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CHAPTER 9:

SATELLITE TECHNOLOGY AND ITS USE IN TURKISH TV BROADCASTING

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1. INTRODUCTION

Today, as technology is developing rapidly, mass media tools are gradually changing their faces. The emergence of Internet technology and the power of digital systems have led to a change in the way television broadcasting is transported to the masses. Publications both in Turkey and around the world have started to be transmitted using Internet infrastructure. Although digital video broadcasting technology - terrestrial (DVB-T) has been in a rapid breakthrough especially in developed countries, it has not reached the desired level in Turkey. The inability of this technology to develop is due to economic and technical reasons, as well as the inability to standardize Turkey's communication infrastructure and the inability to provide the desired level of investment in the media sector.

Mass media have basic functions such as informing, informing, educating and entertaining. Television performs these functions more extensively. With a much wider program perspective, television has a much more important power to influence the masses than mass media tools such as cinema, radio, newspapers, magazines etc. Appealing to all segments from all ages, television is still popular despite the many mass media tools that developed after it. Because television is not only an audio visual and auditory technology, but it is a qualified mass media that outweighs the commercial aspect. Television, which has managed to use technological developments to its advantage, can also contain the qualities of many mass media tools.

Canadian communications scientist Herbert Marshall McLuhan, who introduced the concept of "global village" in the 1960s, stated that, with the spread of electronic culture, nothing would remain hidden, and he emphasized that television would be able to transfer all the developments occurring worldwide.

Satellite broadcasting technology enabled television to be an effective mass media and contributed to the wide spread of broadcasts to a wide audience. Satellite communication expanded the scope of television technology, enabling broadcasts to be transmitted to the world. Thus, satellite technology has become indispensable for television broadcasting. Broadcasting and signal transmission have been facilitated through the revolutionary satellite broadcasting in the field of communication. In this study prepared using the field literature method, the current state of digital satellite technology was examined by providing information about the history of satellite broadcasting and inferences about the future of satellite broadcasting in Turkey were made.

2. THE CONCEPT OF SATELLITE

Satellites communicate are human-designed structures, each of which is used in different ways according to their tasks, that communicate with the ground station using communication systems and that have an orbit in space consisting of many electronic and mechanical sub-components to avoid being affected by extremely challenging environment conditions in space while performing their tasks. "Useful load" is the main reason why we sent the satellite into space. However, this does not mean that other subsystems are useless. Other subsystems undertake critical tasks such as providing the necessary conditions for the useful load to operate with necessary energy and transferring the data it produces to the ground station. For example, the useful load of the Hubble Space Telescope, photographing the depths of space and that will be reviewed in coming chapters, is a 2.4-meter diameter telescope. As in the case of Hubble, it is common for other subsystems of the satellite to be mounted “around” a giant useful load.

We have already stated that, whatever the purpose of the satellite is, the useful load is designed for this task. For example, we use weather satellites to display cloudiness and weather movements of the world. While such satellites allow for a global investigation of meteorological phenomena, they periodically send the data recorded by their sensors (antennas, cameras, lenses, etc.) during their movements in their orbits around the earth to their ground stations. One of the most important features of these devices, which are of great benefit to humanity with the ease of communication, is that it is possible to obtain meteorological information from many large areas such as oceans, deserts, mountainous areas, polar regions where ground observation stations cannot be installed and data cannot be collected (Berger,1995:19).

There are a wide range of satellite systems with different capabilities and used in different missions. In general, global communications satellites, reconnaissance-observation satellites and remote sensing satellites make up the majority of these systems. There are also navigational satellites, meteorological satellites, astronomy satellites and search-and-rescue satellites.

3. HISTORY OF SATELLITE BROADCASTING IN GENERAL TERMS

Satellite technology has a long history. It is possible to base the start date of satellite broadcasting on the year 1957. The cold war between the United States (USA) and the Union of Soviet Socialist Republics (USSR) at the time had a profound effect on the beginning of satellite technology. A year after Sputnik 1 was launched into space, which was the first artificial satellite produced by the Soviet Union, the United States sent Explorer satellites into space. However, none of these satellites were produced for communication purposes. Efforts to launch satellites gained momentum, and Telstar 1 was launched into space on July 10, 1962 by the Bell Telephone Laboratories to transmit television broadcasts between the two sides of the Atlantic Ocean. Telstar 1, launched for experimental purposes, could only remain in its orbit for a few weeks due to radiation problems (Dalgleish, 1991: 2-3). Although the work carried out during this period did not achieve its full purpose, it went down in history as an important step in the development of satellite broadcasting.

With a better understanding of the importance of satellite broadcasting in the world and the changing face of publishing, on August 20, 1964, many countries came together to create a new organization called INTELSAT (International Communication Satellites Organization). The year 1965 marked the turning point of satellite broadcasting. Because, within this year, the world's first communication satellite, Early Bird was launched into space (Şimşek, 1994: 628). Through Early Bird, the first color television broadcast was broadcast worldwide via satellite. Turkey, on the other hand, was not indifferent to the developments in satellite broadcasting, and "Peyk Satellite" Telecommunications Group Chief Engineering was established within PTT (General Directorate of Postal and Telegraph Organization) which conducted satellite surveys of Turkey at the time. Thus, significant progress was achieved towards satellite broadcasting in Turkey, and Turkey became a member of INTELSAT in 1968 (Taurus, 2002;188).

Upon the establishment of INTELSAT, INTERSPUTNIK, a space communications organization led by the Soviet Union, was established on November 15, 1971. Headquartered in Moscow, INTERSPUTNIK is an international organization. In 1976, Marisat, the world's first maritime communications satellite, was produced by the United States and launched into space. In 1979, an organization called INMARSAT, headquartered in England, was established upon the major boost in global maritime activities. Turkey is also one of the members of this organization. By 1984, China's first satellite, the STW-1 satellite, which provided TV, telephone and data transmission services, took its place in space (ITU, 2002: 3-4). Upon all these developments, countries have stepped up their efforts to produce their own national satellites.

The rapid development of satellite broadcasting worldwide attracted the attention of Turkey, and important efforts began to become a national satellite owner. Thereon, an agreement was signed with the French company, Aerospatiale, and Turksat 1A satellite was produced and launched into space on January 24, 1994. However, Turksat 1A exploded in the air about 12 hours after its launch. On 11 August 1994, the efforts to create a second satellite accelerated and this satellite, called Turksat 1B, was launched to 42 degrees east position. This satellite broadcast in a total of 3 destinations including Turkey, Central Europe and Central Asia. After the successful service launch of Turksat 1B satellite, a more advanced satellite was produced by Aerospatiale company. This satellite, called Turksat 1C, was launched to 31.3 degrees east on July 10, 1996, and orbital tests were conducted, and about 17 days later, Turksat 1B satellite was placed at 42 degrees east position (Çakaloz, 2007: 67-68). Turksat 1C satellite had a much wider coverage area than the previous Turksat 1B satellite.

After receiving high efficiency from the first-generation satellites, second generation satellite works were started, and EURASIASAT was established in Monaco in partnership of Türk Telekom by 51% and Aerospatiale by 49%, thus new satellite works started. On February 1, 2001, the Turksat 2A (Eurasiasat 1) satellite had a power of 2800 Watts and a weight of 3400 kilograms. Turksat 2A has also served the geography in Europe and Central Asia where Turkish society lives extensively. After receiving maximum performance from Turksat 2A, the production of Turksat 3A started on February 10, 2006 in accordance with the treaty with Alcatel, and as a result, this satellite was launched into space on June 13, 2008. Turksat 3A satellite is also located at 42 degrees east longitude. This satellite has a power of 24 Ku-Band transponder, 6112 Watts and a weight of 3070 kilograms (Vardar, 2010: 10, 59).

4. SATELLITE RECEIVER SYSTEM

It is a system of devices that send signals to the cable TV system to the part where they are received with various devices and converted to signal that the end user will use. It consists of three main elements:

1. Dish antenna

2. LNB (Low Noise Block)

3. Satellite receiver

Thanks to this system, channels that are broadcast in different frequencies from various satellites are collected and converted to the desired format to be processed in the download centers on the ground, and the broadcast to the Cable TV network is prepared. The costs of these system elements are within the cost of Superstructure.

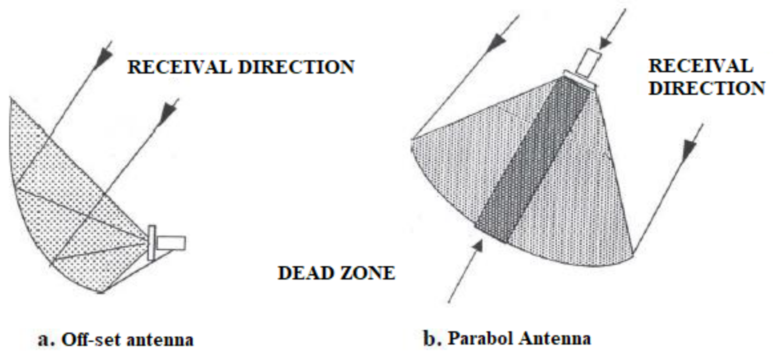
5. DISH ANTENNA

Since the satellites are 36,000 km higher from the ground, the waves reaching the ground spread and reach the earth with a force of approximately 200 dB. In this case, to be able to pick up signs with the desired sign/noise ratio, it is necessary to use high-gain antennas. Such high earnings can only be achieved by using a parabolic reflective antenna. Parabolic reflective antennas collect parallel heat from each other at the focal point and send them to the feedhorn element (Dağdeviren,1990:112).

The gain of a dish antenna depends on reflection coefficient of the material by which antenna is made off, the smoothness of the parabola, and the position of the feedhorn at focal point. Its aluminum antennas are used in professional systems due to their good and light reflectivity. Satellite antennas are generally divided into Parabolic and Offset antennas.

In parabolic antennas, the satellite signal has to come perpendicular to antenna surface. The signals, coming perpendicular to antenna from satellite, are projected into focus, they converge at a point here, and they are collected by feedhorn and sent to LNB. In parabola antennas, a dead zone is formed on the antenna because the focal point of antenna is right in the middle of the antenna, and this area cannot be used.

Figure 1. Receiving Directions of Satellite Antennas (Teknotel, 2005: 13)



In offset antennas, satellite signal arrives at a certain angle on the antenna, so the focal point of antenna shifts to an area outside the antenna signal receiving surface. Therefore, the LNB does not intercept satellite signals on the antenna and does not cause a dead zone on the antenna. Offset antennas appear to be superior to parabolic antennas with these features, but are not used much above 3 m as they hold too much wind in large antennas.

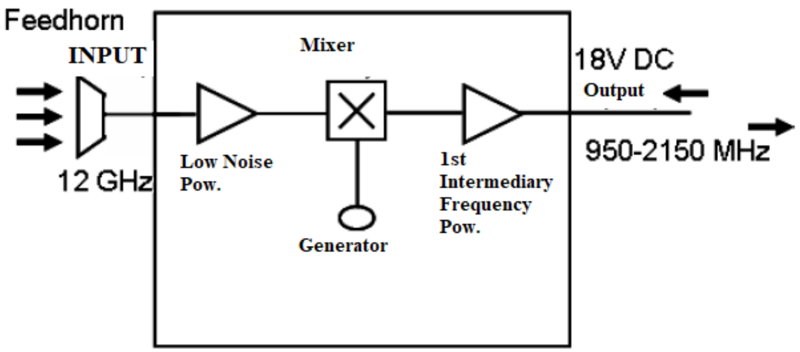
Dish antennas are of various sizes and help to collect broadcast flows in a single center according to the desired broadcast service to collect and present signals in different orbits; in the Turksat antenna field in Gölbaşı, Ankara and Acibadem Türk Telekom, there are dish antenna fields and services provided at Cable TV are collected here. Their costs are considered when calculating superstructure and maintenance costs.

6. LNB (Low Noise Block)

Low Noise Block first amplifies the magnetic waves of signals from antenna collected in feedhorn element at the front. Then, magnetic waves are reduced to 950-2,150 Mhz intermediate frequency by local oscillator. These signs are transmitted to satellite receiver via a low-loss co-axial cable. There are two main types of LNBs: C and Ku Band. They also have different frequency ranges as Wide (top) Band (Universal) and Narrow (Bottom) Band. C Band LNBs are mainly used in ancient Russian satellites and Russian channels. Ku Band LNBs have 2 different frequency ranges. Wide (Top) Band LNBs (universal) are those with a frequency range of 10,700-12,750 MHz, and the most widely used type today. Narrow Band LNBs are LNBs with a frequency of 10,950 to 12,250 MHz (Lewis, 2005:14).

It is also important to move the signal from LNBs to satellite receivers. As shown below, signals taken from the antennas are usually carried to the distribution center by RG-6 and RG-11 cables. The cable distance carried out is an important factor in the cleanliness of the carrier signal and the healthy operation of demodulators and should not exceed 100 m.

Figure 2 . Signal Transport from LNB



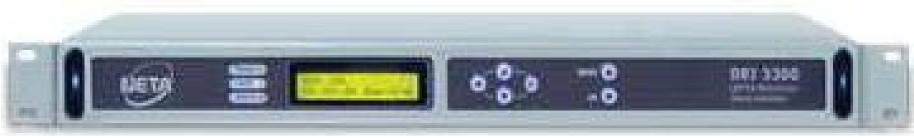
In long-distance cable requirements, line amplifiers are used to raise signal level and cover losses. However, line amplifiers should not be used unless they are very mandatory because they raise signal level but cause suffocation on carrier signal.

LNB is an electronic tool used in the antenna field to receive the broadcast of our dish antennas, they are used to receive services provided in different bands from satellites in different orbits so that the broadcast is received. LNB costs are calculated within superstructure costs and maintenance costs.

7. SATELLITE RECEIVER

The Receiver picks 950-2,150 MHz frequency signals coming from LNB, selects the desired channel and demodulates the frequency, separating image and audio signals and giving them to the output. It also provides supply voltage required for LNB. In DM (H-E) system, a satellite receiver is used for each broadcast.

Figure 3 : Satellite Receiver

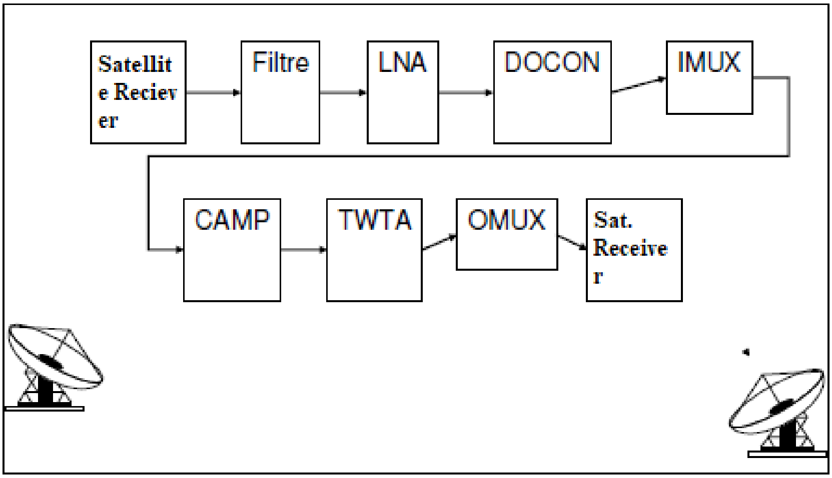


Signals collected by dish antennas must be processed at power plant and converted to digital broadcast format, which is done by satellite receivers operating at power plant. Each channel has 1 satellite receiver, the more channels is provided, the more receiver is needed. This service is not a service that varies by region, but a service that varies by operator. Example: While cable TV has 150 channels, Digiturk has 123 channels. The costs of satellite receivers are assessed within the superstructure and maintenance costs.

8. TECHNICAL CHARACTERISTICS OF RECEIVERS

Satellites are the group of electronic devices prepared with advanced technology that pass signals from any part of the earth through electronic circuits on them and send these signals in various frequency bands to desired regions. One of the most important parts of this group of electronic equipment constitutes of transponders called which are divided into smaller units of the total capacity. Communication data progresses via satellite by following this path called this transponder, which is a kind of signal pathway.

Figure 4 . Transponder (Teknotel, 2005: 39)



Communication satellites usually consist of between 24 and 72 transponders. Very few of these transponders may be for backup purposes. Capacities of transponders are measured in MHz. In today's world where transition to digital broadcasting via satellite is almost complete, data usage is becoming increasingly common and SCPC

(Carrier Press Single Channel) applications are realized; capacity sales and leases are made over Mbit/s. There are 36, 54 and 72 MHz transponders on the market. Transponders with a capacity of 36 MHz are common in satellites. Larger transponders such as 72 Mhz are also designed especially for Internet and data exchange. Such transponders are capable of transmitting 155 million bits of information per second. This capacity allows satellites to transmit audio, Internet, video, etc. as data wholes (Şeker, 2009:75).

Satellites send signals to earth at varying signal levels. Depending on signal levels of satellites, footprints of satellites are obtained, which are obtained by showing satellite EIRP contours covering the earth on regions where they can reach, and example of which is given in Footprint of Turksat 3A Satellite. Footprints can serve different purposes with different radiation, frequency and power values depending on the design during satellite construction.

Signals sent by satellites to the earth are indicated in dBW. Since signal levels sent to the earth vary by region, the diameter of dish antenna used to receive broadcast varies accordingly. To make an analogy, the fact that signal levels vary by region can be better understood by that light power of flashlight held to illuminate a specific region is stronger around the center, and the light power decreases with the distance from light center; similarly, footprints of satellites and accordingly their power may vary.

Table 1 : Receiver Antenna Diameter and Signal Strength

Signal Power	Smallest size	Largest size
36 dbW	240 cm	360 cm
40 dbW	120 cm	150 cm
45 dbW	90 cm	99 cm
50 dbW	60 cm	65 cm
55 dbW	40 cm	50 cm

Satellites transmit information in the form of radio frequencies. Frequencies in C-band Ku-band and upper Ku-band ranges are used by satellite operators in satellite communications. Ka-band, which is higher than the Ku-band, has recently been used to prevent frequencies from interfering each other due to each filling of certain frequency values used (the state of close wave size of signals and interfering with each other's broadcasts).

Today's modern satellites are designed to reach specific geographic allocations at different frequency ranges and at different power levels. Depending on the geographic region covered by satellite, types of radiation can be divided into four main groups:

⇒ **Global:** It easily covers 1/3 of the globe. C band is used.

⇒ **Hemi:** It easily covers 1/6 of the globe. C band is used.

⇒ **Zone:** It covers a large area. It can be a Ku band.

⇒ **Spot:** It covers a specific geographic area. It could be Ku or Ka bands.

9. TRANSITION TO DIGITAL SATELLITE BROADCASTING

Upon positive influence of television systems by technological developments, a comprehensive broadcast technology called digital has developed, and this technology has begun to be used in satellite broadcasting. Before examining digital satellite broadcasting in depth, it would be appropriate to address the reasons why this technology is preferred in satellite systems (Richharia, Westbrook, 2010: 212):

- ✓ **Stability:** While analog signals may experience distortion and interference after a certain degree, this is not the case with numerical signals. Transmission does not face any deterioration or loss.
- ✓ **Regeneration and ease of replication:** Numerical signals can regenerate themselves (regeneration), and errors can be corrected. In addition, transmitted signal copy can be reproduced without loss of information.
- ✓ **Ease of switching:** Electronic circuits used in digital computers are also used in digital publishing. In this way, storage and transition process between targets can be carried out more easily. However, it is possible to create a common multimedia stream for different sources of information.
- ✓ **Eligibility for mathematical manipulation:** Switching and storing operations are carried out in these systems using DSP (Digital Signal Processor); thus, the quality of communication is increasing. This system can also be used to compress numerical

signals to reduce data transfer time in cases where the amount of data that needs to be stored is excessive.

Digital technology has many advantages over analogue publishing. It is possible to list these advantages as follows (Durmaz, 1999: 4-6):

- Digital broadcasting technology offers much better-quality audio and video than analogue.
- In digital broadcasting technology, problems arising from noise and noise can be eliminated.
- 4-6 programs can be broadcast from one channel through digital broadcasting so that they can be used more efficiently.
- In digital broadcasting, film broadcasting in more than 2 languages or a 4-5 channel music broadcast can be performed optionally.
- Digital publishing supports interactive applications.

In digital broadcasting, additional information can be provided to audience on demand outside the image.

- Digital publishing is suitable for different screen formats (4:3, 16:9, 14:9).
- In digital broadcasting, it is possible to transmit information in a narrower band or frequency as a result of compressing repetitions in images and sound and removing unnecessary information.

- In digital broadcasting, digitally coded images and sounds work in a harmonious manner with all transmission networks (cable TV, satellite, terrestrial broadcasting etc.).
- In digital broadcasting, broadcast transmission can be provided to audience in different quality and detail.
- Radio television can be made via digital broadcasting through Internet and similar communication standards (IPTV, Internet TV, Mobile TV).
- With digital television broadcasting via satellite or cable, spectators can watch images from different angles.

In the late 1990s, satellite communication technologies began to develop and direct satellite broadcasting systems called DBS (Direct Broadcasting Satellite) met with viewers. With the DBS system, nearly 200 television channels could be viewed with a fixed dish antenna about 46 cm in size (Srivastava, 2002: 27). DVB-S (Digital Video Broadcasting - Satellite) standard was established on the integration of satellite broadcasting with digital technologies. DVB-S is referred to as the standard of digital broadcasting directly to homes or distribution centers, both encrypted and unencrypted in multi-channel via satellite.

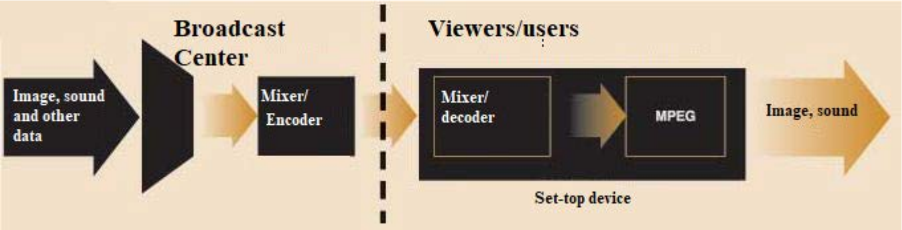
DVB-S broadcasting standard QPSK (Quadrature Phase Shift Keying) uses the modulation technique, while the data rate offered is 2-4 mbps for SDTV and 8-20 mbps for HDTV. Digital signals are sent to satellites from ground stations via transmitters operating in the 17.3-18.1 frequency band and via 9-12-meter dish antennas. A standard communication satellite contains a total of 32 transponders. Signals transmitted to carrier and converter transponders are converted to the range of 10,750 GHz-12,750 Ghz in Ku band and transferred to surface again. In DVB-publications providing service normally, the task of transponders is only to transmit incoming signal to earth. With the positioning of several satellites in close proximity, more transponders in numbers can be obtained. Satellite broadcasting is also carried out via the C-band, which is in the range of 3.7-4.2 GHz; however, it is not much preferred. The C-band is generally preferred in regions with an equatorial climate where tropical precipitation is intense (Morgül, 2011: 244-245). The European Telecommunications Standards Institute is important because it is an organization that makes important decisions about digital satellite broadcasting. Nevertheless, the maximum symbol and usage bit rates corresponding to the channel widths of DVB-S (Digital Satellite Broadcasting) standard by this European institute are shown in detail in the Table below. This table continues to be valid in the same way today.

Table 2 : Speed Values by DVB-S Channel Widths

Channel Width (MHz)	Maximum Symbol RAte (MHz)	Maximum Usage Speed (mbps)				
		Rc = 1/2	Rc = 2/3	Rc = 3/4	Rc = 5/6	Rc = 7/8
54	42,2	38,9	51,8	58,3	64,8	68
46	35,9	33,1	44,2	49,7	55,2	58
40	31,2	28,8	38,4	43,2	48	50,4
36	28,1	25,9	34,6	38,9	43,2	45,4
33	25,8	23,8	31,7	35,6	39,6	41,6
30	23,4	21,6	28,8	32,4	36	37,8
27	21,1	19,4	25	29,2	32,4	34
26	20,3	18,7	25	28,1	31,2	32,8

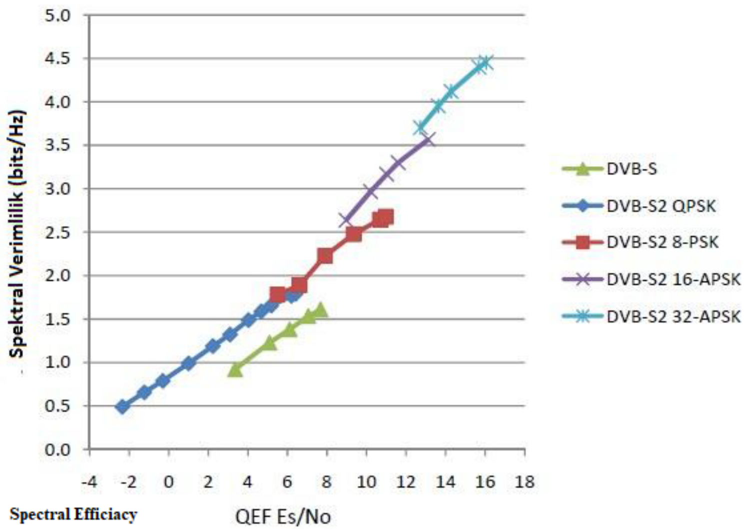
Digital satellite technology has provided significant convenience not only to publishers but also to users/spectators. Passive viewers are transformed into active users thanks to the interaction opportunity offered by digital broadcasting. From the audience's point of view, in digital satellite technology, broadcast transmission is divided into two branches: encrypted and unencrypted. Unencrypted publications are briefly referred to as FTA (Free to Air). In order for encrypted broadcasts to be deciphered by the receiver, conditional access software and hardware called CA (Conditional Access) is needed (Figure below). Digital broadcasting platforms deliver their broadcasts in this way. There is no need for a conditional access unit to receive FTA broadcasts. Such receivers are much cheaper and cost-free (Çakaloz, 2006: 149).

Figure 5. Conditional Access Unit (CA) Technical Operating Scheme



Since digital satellite broadcasting provided viewers with great advantages, this has enabled publishers to benefit more from this technology, then, the DVB-S2 standard was developed in 2003 and revised by the European Telecommunications Standards Institute in 2005. DVB-S2, as its name implies, is expressed as the 2nd generation standard of digital satellite broadcasting and is a much more comprehensive and new broadcasting technology than the DVB-S standard. This standard is fully compatible with the 1st generation DVB-S, and input signal can be in MPEG-2, MPEG-4 and H-264AVC format. With DVB-S2, a much higher data rate can be sent in the same bandwidth. At the same time, DVB-S2 broadcast standard can also be referred to as “Generic Stream” (Morgül, 2011: 245). The Figure below shows a comparative graph of DVB-S and DVB-S2 standards in terms of spectral efficiency.

Figure 6 : DVB-S and DVB-S2 in Terms of Spectral Efficiency



Services and practices offered by DVB-S2 standard cover a much wider range than DVB-S, and it is possible to achieve high bit rates with this standard. DVB-S2 standard, with the increase in H264 and MPEG compression standards, can easily provide the necessary bandwidth for healthier realization of HDTV broadcasting technology. It seems likely that a new communication infrastructure and equipment will be needed for the DVB-S2 standard to convey all features of HDTV broadcasting technology to audience. DVB-S2 standard is crucial to forming the basis of a new broadcast technology called “Satellite TV” (Benoit, 2008: 128-129). As can be seen, digital satellite technology provides significant convenience for both publishers and spectators in data speed, compression capacity and technical specifications.

10. BRIEF LOOK AT THE HISTORY OF BROADCASTING

Introduction of television as a mass media tool was made possible as a result of inventions made at different times and places such as electricity, photography, cinema, telegraphy and radio. The fact that television works with a more complex technique than the ability to transmit images, as well as being a more expensive tool, prevented it from spreading as quickly as radio in countries outside the United States and Europe. The first technical discovery related to television was demonstrated by the work of Andrew May, an Irish telegrapher working on an Atlantic Telegraph cable, and Willoughby Smith in 1873. Paul Nipkow developed a device that can scan the picture while it was moving. What made this device important, developed by German scientist Nipkow, was that it had a rotating disc. With this disc, the pictures could be scanned animately, and it became possible to scan shaded and luminous parts of an item allowing the image to be obtained elsewhere (Abramson, 2003;34). Nipkow’s this invention was improved by John Logie Baird, allowing for the first trial broadcasts.

The system, developed by John L. Baird in 1924, allowed the outer contours of objects to be scanned, as an important step in television development. The main factor that funded television work was the improved forms of Nipkow disc (Projesi, 2008: 27).

Later, Vladimir Kosma Zworykin developed a tool that allowed image broadcasting with electronic scanning called iconoscope (Durmaz, 1999). This technique was actually the original scanning technique used today, but not developed much. The first application with this tool was a broadcast from one coast to another in 1928 by the NBC broadcasting organization, and an image from London was viewed from New York in the same year (Burns, 1998;65). After these experiments, the first regular television broadcast using electronic scanning technique began in England in 1936 (Projesi, 2008: 26).

We see that the Second World War had a negative impact on the development process of television. After the war, the pace of television broadcasting was improved. Thus, new transmitters were built, new television stations were established, and new receivers were produced (Bay, 2007: 42). After the Second World War, television broadcasts began in Asia. In 1952, television broadcast began in Japan. In China, television was launched in 1958. With the rapid development of television broadcasting and technology, the first 'color television' was invented in 1954 and mass production was introduced in 1960 (Aziz, 2013: 54-55). By the 1990s, significant steps were taken in international television broadcasting. During this period, a significant increase in investments in new communication infrastructures occurred. Established operators have returned to Internet protocol-based networks. Thus, in addition to communication, the presentation of new data services has become possible (Yeşil, 2013: 45).

Considering the historical development process of television broadcasts, it is possible to outline the process in question as follows; 1938-1945: Trial or start-up period: During this period, television was able to broadcast in a limited number of countries. The occurrence of World War II also prevented television from becoming broadcast in more countries. 1945-1960: Development or maturity period: This is the period when television began to become prevalent in various parts of the world.

1960-1980: The golden era of television: With the developments in the technical field of television, live broadcast began with satellites. Color television broadcasts began, and increase in the types of broadcasts also occurred in this period. 1980-2000: Satellite age. After 2000: The era of digital terrestrial publishing (Aziz, 2013: 54-55).

11. HISTORICAL DEVELOPMENT OF TV BROADCASTING IN TURKEY

Initial studies on television broadcasting in Turkey were launched to provide applied education to students of the High Frequency Technique Science Branch in 1949 at Istanbul Technical University (ITU). With this initiative of ITU, it was aimed to create an electronic laboratory where students can primarily carry out studies, and in the first step, the aim was only to establish the system without thought of going to regular broadcasts (Yengin, 1994: 67). The first amateur Turkish television was composed of three small rooms within ITU, and the largest of these three rooms was used as a studio. Although it was for practical lessons by students, television in Turkey went down in history in 1952 as the year in which images transmitted from ITU stations were watched on a screen. The first person in television history to appear before a camera, in other words ‘the first cameraman’, was Prof. Dr. Adnan Ataman, an associate professor at the time. The first TV lighting consisted of a projector placed on a stool. The ‘first décor’ in TV history consisted of two curtains, one grey and the other brown. ‘First director’, ‘First producer’ or ‘First picture selectors’ consisted of students and faculty members at ITU (Kıvanç, 2002: 25-26).

When ITU began its first trial broadcasts in 1952, it was said that the number of receivers in Istanbul was 10, and four of them were at ITU (Bay, 2007: 43). The work for television broadcasting, which began in Turkey in 1950s, paid off in 1968. With the establishment of TRT in 1964, closed-circuit publications were initiated in 1966 as a result of the efforts behind the state power, and regular broadcasting was started on January 31, 1968.

In 1963, an agreement between the Ministry of Foreign Affairs and the Federal Government of Germany planned the establishment of a television training center in Turkey to train producers and technical staff, but this arrangement was later adopted by TRT established in May 1, 1964 as per law no.359. The first thing TRT did during its founding phase was to ask for technical assistance from Germany in accordance with the cooperation with the Federal Germany. The first broadcast in Ankara was launched in Ankara province with a 5 KW transmitter gifted by the Federal German government. Broadcasts, which were held three days a week, began to cover all days of the week in 1974. Initial broadcasts were broadcast in CCIR European standard with 111th band and 7 MHz broadcast width in 5th channel and with 625 linages; and news, sports, poetry, music, open sessions, films, culture, education and children's programs were published.

Since television broadcasting required a large budget, the government and the Parliament were indifferent to this issue, and decisions on broadcasts were not included in the second 5-year development plan, as a result, the first trial broadcasts were more devoted than today, in higher quality, however, the situation caused them to progress slowly with a limited budget. The publications carried out between 1968 and 1969 in all kinds of impossibilities were described as "trial publications". According to the fourth five-year development plans data, TRT broadcasts in Turkey in 1974 were watched by 55 percent of the total population, while in 1977 this rate reached 81.5 percent (Bay, 2007: 44)

TRT carried out informative programs in the countryside during this period, and sent television receivers to four villages in Ankara in February 1969 to ensure that these programs were watched. Within the scope of these works, films were shot for educational purposes and broadcast as television series in different rural regions of Anatolia. With the success of these studies, viewer forms were created and feedbacks were received (Aziz, 1999: 31-32).

On March 12, 1971, a new era of Turkish political life began with the memorandum of the Turkish Armed Forces. TRT autonomy, which had been unsettling political power for a long time, was abolished during this period. While various amendments were made to the constitution, article 121 was amended, and the definition of "autonomy" of TRT was abolished, and replaced with the concept of "neutrality". In this way, TRT ceased to be an autonomous institution and came under the domination of political power. In accordance with the constitutional amendment, some provisions of law 359 were amended, and additional provisional provisions were introduced (Tamer, 1983: 95).

The Military Coup of September 12, 1980 was a turning point for radio-TV broadcasts. With the impact of the coup, news, news programs, education and cultural programs changed their face (Aziz, 1999: 56-61).

As per Article 133 of the 1982 Constitution, amended after September 12th coup, “Turkish Radio and Television Law no. 2954 was adopted.” This law regulated not only TRT, but also publications outside the institution; thus, “Supreme Council of Radio and Television of Turkey” responsible for radio and television was put into operation. Among the most important tasks of this board can be shown as proposing two candidates to the council of ministers for TRT general manager, and 12 candidates, which are twice as much for the six-member board of directors, and to approve publication plans. TRTHC is obligated to inform TRT, the Prime Minister and the President in three years of reports by checking whether radio and television broadcasts comply with the law (Aziz, 1999: 66).

While these developments were taking place in Turkey, the waves of political, economic and technological changes in Europe in the 1980s were described as deregulation and had a profound impact on Turkey.

The monopolistic structure implemented by TRT continued until 1990. However, with the drastic changes experienced in 1990, private television broadcasting was launched in Turkey. Europe is the first starting place of private television in Turkey. In 1989, Cem Uzan and Kuno Frick founded Magic Box in Liecehtenstein, then Turgut Özal's son Ahmet Özal became a partner in 1990. Turgut Özal explained that although it is illegal, it is not objectionable for channels abroad to broadcast to Turkey. However, Magic Box began broadcasting test signals as Star 1 channel on the Eutelsat F5 satellite in 1990 (Kırık, 2010: 29)

Color publications in Turkey were launched in 1984. In 1985, technical directors and picture selectors reorganized the broadcast studios for color broadcasting, taking courses for six weeks. New image use techniques were introduced, and a monitor set was installed (Yengin, 1994: 73). While the world was shrinking thanks to television, the TRT monopoly in Turkey was destroyed illegally in 1994. The first private television channel, Star, was broadcast by other national and local channels in the following years. "With *the Law on Radio and Television Organizations and Broadcasts adopted in 1994, private radio and broadcasters have gained legal roof*" (Bay, 2007: 45).

12. SATELLITE BROADCASTING

Satellite broadcasts are an indispensable technology especially for rural areas that cannot access terrestrial and cable broadcasts and cable transmissions. Satellite television broadcasts, which mean better quality imagery for urban audiences, are the only source of image without alternatives for some rural geographies. On the other hand, technological facilities provided by satellites have also provided significant distances in collecting news from the scene. Especially in television journalism, it was possible to transmit news from all geographies to the studio with portable small satellite antennas. This development has enabled live broadcasting from all over the world. Local and alternative radio and television organizations, which also try to broadcast on limited budgets, found opportunity to reach a wide audience through increasingly cheap digital channels. The failure to technically block satellite broadcasts has led to the benefit of satellite broadcasting by a large number of channels that cannot broadcast terrestrially, especially for political reasons. The prohibitions on using dish antennas in some countries have failed with the use of camouflaged antennas in camouflaged shapes and sizes that cannot be seen from the outside (Atabek, 2001: 100)

Communication satellites are expected to be able to deliver the broadcast to the geographical area where it is targeted and to provide quality and safe service during its life. This process is determined by the satellite's communication capacity, physical conditions to operate and technological equipment (Richharia, 1999: 274).

Two-way radio system in communication satellites are called transponders. Transponder picks up signal coming to the satellite and amplifies it, lowering its frequency to satellite receiving frequency and landing in designated areas of coverage. It is determined depending on the bandwidth of transponder how many TVs will be transmitted. Transponders send their broadcast to broadcast area without changing it. Broadcasts sent to satellites from the ground are also picked up by parabolic antennas on satellites and sent back to earth. Publication sent by parabolic antenna to the earth covers a circular area (Rigel, 1991: 56).

Broadcasts received by dish antennas or ground stations in houses are converted by satellite receiver in a format suitable for normal television receivers. Image and sound are transmitted with frequency modulation (FM) in analog satellite broadcasts, while digital satellite broadcasts use MPEG coding and QPSK (Quadrature Phase Shift Keying) modulation (Morgül, 2002: 7).

Satellite digital television and radio broadcasting has been increasing in recent years. Digital publishing, which allows more economical use of transponders using MPEG-2 compression algorithm, has become preferred over analogue broadcasting. 1 analogue television broadcast can be broadcast from a transponder of 36 MHz, while 10 digital channels from the same band width can transmit broadcasts. Depending on compression ratio and quality of image, number of channels that can be transmitted also varies. To spend a fixed bandwidth more efficiently, bouquet broadcast format is also used to deliver publications of many different broadcasters together by an organization.

In order for satellites to function, they must follow a known and predetermined path in space. This path, called orbit, is positioned in accordance with the mission of satellite. Satellites travel in orbits where they are placed for their intended use.

13. NUMERICAL SATELLITE PUBLISHING

DVB-S satellite can be described as a multi-channel, encrypted or unencrypted broadcast standard directly to homes or distribution centers. In this type of satellite transmission, direct broadcasting (DBS-Direct Broadcasting Satellite) can be carried out in MPEG-2 or MPEG-4 formats using numerical compression methods. In Turkey, satellite management is operated by TURKSAT Inc., and television broadcasts are transmitted in full digits (Paçacı, Seçki, Pençereci, 2011, p.13).

Platforms providing paid satellite broadcasting services in Turkey include Digitürk, D-Smart and Filbox.

DVB-S standard is used for digital satellite broadcasts from DVBS (Direct Broadcast Satellite) satellites. These broadcasts are made from geostationary satellites 36.00 km from the ground on equatorial plane. These satellites seem to be moving from the ground at all, but they actually circle earth in 24 hours. Once we have set up our antenna, it is not necessary to follow satellite. However, because these satellites are too far away, signals sent from satellites weaken while reaching the earth. For this reason, high-gain (40 -50db) dish antennas are recommended to reduce signal losses (Morgül, 2011, p.243-244).

Signals are usually received via satellite dish, LNB (Low Noise Block) and parabolic reflector antenna. Then, broadcast reaches television via satellite receiver. In paid satellite broadcasts, program is solved with a satellite receiver smart card. Receivers can be STB or internal television receivers (Telkoder, 2015, p.4).

14. GENERAL INFORMATION ABOUT TURKSAT SATELLITES:

⇒ **TURKSAT SATELLITE;**

In 1989, an international satellite tender was opened as a turnkey. Following the evaluation of proposals, Turkish National Communications Satellites System Agreement was signed between Aerospatiale Company and Türk Telekom on December 21, 1990.

⇒ **TURKSAT 1A;**

TURKSAT-1A, the first satellite of TURKSAT Project, was launched on the ARIANE-4 rocket from the Kourou Space Station in French Guyana on January 24, 1994. However, due to a malfunction in the launcher rocket, TURKSAT-1A was lost before it could be placed in its orbit.

⇒ **TURKSAT-1B;**

TURKSAT-1B satellite was successfully placed in position 42°E on August 11, 1994. Following orbital tests, TURKSAT-1B satellite was put into service on October 10, 1994. It was shifted from 42° to 31.3° east during 27 September to 12 October 1996. After October 12, 1996, it began to serve at 31.3° east longitude. Turksat 1B satellite, which will be switched to inclined orbit in May 2004, will continue to serve until 2007.

TURKSAT-1B satellite has 3 coverage areas including Turkey, Central Europe and Central Asia. On TURKSAT-1B, there is a total of 16 transponders, 10 of which are in 36 MHz width and 6 of which are in 72 MHz width running on Ku-band (11-14 GHz). It has ability to switch 4 transponders between Turkey and Central Europa, and switch 4 transponders between Turkey and Middle East.

Over TURKSAT-1B satellite, services such as Internet, SCPC, VSAT, TES (Telephony Earth Station) Project and small-scale IBS systems and Southeast IBS/IDR telephone channels are provided.

⇒ **TURKSAT 1C**

Following the loss of TURKSAT-1A, Aerospatiale Company started the construction of a new satellite in accordance with the insurance clauses of the TURKSAT contract. This satellite was later modified to have two wider coverage areas instead of the three coverage areas at TURKSAT-1B, under an agreement signed between Türk Telekom and Aerospatiale. TURKSAT-1C is designed to cover Turkey and Europe in the Western Spot, Turkey and Central Asia in the East Spot to serve Turkey and Europe at the same time and to establish a direct connection between Europe and Central Asia.

TURKSAT-1C satellite was thrown into 31.3° East position successfully on July 10, 1996. Following orbit tests, this satellite was shifted from 31.3° to 42° east longitude. After this 17-day transfer, broadcast traffic on TURKSAT-1B satellite was transferred to TURKSAT-1C satellite. TURKSAT-1B satellite was also shifted to 31.3° east longitude with similar orbital maneuvers. On TURKSAT 1C satellite, there are analogue and digital TV and radio broadcasts, Internet, SCPC, TES, Central Asia IBS phone channels, VSAT data communications network and a numerical TV broadcast belonging to Azerbaijani television company.

⇒ **TURKSAT 2A**

Maintaining this success of TURKSAT Satellite Systems in the future requires that we have new satellites with multi-channel, broadcast coverage, backup capability in international market like other satellite operators.

Therefore, to provide a wider range of satellite coverage to existing domestic customers and to compete with other satellite operators in the international market, it is considered that a new satellite be manufactured and placed in the same position with TURKSAT 1-C Satellite.

Turksat 2A Satellite, manufactured by Joint Venture Company EURASIASAT, established between Türk Telekom and French Aerospatiale Company, was placed in the same position as our TURKSAT 1C satellite, which operates in 42° Eastern location, and was opened for commercial services on February 1, 2001.

There are 32 transponders on TURKSAT 2A Satellite, 20 of which are fixed and 12 are in moving coverage areas.

Fixed coverage fields on TURKSAT 2A satellite and having BSS band transponders have two separate covered areas as in TURKSAT 1C. Broadcasts from fixed coverage areas to be provided over this satellite can reach from England in the west to Scandinavian countries in the north, to North Africa in the south, to Caspian Sea in the east in western coverage area; and from Balkan peninsula in the west to Russian Federation in the north, to Indian Subcontinent in the south, and to Chinese border in the east within the scope of east coverage area. Over moving coverages having FSS band transponders, it is possible to reach regions within satellite's field of view such as India and South African Republic.

⇒ **TURKSAT 3A**

Production of Turksat 3A satellite began on February 10, 2006 with an agreement with Alcatel. The satellite was sent to space with Ariane 5 rocket launched from the Kourou Guyana Space Center in French Guiana at 01:05 a.m. on June 13, 2008. Turksat 3A satellite, serving in the 42.0° Eastern location, has 24 120-watt Ku-band transponders on it.

Turksat 3A satellite, which has a higher usage capacity of 1296 MHz compared to our other satellites, is used both for satellite communication services and for direct TV broadcasts through Europe, Turkey and Central Asia. With the advantage of high receiver power of Turksat 3A satellite, Turkey coverage is used for uplink TV broadcasts, broadband data services, VSAT and narrow band data services from Turkey. In this way, small-scale and low-cost uplink systems have provided great convenience to users who provide services via satellite.

Turksat 3A satellite will respond to the needs of users who want to use different coverage areas. Turksat-3A can meet the needs of users who want to use different coverage in Uplink and Downlink. Turksat 3A has high switching capability among its coverage areas. With this feature, it has brought great flexibility to the satellite fleet.

In addition to direct TV broadcasts via these satellites, Turksat 3A satellite is also used for delivering a wide range of services such as telephone, Internet, faxes, etc. via satellite terminals (VSAT) to regions where radio-link and cable communication infrastructure does not exist due to geographical conditions.

TV channels broadcasting via Turksat 3A Satellite deliver their broadcasts to a wider geography in a more powerful way compared to previous satellites. Powerful broadcasting ability and high gain Turkey coverage of this satellite also bring along another social benefit.

With Turksat 3A satellite, telephone and Internet service is provided to regions, schools and villages where access to these services is not possible due to infrastructure and geographic conditions in Turkey. In addition, these services can be carried out with lower costs compared to prices in the past.

⇒ TURKSAT 4A

Turksat 4A communications satellite, which was successfully launched from Kazakhstan Baikonur on February 14, 2014, was placed in its first orbit (50° East). Satellite's orbital acceptance tests were launched. A week later, Turksat 4A will move towards its latest business location, 42° East longitude.

Turksat 4A communications satellite will start providing satellite communications service in 42° East orbit together with Turksat 3A and Turksat 2A communications satellites after a week-long journey.

15. THE FUTURE OF SATELLITE BROADCASTING IN TURKEY AND TURKSAT 4A

Since Turkey is a country that closely follows technological developments, Turkey has never been insensitive to changes in communication systems and satellite broadcasting. Turksat Inc., subject to the provisions of Turkish Commercial Code and private law, started its service life on July 22, 2004 and became the authorized body of Turkey in the field of satellite technology with a view to ensure healthy communication activities via satellites in Turkey and to establish a solid foundation of the communication infrastructure. Turksat Inc. is a very important step for the future of satellite broadcasting in Turkey. Because satellite broadcasting has expanded its field of activity throughout Turkey with Turksat Inc. Turksat Inc. also has aims to follow developments in satellite technology occurring worldwide and to increase Turkey's effectiveness in satellite market. In more descriptive terms, Turksat Inc. carries out all activities for satellite technology in Turkey (Büyükbakkal, 2013: 23).

As part of international communication organizations, Turkey is expanding its efforts in the field of satellite broadcasting. Turkey, also a member of EUTELSAT and INTELSAT organizations, has delegates in these organizations. In this way, inter-institutional relations are strengthened. Nevertheless, since Turkey is a member of the European Broadcasting Union (EBU), Turkey also makes use of ECSF2 satellite along with its communication systems. All satellite connections with Intelsat and Eutelsat fall under the jurisdiction and responsibility of Turksat Inc. Turksat have large dish antennas facing satellites Intelsat's 1 degree west and 66 degrees west, and Eutelsat's 13 degrees east and 7 degrees west satellites in its ground station facilities located in Gölbaşı district of Ankara. All connections with Turkey's communications satellites are carried out through this facility (MEB, 2013: 6).

Japanese technology company, Mitsubishi Electric MELCO, signed an agreement of $571,000,000 with Turkey to accelerate Turkey's efforts for satellite broadcasting and to produce 4th generation satellites in March, 2011. Thus, the construction of Turksat 4A started and the planning of Turksat 4B also began. Having proton rockets, Turksat 4A was designed to have 2340 MHz bandwidth and a weight of approximately 3800 kg. Turksat 4B, which is intended to be launched in 2014, will be 3340 MHz band width and weigh 3900 kg. Turksat 4A, the first satellite of the 4th generation, which is placed in the 42-degree east longitude and is projected to serve for about 15 years, can also be deliver broadcasts to Africa because it uses the C-band in addition to 28 Ku-2 Ka transmitters. In this way, it has become possible to receive broadcasts by the African continent after Turkey, Europe, Middle East, North Africa, China and Central Asia.

Turksat 4A has a much wider coverage area. Likewise, Turksat 4B satellite, which will take its place in space in the near future, will be able to offer Internet and data services to companies thanks to Ka band as well as television and satellite services. In addition, satellite Internet service will be much cheaper, and this will contribute greatly to users and spectators economically.

All operations for the construction of Turksat 4B satellite and all kinds of controls of the satellite are carried out at Melco and Jaxa's own facilities. Turksat 4B weighs 4,985 kilograms and is in 3,400 MHz bandwidth and will be positioned in an eastern orbit of 50 degrees.

Turksat 4B satellite, which will allow live broadcasting from three continents, will have much wider coverage in Turkey, East and West than Turksat 4A.

Important steps are being taken regarding the future of satellite broadcasting in Turkey. Engineers of Turksat A.S. are currently working on Turksat 5A (Peykom 1) satellite at the Turkish Aerospace Industries Inc. (TAI) facilities.

Studies and research on the production of Turksat 5A and other communication and observation satellites in Turkey are carried out at Satellite Assembly, Integration and Testing (UMET) Facilities. Turksat 5A satellite is expected to be launched into space in 2015, Turksat 5B satellite in 2017 and Turksat 5 satellite in 2019. Turksat Inc. has indicated that at least three satellites will be produced in Turkey in 2019, and a fleet of 7 satellites will be established. In this way, it is planned that 91% of the world's population will be broadcast via Turkish satellites by including eastern North America, South America, Asia, Europe, Africa and western Australia to the coverage area.

16. CONCLUSION

Communication is one of the oldest and most fundamental activities in human history, and it is possible to say that this importance will continue in the same way as long as human beings exist. The rapid development of mass media and dizzying changes in size of technology have led to the emergence of alternative broadcasting systems. The most important among them is satellite broadcasting technology that allows signals sent from the earth to be transmitted back to earth.

Satellite broadcasting has progressed significantly from its inception to the present day and has survived despite many communication systems that followed it. With the popularization of satellite broadcasting and publishers paying attention to this technology, many countries around the world have started to invest significantly in satellite systems. Countries, members of international organizations such as Intelsat and Eutelsat, are in a desire to cooperate with different countries by increasing their knowledge and capabilities for satellite broadcasting. The production objectives of satellites may differ from each other. Because not all satellites are launched into space for communication purposes. Countries produce satellites for research purposes, and they can carry out investigations in different fields such as agriculture, technology, observation, water resources, agriculture, forestry etc.

The most fundamental point that enables the development of satellite broadcasting worldwide is the transition from analog to digital technology. With the power of digital technology, satellite broadcasting has gained significant advantages, and the face of communication systems has begun to change. While digital publishing has improved the quality of broadcasting, it has provided great convenience to both viewers and publishers.

Upon determination of the advantages of satellite broadcasting and understanding of its importance, countries have made significant efforts by conducting great research in order to produce their own national satellites. Turksat Inc. was established and started to offer services to advance satellite broadcasting in Turkey from a single branch. Efforts to produce Turkey's first national satellite, Turksat 5A, organized by Turksat Inc. are promising for the future of satellite broadcasting. Consequently, it is possible to say that Turksat Inc.'s efforts to develop and renew satellite broadcasting will expand its coverage in 2020s and gain an international dimension, and Turkey will receive both economic and technological support from many countries that have proven themselves in the field of technology.

REFERENCES

Abramson, A. (2003). The History of Television, 1942 to 2000. London: McFarland & Company Inc. Publishers.

Atabek, Ü. (2001). İletişim ve Teknoloji. Ankara: Seçkin Publishing.

Aziz, Aysel (1999). Türkiye'de Televizyon Yayıncılığı'nın 30 Yılı (1968-1998). Ankara: Turkish Radio and Television Corporation.

Aziz, A. (2013). Televizyon ve Radyo Yayıncılığı. İstanbul: Hiperlink Publishing.

Bay, N. (2007). Radyo ve Televizyon Yayıncılığı. Konya: Nüve Culture Center.

Benoit, H. (2008). Digital Television (Satellite, Cable, Terrestrial, IPTV, Mobile TV in the DVB Framework), Oxford: Focal Press.

Berger, A. (1995). Essentials of Mass Communication Theory. London: Sage Publications.

Burns, R. W. (1998). Television: An international history of the formative years. London: The Institution of Electrical Engineers.

Büyükbaykal, C. (2013). Günümüzde Türkiye'deki Televizyon Yayıncılığının Genel Görünümü. İstanbul Aydın University Journal, 3(10), 23-33.

Çakaloz, İ. (2006). Uyducunun El Kitabı, İstanbul: Pusula Publishing.

Çakaloz, İ. (2007). Uydu Yayıncılığının Kısa Tarihi (1957-2007),

Dağdeviren, E. (1990). Uydu İle İletişim. İstanbul: Dünya Publishing.

Dalgleish, D. I. (1991). An Introduction To Satellite Communications, London: Peter Peregrinus Ltd.

Durmaz, A. (1999). Profesyonel Televizyon Yapım Ve Yayın Teknolojileri. Eskişehir: Anadolu University Publishing.

International Telecommunications Union - Itu. (2002). Handbook Of Satellite Communications (Hsc), New York: Wiley Publishing.

Kirik, Ali Murat (2010). Etkileşimli Televizyon. İstanbul: Anahtar Kitaplar.

Kivanç, Halit (2002). Telesafir (Bizde Böyle Başladı). İstanbul: Remzi Publishing.

Lewis, J. (2005). İzlerkitle. Erol Mutlu (Ed.) Kitle İletişim Kuramları Içinde (Ss. 344-358). Ankara: Ütopya Publishing.

Milli Eğitim Bakanliği. (2013), Elektrik- Elektronik Teknolojisi Uydu Haberleşmesi, Ankara: Meb Publishing.

Morgül, A. (2002). Dijital Televizyon Uydu Ve Karasal Yayın Sistemleri. İstanbul: Uydu Dünyası Eğitim Publishing.

Morgül, A. (2011). Sayısal Televizyon Tekniği, Ankara: Papatya Publishing.

Paçaci, K., Seçki, A. Pençereci,, Ş. (2011), Düzenleyici Kurumların Sayısal Publishingta Rolü, Bilgi Teknolojileri Ve İletişim Kurumu, P.14

Projesi, M. E. (2008). Gazetecilik-Radyo Tv Tarihi. Ankara: Ministry Of Education Publishing.

Richharia, M. (1999). Satellite Communication System Design Principles. New York: Mcgraw-Hill Companies.

Richharia, M. Ve Westbrook, L. D. (2010). Satellite Systems For Personal Applications: Concepts And Technology. New York: Wiley Publishing.

Rigel, N. (1991). Elektronik Rönesans. İstanbul: Der Publishing.

Srivastava H O (2002) Interactive Tv Technology And Markets, Artech House, Norwood.

Şeker, T. (2009). Teknoloji Ve Televizyon. Konya: Literatürk Publishing.

Şimşek, N. (1994). "İleri Veri Aktarım Teknolojilerinden Uyduların Eğitim Ortamı Olarak Kullanılması", Ankara University, Faculty Of Educational Sciences Journal, Vol.:27, Issue:2.

Tamer, Emel Ceylan (1983). Dünü Ve Bugünüyle Televizyon, İstanbul: Varlık Publishing.

Teknotel, (2005). Staj Eğitim Notları.

Telkoder, 2015, Veri Merkezi İşletmeciliği Raporu, Serbest Telekomünikasyon İşletmeciliği Derneği.

Toros, M.C. (2002). "Türkiye'de Uydu Haberleşmesi", Türk Telekom Magazine, Promotion Issue.

Vardar, U. (2010). Gelişen Uzay Sistemleri, Uydu Teknolojileri Ve Tsk'da Askeri Uydu Kullanımının İncelenmesi, Unpublished Master's Degree Thesis, İstanbul Airforce War Colleges Command: Institute Of Aeronautics And Space Technologies.

Yengin, H. (1994). Ekranın Büyüsü, İstanbul: Der Publishing.

Yeşil, S. (2013, Eylül 13). Telekomünikasyon Ve Yayıncılık Sektöründe Yakınsama. Telekomünikasyon Ve Yayıncılık Sektöründe Yakınsama. Ankara, Ankara, Türkiye: Information Technologies Institution (Btk).