

Transition to Digital TV: Approaches, Standards and Trends in the Case of Kazakhstan

Zhadyra Toibayeva, Arystanbek Mukhamediuly and Sabyr Baizakov

Kazakh National Academy of Arts named after T. Zhurgenov, Panfilov Street,
127, 050000, Almaty, Kazakhstan

Abstract: Many countries in the developing world work on a comprehensive policy approach for transition from analog TV to digital TV. Digital TV allows for sound and image of a much higher quality as well as offers a wide choice of channels and programs. Broadcasting companies can offer several programs simultaneously, applying a spectrum amount required for one analog channel only. In addition, transition to digital technologies leads to waterhouse effect reduction due to a considerable, virtually tenfold, saving of power consumption by broadcasting transmitters. However, the mechanism of transition to digital TV in various states differs to a great extent. In the present article the policy approach for transition to digital TV in the case of Kazakhstan is being reviewed.

Key words: Transition to digital TV • Television lines • ATSC • ISDB-T • DVB-T2 standards • Kazakhstan

INTRODUCTION

For tens of years the spectrum in very-high frequencies (VHF) and ultra-high frequencies (UHF) brands globally was allocated for analog television broadcasting. States and regions have been applying various approaches to make use of this possibility.

The digital TV epoch came in the 1990s. But different countries applied different approaches. Virtually simultaneously in Europe and the USA started works on the national standards-ATSC in the USA and DVB in Europe. In the second half of the 1990s digital television in Europe surely started to push out analog television, at the beginning-in satellite/cable television. Then, in the urban conditions-in majority of countries the issue of “capacity” of TV-frequencies was seriously discussed and debated. For example, in Berlin the analog broadcasting totally ceased to exist. In Russia the radio frequency problem has been discussed by specialists for a long time.

The Japanese were standing apart. They developed an independent digital TV which is called ISDB. It is in many ways analogous to the European family of the DVB standards but priority is given to data transmittance, not

TV-signal; ISDB performs better in certain conditions. Notwithstanding this, it did not get spread in Japan (only Brazil is considering transition to ISDB).

MPEG-2 video lies in the basis of the three standards (American ATSC, European DVB and Japanese ISDB). These standards mainly differ in usage of frequencies, modulation and signalization methods. As the European standard DVB, has been accepted recently in Russia, particular attention will be paid to it.

Earlier, on this theme there were published such works as: Gregory Taylor “Shut Off The Canadian Digital Television Transition” [1]; KEXIN ZHAO, MU XIA, MICHAEL J. SHAW “What Motivates Firms To Contribute To Consortium-Based E-Business Standardization”, Journal of Management Information Systems [2]; Sung-Young Kim “Transitioning from fast-follower to innovator: The institutional foundations of the Korean telecommunications sector, Review of International Political Economy [3]. The present article is based on the experience of the above-mentioned scientists.

In the present article I was trying to answer the following questions: What are the main digital television standards parameters and what are the differences

between digital and analog television? How are the problems of transition from digital to analog television solved, based on the experience of leading countries of the world? What problems appeared in Kazakhstan when implementing the program of transition to digital television?

The present article is divided into three parts. In the first part the main parameters of digital television standard are reviewed.

The second part highlights the problems of transition to digital television based on the experience of the leading countries in the world.

The third part reviews the particularities and specifics of transition to digital television in Kazakhstan.

The Main Parameters of Digital Television Standards:

Applying the experience of the world leading countries in transition to digital television, in Kazakhstan, it is planned to cover 95% of the territory of the country by 2014. In the plan approved by the Ministry of Communication and Information of the Republic of Kazakhstan, there were changed the perspectives of digital television development in Kazakhstan. In accordance with the statistics, by 2012 the digital television coverage reached 25% of the territory of the country. And by the 2013 end, it is planned to cover 62% and in 2014-95%.

When considering introduction of new digital television standards experts in Kazakhstan are considering the digital television main parameters.

DVB-is acronym for Digital Video Broadcasting (digital broadcasting). This is a huge family of standards. In Kazakhstan as well as all over the world the systems DVB-S (t. i. satellite), DVB-C (cable) and DVB-T (terrestrial) operate. Coming soon is the DVB-H standard-for mobile phones. In the beginning there appeared the DVB-S (December, 1993) and DVB-C (1994) standards, since in the cable and satellite networks it was required to somehow arrange a huge quantity of channels into a dedicated frequency spectrum. Following them there appeared the DVB-T standard (December, 1995) and Smirnov, A. [4]. The standards varied in frequencies and modulation methods.

In the studio separate video programs (MPEG-2) signals are united by the means of a multiplexor and are converted into the DVB torrent, which “is closed”, is modulated in a required manner and is submitted into the air. In a receiver’s part, the signal is received by the means of an antenna, de-modulated, “is opened” (if it is

closed and a viewer has a right to view this particular channel) and becomes a DVB-container, containing the MPEG-2 signal and additional information. What to do with it is up to a viewer. A viewer can choose a broadcasting language, which is of great importance to Kazakh-speaking viewers, to look through a weekly TV schedule, to read a synopsis to a current TV show or to just listen to the digital radio (normally digital television providers also translate a ten of radio stations in a stunningly high quality; not all the Kazakhstan providers please their subscribers with such a service).

In the DVB system the possibilities for data transmittance (including the Internet) are provided and not only to a customer’s part-the possibilities of feedback channel transmittance were described (to a provider’s part) with the help of such systems as DECT, GSM, a common phone (a modem) or ISDN. All the DVB standards support a high definition image (HDTV), but broadcasting in HDTV in Europe was not developed until 2012-2013-no HD-receivers, no HD-programs and so on, around a closed circuit. As of today, only one broadcaster-the Belgian Euro 1080 television company-provides for an image of high definition.

The important element of the DVB standards is scrambling (called cyphering and “closing” of channels as well). It is only used in the case when it is required to provide for a conditional access to the signal-so that only those who paid could be able to view it. The interfaces for scrambling methods connection are provided and different broadcasters opt for different methods. In the studio the signal is scrambled for each subscriber and is transmitted into the air in a cyphered form. A customer’s decoder demodulates the signal, then “discloses” it and displays an image on a TV screen or a TV panel. If a television is digital and the interface between the decoder and the television is also digital (SDI, DVI or dictated by “intellectual property defenders”, -HDMI), then the signal yet remains a digital one closely until a TV-image formation.

TVL or television lines-this is what determines analog TV capacity. One TVL-is one transition from a signal of the highest intensity (a white color) to a signal of the lowest intensity (a black color) or vice versa. These lines are vertical ones, in other words, a quantity of television lines is counted along the screen horizontal. The quality of signal or a television image is defined by quantity of such transitions. A perfect air signal can have definition of 500 TVL; S-VHS gives 400 TVL and VHS-240 TVL and Khokhlov, B.N. [5]. A good cathode-ray

television allows for just 400, maximum 450 TVL. An average television reflects just about 350 TVL. Let us take as a basis a quality of a good television, 400 TVL, which is 400 transitions, or 200 white and 200 black stripes intermingled. At that it is required to keep in mind that only analog data are being under review. It is possible to digitalize them in any definition-be it 200 countdowns, or a thousand. All we have to remember that the information in the signal is for 400 TVL only.

In the digital signal everything is much simpler- it is counted in dots. In the DVB system, the following quantity of dots by the horizontal is provided: 720, 704, 544, 528, 480 or 352. The quantity of dots by the horizontal is determined by a broadcasting standard-480 for NTSC, 576 for PAL. In the HDTV systems everything is also quite simple. Such formats as 1920x1080 and 1280x720 are possible and the signal can be either interlaced or progressive and Ptachek, M. [6]. Kazakhstan decided to use the PAL standard due to a geographical proximity to European states and technical assistance provided for transition to this format.

The Problems of Transition to Digital Television Based on the Experience of the Leading Countries of the World: When transiting to digital television Kazakhstan has been studying the experience of several leading countries of the world.

In the world various terrestrial digital television technological types are used. In North America and Republic of the Korean the ATSC (Advanced Television Standards Committee) standard is used, developed from the NTSC (National Television Standards Committee) standard. The receiving system for digital television in Japan is ISDB-T, it is used in Brazil and Peru as well.

The transition to “digit” process is accompanied with multiple considerable changes in broadcasting structure. Mainly, the approach to signal distribution is changed. In majority of countries in Europe and North America, television reception with the help of an analog antenna virtually ceased. Nowadays satellite and cable televisions are the leaders and the so-called Internet-television (IPTV) is developing.

An unavoidable transition to digital television is associated with numerous issues, which could be conditionally divided into several groups:

- Political and legal issues;
- Social issues;
- Economic issues;
- Technical problems;
- Digital inequality issue (“digital gap”), etc.

One of the principal barriers in the telecommunication systems digitalization in the world was the standards war, into which Kazakhstan was involved as well. In various countries they started to create completely different and often incompatible digital broadcasting specifications. Even inside one country some companies created their own broadcasting standards. However, by 2010-2012 disputes and confrontation between developers subsided, a number of digital broadcasting standards stopped augmenting and, what is most important, amidst numerous specifications there appeared several leading ones. Each country in the world that decided to transit to “digit”, has to choose from them.

The choice for some of them is often ambiguous. But most frequently commissions in transition to digital television are guided by how much cost-effective television and radio system modernization is in case of transition to a certain standard. Quite often, choice of this or that standard is made due to co-incidence of frequencies planned for “broadcasting” in the future and those that are already in use.

As is well-known, the USA is not only transiting to digital broadcasting, but is principally changing its standard for the high definition television (HDTV) standard. Until now, the USA had the worst TV standard: 525 NTSC lines. Jocularly, it read as “Never Twice the Same Color”. The USSR in their own times, chose a good standard of 625 lines but politicians insisted on choosing the SECAM system.

In Japan by March, 2005, there were sold almost 2.7 million televisions and digital broadcasting receivers. In that year the amount of digital receivers increased three times. The Sony Europe Company then announced that since 2006 they would cease producing analog receivers, ITU Radio Communication Sector [7]. In the countries where there is no digital television, televisions able to receive both analog and digital broadcasting will be sold.

2006 became crucial for digital broadcasting in Europe, “breakthrough” for HDTV, IDTV and mobile TV started in Europe. By 2006 end, about 65 million families switched for digital television reception. In Europe transition tempos were determined by two factors mainly: offered programs (content) and a price of a television device (set-box).

By 2007 start, the coverage of the population with at least one multiplex of terrestrial digital broadcasting was as follows: Finland-99.9%, Sweden-93%, the Great Britain-80%, Spain-80%, Italy-70%, Germany-60%, the Netherlands-50%, France-50%.

The transition strategy is different in different countries. In the Great Britain and Sweden all-over the nation transition is planned (*"the national model"*). Spain, Denmark, France, Italy and the Czech Republic follow this way, too. Such an approach allows all the population of a country to make use of advantages of digital broadcasting simultaneously. In Germany they followed the *"regional way"*; transition was implemented by regions. It seems to us, in Russia they follow this way (let us take Mordoviya as an example), as well as in Uzbekistan (in Bukhara).

Transition to digital broadcasting is a complex process. Viewers sometimes may lose a part of terrestrial broadcasting, when the analog one stops (frequency is needed for a digital one) and the digital has not started yet. This is what happened in some regions of Switzerland. For successful transition consensus between a government, broadcasters, networks providers, industry and viewers is needed.

The world is getting more and more digitalized. Kazakhstan has an intention to transit from analog broadcasting to the digital one by 2015.

Peculiarities and Specifics of Transition to Digital

Television in Kazakhstan: On the 3rd of July, 2012, in Kazakhstan the digital air network was officially launched in Astana, Almaty, Karaganda, Zhezkazgan and Zhanaozen. In total, the network will include 827 radio-and-television stations (RTS). The DVB-T2 broadcasting standard, using the Irdeeto Cloaked CA Conditional Access System, Kazakparat Agency (2012). In Astana, Almaty and different provincial centers, two multiplexes equivalent to 30 SDTV channels are used, in other inhabited settlements-one multiplex for 15 TV channels. Until full completion of digital air television construction in 2015, the national many-channel television and radio broadcasting Kazakhtelecom JSC shall be providing for parallel operation of the existing analog broadcasting network.

Also in March of the current year Kazakhtelecom JSC purchased DIGITAL TV LLP, the second major provider in the market of paid television and Gayfutdinova, B. [8]. The company provides for cable and digital television services in 14 cities and towns of Kazakhstan. This purchase highlights a constant striving to widen the spectrum of the services provided in content and applications for the population of the Republic.

Currently, television and radio broadcasting is at the threshold of change. As of today, the first stage of digital television implementation is over. In the republic, digital

satellite television is developing and at this stage a number of subscribers amounts to 407,000 people and by 2020 their number may reach one million and Irzhanov, M. [9].

By the results of the opinions search conducted by NAT Kazakhstan (National Association of Television and Radio Broadcasters) in Kyzylorda, Aktobe, Petropavlovsk and Karaganda, there are the data on the highest viewers' rating of the regional private channels, the population's assessment of their ability to buy digital devices for air television reception, their attitude towards regional non-state TV channels as sources of important local information and current issues discussion.

Apart from technological advantages of digitalization, it can bring considerable additional revenue to the state. With adequate frequency spectrum distribution, digitalization, on the contrary, provides for plenty of technical possibilities for new channels opening. In the experts' opinion, digital broadcasting in a new format will only make good to the society and to the process of democratization of the country.

CONCLUSION

With advance of the digital technologies there will appear a need in a new quality of television and radio production. Moreover, in perspective utterly new adjacent services will be developing: *TV medicine, TV education, satellite navigation corporate TV conferences, etc.*

The Kazakhstan TV companies have been closely watching the global processes, but have been postponing transition to digital television until 2010-2015. The broadcasters emphasize the following aspects.

First, frequency spectrum is used cost-effectively: in the same 8 MHz band (7 MHz for European cable channels), where one analog TV-channel was allocated, it is possible to allocate from 6 to 10 digital ones.

Second, in digital broadcasting it is not required to transform the signal-the broadcaster obtains it in digital form, it remains a digital one in the studio and it goes into the air digital as well.

Third, there appears a new audience-mobile users (the European DVB-T standard suggests for reception in a going car, helicopter, train), whereas it is virtually impossible to receive analog television in motion and in the urban conditions and Peskin, A.E., Smirnov, A.V. [10].

In Kazakhstan, in the free market competition manufacturers fight for television viewers and viewers get additional information-there is no need to buy a

newspaper with a weekly TV schedule. EPG (Electronic Television Program) is a part of a digital TV show; a viewer sees both information on a current TV show and a synopsis TV guide for a week or two.

Fourth, there appears a possibility of getting additional conveniences-multilingual support (for instance, Euro News channel broadcasts in seven languages simultaneously, including Russian), subtitles in various languages, particularly in Kazakh.

Fifth, it is possible to transmit five-channel sound by digital television (the NICAM stereo sound system allows for transmittance of two channels only, t. i. PRO LOGIC).

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