television.

2. Wide application of the optic technology and signal quality

FTTH is the most capable technology, which is able to conduct the future services to the location of the user. Primarily this is based on the excellent features of the optical fibres such as the unlimited bandwidth that enables much more services compared to copper pairs as a medium or any other medium. Today, there are no technological obstacles to build a FTTH network because there are various optical components such as connectors where mechanical joining of the optical fibres is made, which indicates that splicing is not necessary; there are fibres that have a high elasticity (r<10mm) without causing considerable deterioration; there are also very flexible and compact cabinets which serve as optical-cable outlets and many other components, which makes the construction of this network much easier. The services that the operators can offer through their FTTH network consist of communication and entertainment services that include transmission of voice, fast Internet access, broadband cable television, broadband satellite television, interactive two-way broadcasting of video recordings, etc. Furthermore, the FTTH network that is based on wavelength multiplexing opens additional space for future new services, and intensive efforts are made to provide the possibility for statistical multiplexing of bursty traffic such as the IP (Internet Protocol) data transfer [1].

The quality of the signal with which the radio broadcaster works, should meet the following criteria: to be in colour according to the G/PAL norm; the production of the audio-video signal should be in a digital format and every TV station should possess output audio compressor/limiter. Table 2 shows the bit rates of compressed television signals that are used in practice in broadcasting, obtained based on MPEG2 and MPEG4 standards.

Table 2. Compressed video/audio signal bit rates for certain standards

Video Compression Standards	TV video resolution	Compressed video/audio signal bit rates
MPEG-2	SDTV	2 – 4 Mb/s
	HDTV	15 – 20 Mb/s
MPEG-4	SDTV	1.5 – 2 Mb/s
	HDTV	6 – 8 Mb/s

3. Legal frame for digitization in the countries of former Yugoslavia and comparison with the situation in Europe, USA and Japan

The digital technology rapidly replaces the analogue technology in many areas. All broadcasted signals receive a certain level of noise or interferences from other signals. With the analogue signals, such noise or interferences is part of the received signal and cannot be separated from the audio or video signal. With the digital systems, the receiver only needs to decide whether the received signal is 0 or 1. If the noise is low (<0.5), the original signal is decoded without error. The benefits from the digital television are:

- Good program contents,
- Excellent technical quality (audio and video),
- Simple navigation (program guide),
- Useful additional information,
- Saving of frequencies, which are a national limited resource.

The digitalization, as a global process of the broadcasting modernization, has started nearly two decades ago. Digital television was introduced in the United States of America in 1998, while the switch-off process of the analogue signal of the largest TV transmitters finished in June 2009, although certain low power transmitters continue to broadcast with analogue signal. Apart from the superior image, which is received through the digital signal, and the possibilities to watch in larger either joint or split screens, the remaining frequencies in the United States of America, the digital

dividend, worth $ 18,957,582,150, which price was obtained at a public auction by the telecommunications operators. Japan in July 2011 was the first country in Asia, which ended the era of analogue broadcasting that lasted 58 years. As in the previous case, the digital dividend has been used for conversion into telecommunication services.

In Europe, the process of full digitalization is slower in comparison with the United States of America and Japan. The process is completed in some of the European countries, in some it is a simulcast period and some have not even started their process of digitalization [3,4,5]. The following European countries have fully completed the television digitalization process:

- **Netherlands** transferred to a complete digital signal in December 2006.
- **Finland** switched off the analogue signal in September 2007. Interesting for this country is the fact that their cable network was completely digitalized as of February 2008.
- **Andorra** completed the transfer in September 2007.
- **Sweden** switched off the analogue signal region by region. The process started in September 2005 and was completed in October 2007. However, this only applies to digital terrestrial television.
- **Switzerland** started the switch-off process in July 2006 and finished the process in November 2007.
- **Germany** started the switch-off of the analogue signal in November 2002 in the region of Berlin and finished the complete switch-off process in November 2008, except one of the largest transmitters in Bad Mergentheim, which was switched off in June 2009.
- **Denmark** switched off its analogue signal in the whole country in November 2009.
- **Norway** started the switch-off process of the analogue transmitters in March 2008 and after one and a half-year of simulcast period, all analogue signal transmitters were switched off in September 2009.
- **Belgium** as a country comprising of two entities, switched off the analogue transmitters in two phases, first in Flanders in November 2008 and in Wallonia in March 2010.
- **Spain** completed the switch-off of the analogue signal transmission in April 2010, after five years of simulcast period.
- **Latvia** completed the conversion of its analogue to digital television in June 2012.
- **Estonia** completely switched off the analogue transmitters in July 2010.
- **San Marino** started the use of the complete digital signal in December 2010.
- **Luxembourg** switched off its last analogue transmitters in December 2010.
- **Monaco** switched off the analogue television in May 2011.
- **Austria** started the multicast period in March 2007, which lasted until June 2011.
- **Malta** switched off all analogue transmitters in October 2011.
- **Cyprus** completely transferred to MPEG-4 broadcasting in July 2011.
- **France** switched off all analogue services (terrestrial, cable and satellite) in November 2011.
- **Portugal** started the digital broadcasting in April 2009, and three years later in April 2012 switched off all analogue signal transmitters.
- **Czech Republic** switched off the last analogue transmitter in June 2012.
- **Italy** started the digitalization process in October 2008 and finished it in July 2012.

The following European countries have started, but have not finished the digitalization process yet:

- **Bulgaria** will finish the process in September 2012
- **Greece** is expected to finish the multicast in 2013
- **Hungary** prolonged the signal switch-off from January 2012 to January 2015.
- **Iceland** will be fully digitalized in 2013.
- **Ireland** started the simulcast period in October 2010 and will finish the complete switch-off of the analogue transmitters in October 2012.
- **Lithuania** intends to start the complete digitalization in October 2012.
- **Poland** will finish the simulcast in July 2013.
- **Romania and Russia** are planning to switch off the analogue transmitters in January 2015.

- **Slovakia** is expected to switch off the signal by the end of 2012.
- **Turkey** started the experimental broadcasting in 2006, and will finish the switch-off in 2014.
- **Great Britain** started the digital signal broadcasting in October 2007 and is gradually transferring to complete digitalization that should happen by the end of October 2012.

Albania, Moldova and Ukraine have not started the digitalization process yet.

The countries of the former Yugoslavia are carrying out the digitalization process. Part of them, like Slovenia and Croatia, have already finished it, while the remaining Montenegro, Serbia and Macedonia will finalize the process in 2013. Bosnia and Herzegovina will finalize the digitalization on 01.12.2014.

Croatia switched off the analogue signal on its national television in November 2010. The digitalization process was carried out in accordance with the Strategy for conversion from analogue to digital TV broadcasting and the Law on Electronic Media [6].

Slovenia switched off its big transmitters in December 2010, while the complete TV digitalization was done after the switch-off of the local signal broadcasting transmitters in June 2011. The digitalization process was regulated and carried out in accordance with the Digital Broadcasting Act, adopted on 09.11.2007 and its modifications dated 29.10.2010 [7].

Montenegro will finalize the digitalization process in the first quarter of 2013. The process is carried out in accordance with the Strategy for conversion from analogue to digital broadcasting systems in Montenegro [8]. This document is for public usage: the citizens as end users of the new services, the industry, network operators, program content providers, state authorities and public institutions of Montenegro, as well as all other entities that will be in any way, actively or passively, directly or indirectly, involved in the process of conversion from analogue to digital broadcasting systems. Therefore, the purpose of this document is most rationally to examine the starting points, opportunities and future challenges and to offer viable solutions to the Montenegrin society. The purpose of the strategy is to provide guidance, propose specific solutions, as well as to inform and prepare all relevant entities involved in conversion to digital broadcasting systems process, in order to achieve effective implementation as soon as possible.

Serbia started the broadcasting of the first digital television in 2005 and is expected to switch off the analogue transmitters by the end of 2013.

The process of digitalization in Serbia is carried out in accordance with the Strategy for conversion from analogue to digital radio and television broadcasting in the Republic of Serbia and the Decision on amendments of Strategy for conversion from analogue to digital radio and television broadcasting in the Republic of Serbia [9].

The Strategy for conversion from analogue to digital radio and television broadcasting in the Republic of Serbia (hereinafter: Strategy) defines a framework for conversion from analogue to digital radio and television program broadcasting, which is based on modern advances in the digital broadcasting, as well as in the areas affecting it or deriving from it, in order to make more efficient and better quality delivery of television, radio, multimedia and other important contents to the end user.

The Strategy defines the basic strategic guidelines for introduction of the digital and switch-off of the analogue television and radio programs in the Republic of Serbia, which will adequately achieve the fundamental national interest in the field of introduction and development of the digital electronic communications. In the process of defining the guidelines, it was acted in accordance with the conclusions of the Regional Radio communication Conference, International Telecommunication Union brought in May and June 2006 in Geneva and the Recommendation of the European Commission, COM (2005) 204. The switch-off of the analogue signal and the transition to digital TV program broadcasting will be carried out in phases. The Action Plan for implementation of the Strategy is its integral part, which regulates the obligations of the competent bodies in the digitalization process and defines the timetable for its implementation.

Macedonia will finish the digitalization process in June 2013. The digitalization process is carried out in accordance with the **Broadcasting Law from 2005** and the amendments from 19.02.2007, 19.08.2008, 15.01.2010, 18.07.2011 and 27.01.2012, as well as the Strategy for the Development of Broadcasting 2007-2012 [10,11].

4. HDTV Distribution Standards

DVB-S (DVB-Satellite) is the oldest DVB standard proposed by the DVB Project. It was developed in the course of the year 1993, adopted in 1994 by the European Telecommunications Standards Institute (ETSI). It is a satellite long-distance broadcast of digitalized audio and video content through a complex system of transmitters, geostationary satellites and corresponding receivers. The second generation of this standard, ratified by the ETSI, is DVB-S2 (which has higher capacity, uses more efficient modulations and H.264/VC-1 compression), high definition content support (HDTV). Compared to DVB-S, DVB-S2 gives about 30% better performances, which in combination with MPEG-4 AVC (H.264) compression gives an opportunity the HDTV program to be broadcasted with the same bit rate as previously needed for SDTV. **BIH** the first deadline (01.12.2011) was set by the Strategy (by-law), which was adopted by the executive government of BiH (Council of Ministers) [12]. Since that deadline passed, the new deadline is set for 01.12.2014. in the Action Plan (also by-law), which was prepared and should be adopted by the Council of Ministers soon.

DVB-C (DVB-Cable) is a variant of digital content broadcasting via cable distribution network. It began with a parallel development and modification of the DVB-S standard, and adopted in 1994.

DVB-T (DVB-Terrestrial) is the youngest and the most complex system from the group of the DVB standard. The first concepts were adopted 1993 and the first final version in 1997. It refers to digitalized audio and video content broadcasting via terrestrial broadcasting technology in the VHF and UHF range using the conventional systems of transmitters and corresponding receivers. DVB-T2 is an enhanced version of the DVB standard for terrestrial broadcasting. Compared with DVB-T, DVB-T2 offers significantly less sensitivity to noise and interference. It provides 30-50% higher data flow, which is particularly suitable for HDTV [1].

Internet Protocol Television (IPTV) is a system, which provides Internet Television services through switching of the network infrastructure, architecture and networking of the Internet protocol. For example, access to the Internet is provided with the broadband networks, instead of being delivered through traditional radio frequency broadcasting, satellite signal and cable television (CATV) formats. With development of the telecommunications, especially the broadcasting technique, there was a possibility a large amount of data to be transmitted over the standard telephone structures. In such manner ADSL was developed, which was used as an IP structure for IPTV broadcasting. It created an opportunity for transmitting of digital TV signal to a large number of households over the telephone line, which was not possible before. The broadcasting market is becoming more and more interesting and important from the electronic communications perspective due to the phenomenon of convergence, i.e. breaking down barriers/boundaries between these two markets - broadcasting and electronic communications. The process of digitalization in the radio broadcasting sector has led to increasing the importance of the telecom operators because now they can start offering digital TV services. Picture 1 shows the number of TV connections as a percentage of the total EU population in July 2007, and Picture 2 shows the number of IPTV users as a percentage of total population in each of the member countries of the European Union in July 2007.

Except for the ADSL, the IPTV has later, due to its advantages (two-way communication) started to be used in other places where IP structure has been developed, regardless of whether it comes to ADSL, cable Internet, wireless, 3G.IPTV includes live TV coverage, as well as (VoD) service. Playback of IPTV requires a computer or a set-up-box connected to the TV. The video quality is typically achieved with the use of compressed data, using MPEG-2 or MPEG-4 formats [1,4].

Primary protocols among the standards for IPTV systems are as follows:

- Live IPTV uses IGMP version 2 or 3 (for IP v4) for connecting with the multicast infrastructure (TV channels) and for changing TV channels. IGMP operates within LANs or VLANs, so that other protocols, such as the Protocol Independent Multicast (PIM), are used to route the multicast IPTV signal from one LAN segment to another.
- VOD uses UDP or RTP broadcasting protocols, and the co n trol is carried out by using the RTSP pro t ocol (Real Time Streaming Protocol).

– NPVR (Network Personal Video Recorder), same as the VOD, uses UDP or RTP for IPTV, and the control protocol RTSP for communication with the end user.

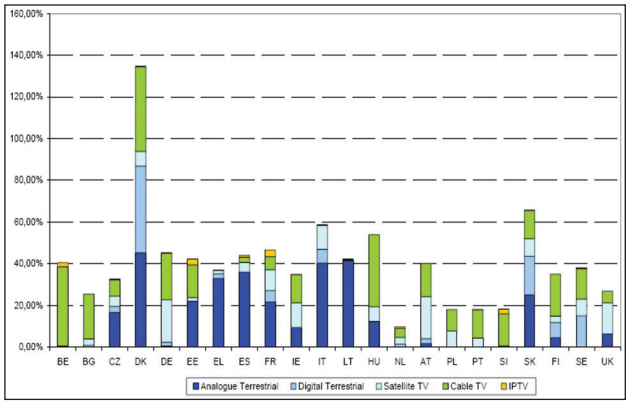


Figure 1. Number of TV connections as a percentage of total EU population in 2007

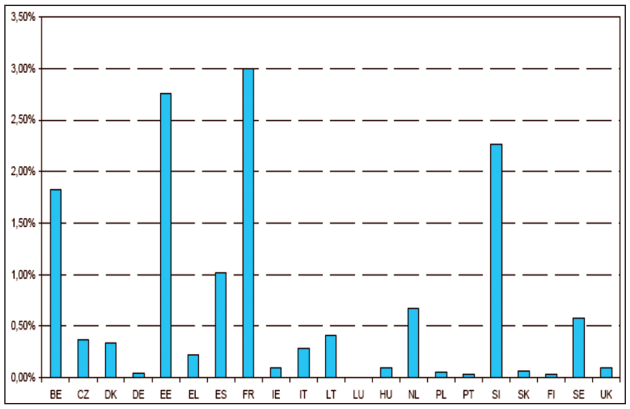


Figure 2. Number of IPTV users as a percentage of the total population in each of the EU member states in July 2007

The traditional way of distribution of TV signals allows only a limited number of available channels to the users, compared to the IPTV service, which allows individual selection of channels to every user.

The IPTV or television services, provided over a controlled IP (Internet Protocol) network, are expected to be considerably developed and enlarged in the last few years.The IPTV service has the following important features:

– Continuous stream (as a TV broadcast network),
– Hundreds of 24 x 5 channels,
– Uniformed content format (all channels share one same method of compression and approximately same bit rate),
– It is provided through an access network (for ex. DSL, FTTH …),
– The television broadcast is available through set-top boxes.

Only three additional network elements are required for the implementation of IPTV: a video encoder for conversion from the broadcast television into IP packages (in heading), access network for connecting the subscribers with their service provider and the Set Top Box receiver in order to convert from IP into video signals in the subscriber's premises. Due to the large bandwidth used by the video signal, it requires a compression procedure. The standardized group Motion Pictures Experts Group (MPEG) has developed two standards for video signals compression MPEG 2 and MPEG 4 (H.264) standard. MPEG-2 is based on coding the overall stream consisting of video, images, audio and translation, which is not the case with MPEG-4. MPEG-4 defines the way of coding the audio, video and fixed images; also the text, graphics, synthetic (generated) sounds. IPTV is practical because of the unbelievable levels of compression, which are achieved with the contemporary video codecs, as the video streaming may be compressed more than 100:1 by using the newest MPEG-4 (H.264) codec. Even with this level of compression, IPTV is the largest broadband service that was ever widely applied in the network. Just one hour of use of this service demands 5Gb, which is equal to 1000 hours of voice and more than the annual quantity of e-mail that the subscriber will receive or send in the network. A single video streaming consumes between 1.6 Mbps and 12 Mbps, depending on the encoding method and whether the streaming is with Standard Definition-SD or with High Definition-HD.

IPTV-2 enables broadband Internet to the service providers for providing "Triple Play" to the users, an open possibility to rule the TV market and earn money. On the other hand, the viewer will get the requested service.

Web TV, which is a rapidly growing digitalization technology, using various forms of the new media to deliver original shows or series to an audience. WebTV allows the TV to be linked to the Internet, primarily for browsing the web and the e-mail. While WebTV does not allow as much

functionality as a computer based web browser, it is a low price for a traditional connection to a computer linked to the Internet.

Webcasting is a media lecture distributed via Internet by using a streaming technology to distribute a source of specific contents to many simultaneous listeners/viewers. Basically, webcasting is "broadcasting" via the Internet. The term webcasting usually refers to non-interactive linear flows or events. Webcasting is a delivery of media contents and all digital information in different formats, such as e-mail, graphics, audio and video files on the World Wide Web to the Internet users. This definition of the webcasting refers to its two characteristics:

– Recipients must have access to the Internet in order to get the contents and the information
– Contents may vary from a simple text to rich media files with multimedia capabilities.

5. HDTV channels through different types of distribution

The HDTV market in the region of former Yugoslavia is relatively new compared to the other parts of Europe. Distribution of HDTV channels has been monitored in the following countries: Serbia, Bosnia and Herzegovina, Montenegro, Croatia and Macedonia through four types of distribution: DVB-T, DVB-S, DVB-C and IPTV. Distribution via terrestrial digital network DVB-T is at its beginning. Slovenia and Croatia have completely converted from analogue to digital transmission, Serbia and Macedonia are in the process of conversion, while Montenegro and Bosnia and Herzegovina are still not broadcasting digital signal.

Unlike DVB-T, DVB-C is much more developed and in all countries the distribution of the channels is simultaneously carried out in analogue and digital format (SDTV and HDTV) with a much wider offer of channels compared to the analogue. Satellite transmission (DVB-S) has significantly developed in the recent years especially in the regions, which do not have infrastructure for DVB-C and IPTV.

Distribution of SDTV and HDTV via IPTV in the recent years recorded the highest growth compared to the other types of distribution. Table 3. shows the number of HDTV channels based on different types of distribution. Figure 3. shows that the most HDTV channels are distributed via DVB-C platforms, except in Slovenia where IPTV keeps the primacy.

Table 3. Number of HDTV channels based on the way of distribution

	DVB-T	DVB-S	DVB-C	IPTV
Serbia	1	9	28	10
BIH	-	7	29	7
Montenegro	-	7	10	5
Croatia	-	10	17	14
Slovenia	-	5	28	30
Macedonia	-	6	10	5

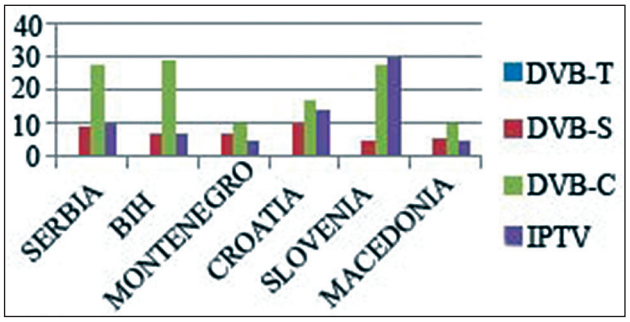


Figure 3. Number of HDTV channels based on the way of distribution

Distribution via DVB-T, except in Serbia, does not exist in the other countries, primarily due to undeveloped infrastructure and high bandwidth that is required for HDTV channel.

Transmission via satellite is present in all countries. The regional platform Total TV distributes HDTV channels in all six countries, while in Serbia and Croatia in addition to Total TV, HDTV services are also offered by Polarismedia (in Serbia) and MaxTV Sat (in Croatia).

Providers that enable the distribution of HDTV via cable network (DVB-C) are present in all countries: in Serbia – SBB and Radius Vector, in Croatia - B.NET, in Montenegro – Cabling, Bosnia and Herzegovina – Telemach, HS, Elta Kabel, Slovenia – Telemach, SIOL CATV, and other providers with lower coverage, Macedonia – Telekabel, Blizoo.

Distribution of HDTV via IPTV is enabled in all six countries: Serbia – Open Telekom, Bosnia and Herzegovina – Super TV, Montenegro – Extra TV, Croatia – Max TV, Amis, Slovenia – SIOL IPTV, T-2, Macedonia – MaxTV.

Channels that are distributed in one country by more than one provider are generally the same; the

only difference is in the individual channels over which certain providers have the exclusive right, such as Sports Club and Arena Sport channels.

Table 4. Number of HDTV channels of national production

	DVB-T	DVB-S	DVB-C	IPTV
Serbia	1	4	9	5
BiH	-	-	2	-
Montenegro	-	-	-	-
Croatia	-	5	4	6
Slovenija	-	-	3	3
Macedonia	-	-	-	3

Table 5. Number of HDTV channels of foreign production localized for a certain spoken region

	DVB-T	DVB-S	DVB-C	IPTV
Serbia	-	2	7	2
BiH	-	6	15	5
Montenegro	-	6	5	4
Croatia	-	2	3	1
Slovenia	-	2	5	2
Macedonia	-	-	-	-

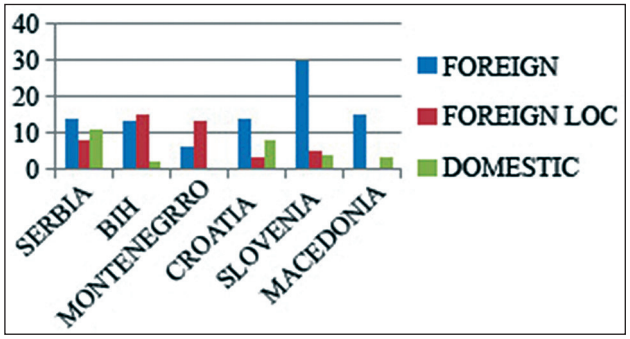


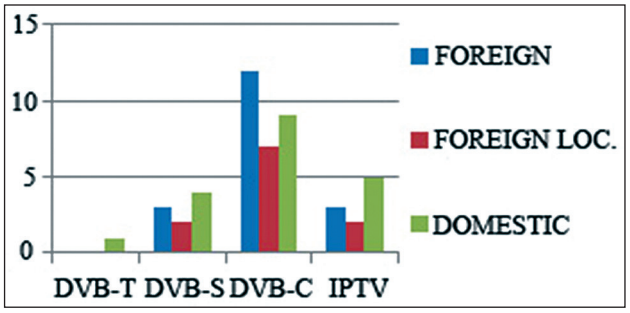
Figure 4. Share of HDTV channels of national production in %

HDTV channels that are distributed are mainly of foreign production, while the national production is less prevalent, and in some countries, it does not exist at all. Market development gives an increasing number of foreign channels that perform localization for specific languages via subtitles or audio, such as the pan-European version of Eurosport, Discovery Channel, Travel Channel, Viasat History / Nature, HBO and others. There are also regional versions of some channels whose production is in Croatia or Serbia, which are, due to the similarity of the language, distributed to other countries, such as Sports Club and Arena Sport channels.

Table 6. Comparison of national, local and foreign HDTV channels; All (different) channels in all types of distribution were subject of the monitoring

	Foreign	Foreign loc.	National	Total
Serbia	14	8	11	33
BiH	13	15	2	30
Montenegro	6	13	-	19
Croatia	14	3	8	25
Slovenia	30	5	4	39
Macedonia	15	-	3	18

Figure 5 shows the number of HDTV channels present in the monitored countries. All types of distribution have been taken into consideration, where one same channel that was present in different types of distribution was monitored as one. The largest number of local channels are available in Serbia, while the largest number of foreign localized channels exist in Bosnia and Herzegovina and Montenegro. The number of foreign localized channels for these two countries has further increased due to the distribution of channels from Serbia (four Sports Club and four Arena Sport channels) because of the similarity of language.



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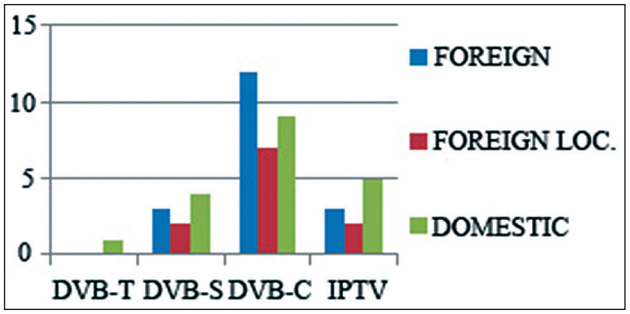


Figure 6. Share of channels in different types of distribution in Serbia

However, if we observe the localization of the pan-European channels, the number of foreign localized channels is similar to Serbia and Croatia.

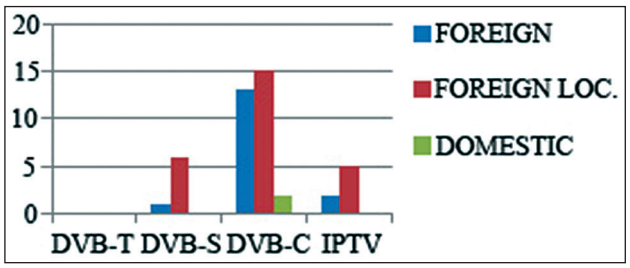


Figure 7. Share of channels in different types of distribution in BIH

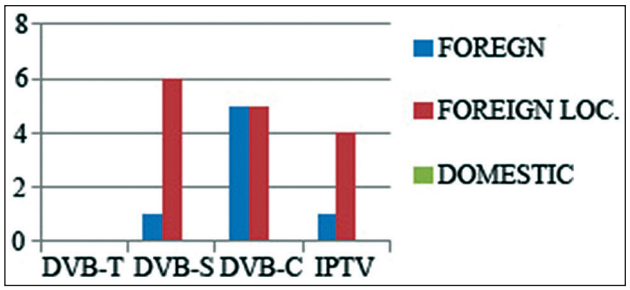


Figure 8. Share of channels in different types of distribution in Montenegro

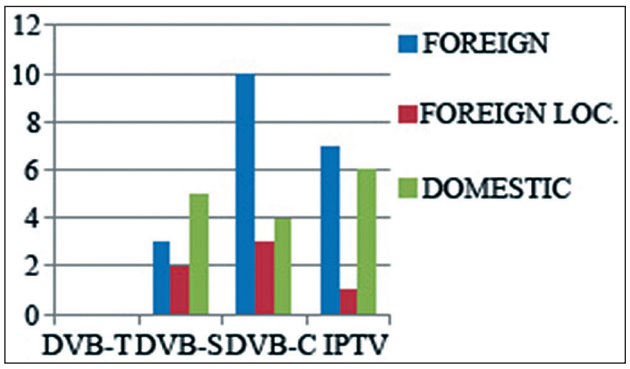


Figure 9. Share of channels in different types of distribution in Croatia

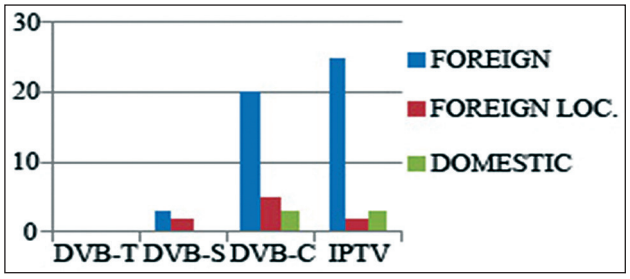


Figure 10. Share of channels in different types of distribution in Slovenia

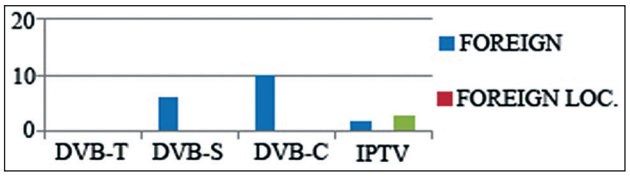


Figure 11. Share of channels in different types of distribution in Macedonia

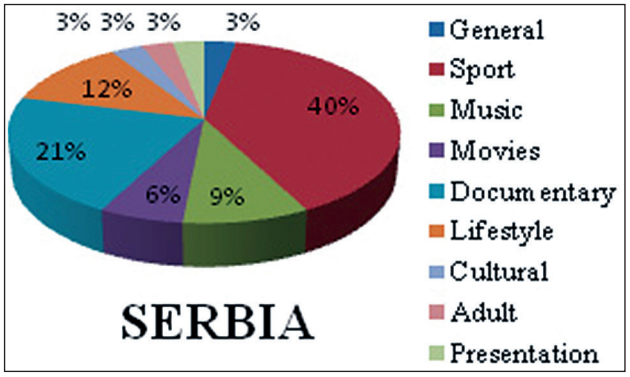
The following HD channels are broadcasted in Serbia: RTS HD, Sport Klub HD, Sport Klub+ HD, Sport Klub Prime HD, Sport Klub Premium HD, Arena Sport 1, 2, 3, 4 HD, FeelMax HD; in Bosnia and Herzegovina: Face HD and Elta HD, in Croatia: Arena Sport Hr 1, 2, 3, 4 HD, Nova HD, Sport Klub Hr HD; in Slovenia: TV SLO1 HD, TVSLO2 HD, Info TV HD, Sport Klub Slovenija HD, and in Macedonia: Kanal 5 HD, Sitel HD and Alfa HD.

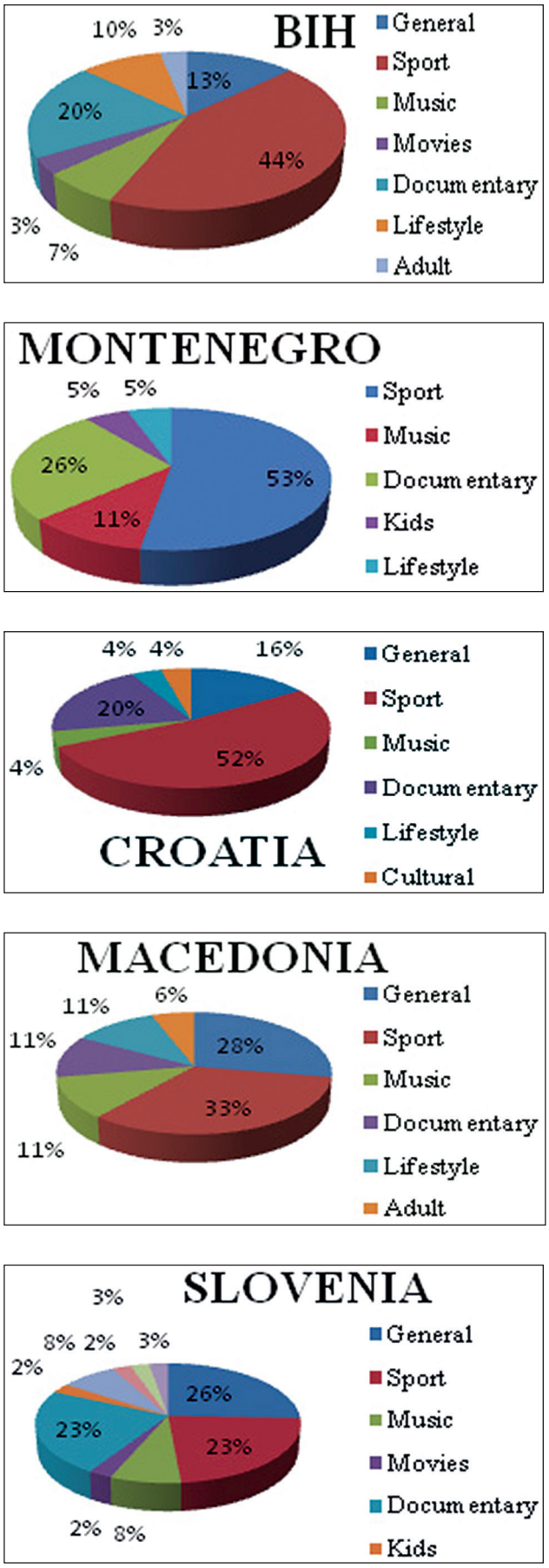
Figures 6, 7, 8, 9, 10 and 11 show a comparison of national, foreign and local channels in all types of distribution for Serbia, Bosnia and Herzegovina, Montenegro, Croatia, Slovenia and Macedonia respectively.

6. Presence of HDTV channels by genre

Picture 12 shows the presence of HDTV channels by different genres in all six monitored countries. In all countries, except Slovenia, the most common are the sport channels, then documentary, music channels and the channels with various contents.

In Slovenia the common are the HDTV channels with various contents, then documentary and sport channels.

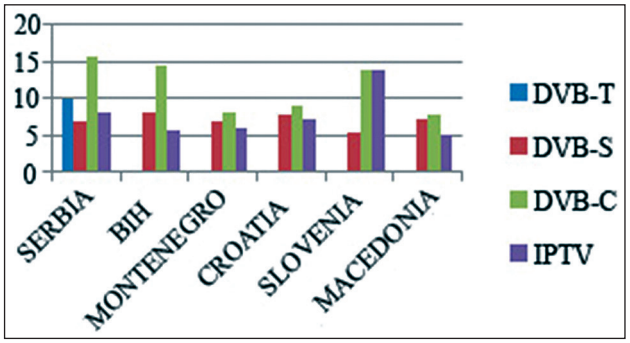




Picture 12. Presence of HDTV channels by genre

7. SDTV and HDTV Channels Ratio

Figure 13. shows the percentage of HDTV channels compared to the total number of channels (SDTV+HDTV) in all four types of distribution for all monitored countries. The largest share of HDTV channels is available in DVB-C platforms. The only exception is Slovenia where the share of HDTV for DVB-C and IPTV platforms is equal.



Picture 13. Percentage of HDTV channels compared to the total number of channels for different types of distribution

8. Conclusion

Benefit of the digitalization is the release of the analogue frequencies that are now used by the terrestrial televisions. In the future, those frequencies will be granted to the mobile operators for the new 4-G generation of mobile telephony, i.e. for faster mobile internet, while the Governments will gain a substantial income from the sale of those frequencies. The most popular method of distribution of HDTV channels is DVB-C, except for Slovenia, where the most popular is IPTV. After DVB-C, the most common way of distributing HDTV is IPTV, while DVB-T is the least popular. The channels of national production are mostly broadcasted in Serbia, then in Croatia and Slovenia, while the other countries have a relatively small share of HDTV channels of national production. The foreign channels that perform localization for these countries have gained huge popularity. Because of the similarity of spoken languages in the region, there are regional channels that are broadcasted in several countries, which makes their broadcasting less expensive. The most popular are the sport and documentary channels, except in Slovenia where the most common are the channels with various con-

tents and documentary channels. In relation to the total number of channels (SDTV+HDTV) on a single platform, the largest share of HDTV channels is in the DVB-C platforms, except Slovenia, where the share in the DVB-C is equal with the IPTV.

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Corresponding Author
Zaklina Spalevic,
Faculty of Entrepreneurial Business,
University Union Nikola Tesla,
Belgrade,
Serbia,
E-mail: zaklinaspalevic@ymail.com