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Designing of DVB-T with RS Encoding and Different Modulation Schemes

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Abstract: Digital video broadcasting – Terrestrial standard as the one which actually is modifying the existing analog standards existing currently across the globe. The most important part of such standards is the retrieval of perfect signal at the receiver end excluding the effects of the channels it goes through and the noise and timing jitter. In the transmission being carried out, the data – either audio – video or any picture information or randomized data is processed for Coded Orthogonal Frequency Division Multiplexing (COFDM) before they are modulated using QAM – Quadrature Amplitude Modulation constellation and mapped in the group of blocks. After formation of the blocks, IFFT – Inverse Fourier Transform is carried out with point 2048 or 8192, which will determine bandwidth requirement and number of subcarriers. Some of these subcarriers are kept in reserve to be used for the pilot symbols – much needed for efficient reception of the signals, whereas the others are to be used for guard bands as well. Though there are many virtues of implementing DVB-T system, there are many shortcomings too of the same which cannot be neglected. The very first limitation and an important one too, is in the form of bit error rates supported by it. They are limited and not compatible with the existing and rapidly changing wireless standards. For the transmission of HDTV – high-definition television and also for accommodating more channels for broadcasting, there was a strong need of new standard. The second limitation of the DVB-T system is its hugely inferior performance with portability or mobility which restricted its usages in moving vehicles.

Keywords: DVB-T, OFDM, BER, RS

I. INTRODUCTION OF DVB-T

Digital broadcasting systems provide several mechanisms for transmitting data services to improve the conventional radio and TV services, and these systems also have the capability to support new multimedia services. There are several competing technologies for the broadcasting of digital content. In some parts of the world, we can tune into digital broadcasting on our digital TV set in the living room. The standards that provide this facility include Integrated Services Digital Broadcasting (ISDB), Digital Video Broadcasting (DVB), and Digital Multimedia Broadcast (DMB). These digital broadcast standards are being used in different parts of the world. In Japan, the ISDB standard is used to provide multimedia broadcast services to the terrestrial networks. The DMB standard is based on the Digital Audio Broadcast (DAB) standard and is deployed in South Korea [6]. It allows mobile reception of the multimedia content. The DVB standard is adopted in Europe for digital video broadcasting, and the European Telecommunications Standards Institute (ETSI) has regulated it. Based on these standards, there are several systems that can provide the broadcasting of digital contents. The most common systems include ISDBT, DVB-T, DAB, DMB and DVB-H [7].

(a). Integrated Services Digital Broadcasting (ISDB-T): It is an emerging digital TV broadcasting system developed in Japan to provide flexibility for multimedia broadcasting services using the terrestrial networks. The ISDB-T system uses the Band Segmented Transmission technique (BST), which divides the channel into a set of frequency blocks called segments. The ISDB-T systems are capable of providing a variety of multimedia services to the stationary as well as the mobile receivers. The main drawback of ISDB-T for mobile reception is that the digital TV transmission to the mobile terminals requires high power consumption.

(b). Digital Video Broadcasting Terrestrial (DVB-T): It is a flexible terrestrial system that supports various broadcast service environments ranging from a fixed-rooftop antenna to a portable service. DVB-T also supports mobile reception of the services and content. This standard has been accepted as a common standard for the digital television in Europe and it is the basis of the new emerging standard for reception of the digital television services on the handheld terminals i.e., the DVB-H standard. DVB-T uses the MPEG-2 standard for the compression because it makes it possible to multiplex the separate elementary streams that are associated with the current service and it allows the encryption of all transport streams. DVB-T has the same drawback as ISDB-T; it was not originally designed to target the mobile receivers, and the major problem in receiving the digital TV on handheld devices is the battery consumption. Neither of these systems takes into account the special requirements to support digital TV services on the mobile handheld terminals [6].

(c). Digital Multimedia Broadcasting (DMB): It is a digital transmission system for the delivery of multimedia content and services to mobile phones. It has been developed in South Korea and is the further development of the DAB standard, with additional error correction capability to deliver television services to the mobile handheld receivers even at high speeds. For the error correction, the DMB uses the technique called Forward Error Correction as does DVB-H, but the DMB additionally uses the time interleaving to solve the problems of difficult conditions such as impulsive noise, typically found in the mobile environments. The time interleaving works by spreading the errors in time over logical frames so that the receiver can correct the errors, hence, it is very effective. The DMB offers the possibility to work using considerably less power. All of these features make DMB a better choice to be used for delivering digital TV services to the mobile handheld terminals. The only problem with the DMB system is its limited capacity. Scaling up to a large amount of multimedia services on top of DAB/DMB would require frequency reallocation. For high-capacity demand, the DVB-H system would normally be the system of choice [7].

(d). Digital Video Broadcasting Handheld (DVB-H): It is an extension of the DVB-T, which is the current terrestrial digital TV broadcast standard. The DVB-H enables service reception in the handheld devices using IP data. DVB-H network parameters are optimized for mobile usage, and for the handheld devices that have low battery capacity. The DVB-T was particularly designed to deliver broadcast services to the living room TV connected to a continuous power supply with a large rooftop antenna. In contrast, the DVB-H was developed by taking into account the mobile handheld receivers and is optimized for the battery-powered receivers that have internal antennas and small screens. Although, the DVB-T has proved itself to be able to work in a mobile environment e.g., public transportation, the DVB-H overcomes two key limitations of the DVB-T when used for the handheld terminals. Firstly, it lowers the battery power consumption. Secondly, it improves robustness in very hard reception environments both indoor and outdoor. DVB-H reduces power consumption by using a technique called time slicing. The data is transmitted in high-speed bursts and the mobile receiver only wakes up when it has to receive these bursts. The receiver remains in the sleep mode between these bursts, i.e., at all other times. This technique enables the receiver to save power up to 90 percent. DVB-H has the ability to converge with the GSM standard when using the IPDC technology. Mobility and flexibility are obvious benefits of the mobile TV. DVB-H has full potential and capability to deliver large amount of multimedia and digital TV services to the mobile handheld terminals with high data transmission rates. Because of the related features and similarities among basic building blocks in DMB and DVB-H, it is unlikely that two handsets, each having a different mobile TV standard, will end up being vitally different in the reception quality or the power consumption [8].

II. SYSTEM MODEL OF DVB-T

It is the DVB European-based consortium standard for the broadcast transmission of digital terrestrial television that was first published in 1997 and first broadcast in the UK in 1998. This system transmits compressed digital audio, digital video and other data in an MPEG transport stream, using coded orthogonal frequency-division multiplexing (COFDM or OFDM) modulation. It is also the format widely used worldwide (including North America) for Electronic News Gathering for transmission of video and audio from a mobile newsgathering vehicle to a central receive point. It is also used in the US by Amateur television operators.

Rather than carrying one data carrier on a single Radio Frequency (RF) channel, COFDM works by splitting the digital data stream into a large number of slower digital streams, each of which digitally modulates a set of closely spaced adjacent sub-carrier frequencies. In the case of DVB-T, there are two choices for the number of carriers known as 2K-mode or 8K-mode. These are actually 1,705 or 6,817 sub-carriers that are approximately 4 kHz or 1 kHz apart. DVB-T offers three different modulation schemes (QPSK, 16QAM, 64QAM).

DVB-T as a digital transmission delivers data in a series of discrete blocks at the symbol rate. DVB-T is a COFDM transmission technique which includes the use of a Guard Interval. It allows the receiver to cope with strong multipath situations. Within a geographical area, DVB-T also allows single-frequency network (SFN) operation, where two or more transmitters carrying the same data operate on the same frequency. In such cases the signals from each transmitter in the SFN needs to be accurately time-aligned, which is done by sync information in the stream and timing at each transmitter referenced to GPS[11].

The length of the Guard Interval can be chosen. It is a trade-off between data rate and SFN capability. The longer the guard interval the larger is the potential SFN area without creating intersymbol interference (ISI). It is possible to operate SFNs which do not fulfill the guard interval condition if the self-interference is properly planned and monitored.

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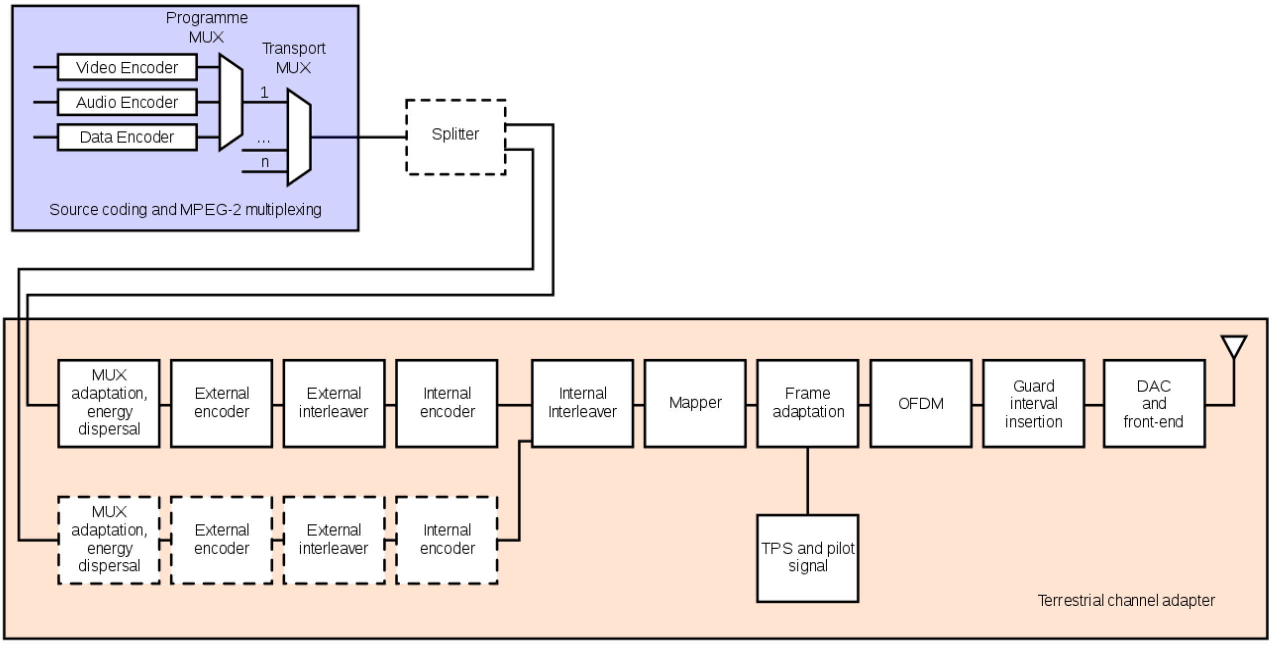

Figure 1. DVB System

III. DVB-T PERFORMANCE ANALYSIS

In the performance analysis of DVB-T system the transmitted signal, received signal, scattered plot and bit error rate of the systems are analyzed.

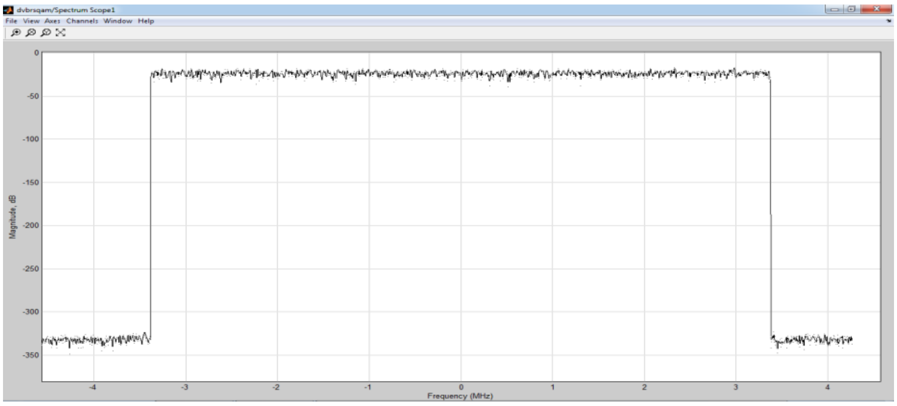

Figure 2. Transmitted Signal of DVB-T with RS Encoder.

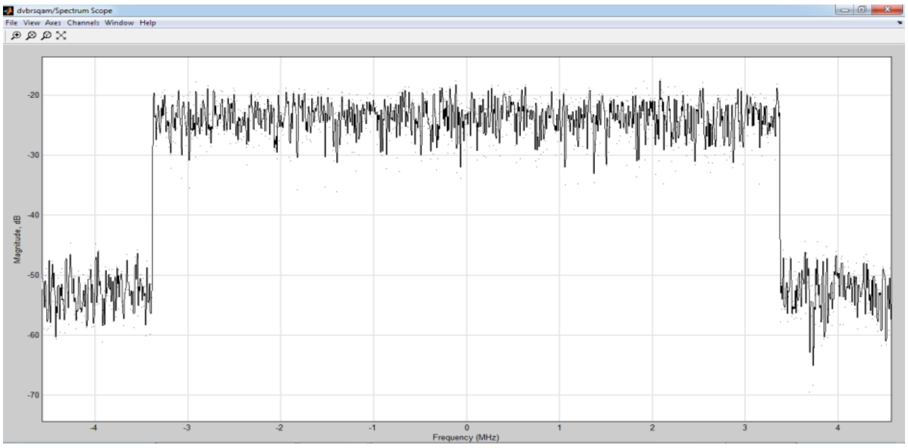

Figure 3. Received Signal of DVB-T with RS Encoder.

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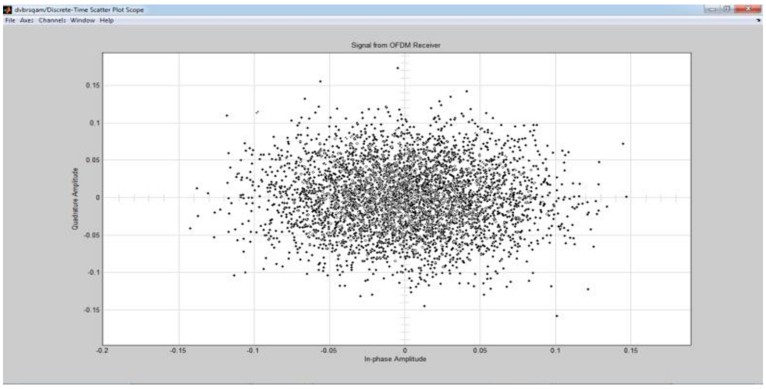

Figure 4. Scatter Plot of DVB-T Transmitted Signal with RS Encoder and QAM Modulation.

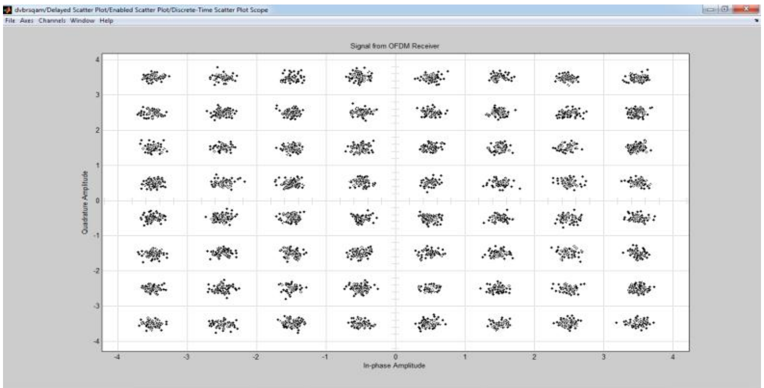

Figure 5. Scatter Plot of DVB-T Received Signal with RS Encoder and QAM Modulation.

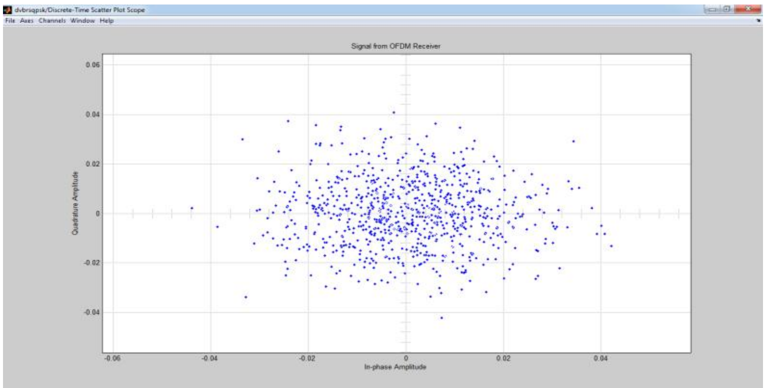

Figure 6. Scatter Plot of DVB-T Transmitted Signal with RS Encoder and QPSK Modulation.

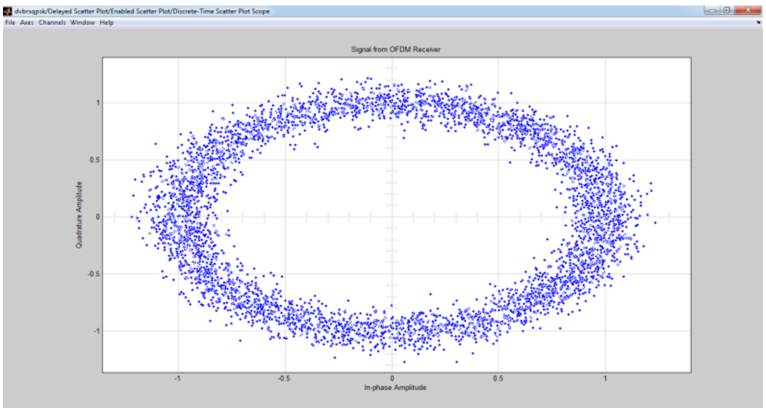

Figure 7. Scatter Plot of DVB-T Received Signal with RS Encoder and QPSK Modulation.

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IV. CONCLUSION

The Figure shows the transmitted and received signal of DVB-T system. To plot these signals spectrum scope is used. The Spectrum Scope block computes and displays the periodogram of the input. From the plot of transmitted and received signal it is clear that the received signal is so much distorted as comparison to transmitted signal due to channel. The simulation results are plotted in term of the performance of DVB-T system that is transmitted, received signal. The scatter plot shows the strength of signal with different encoding and modulation techniques.

REFERENCES

[1]. Drakshayini & Arun Vikas Singh, "Integrated Antenna for the Digital Audio Broadcasting & Digital Video Broadcasting by Orthogonal Frequency Division Multiplexing", International Journal of Innovative Technology & Exploring Engg, Vol.8, Iss:11, pp.3320-3328, 2019.
[2]. Loreta Andoni and Aleksander Biberaj, "Multi-Antenna Systems in DVB-T2/SFN Networks", International Refereed Journal of Engineering and Science, Vol. 8, Issue 1, pp. 66-70, 2019.
[3]. Bundit Ruckveratham and Sathaporn Promwong, "Empirical single frequency network threshold for DVB-T2 based on laboratory experiments", Turkish Journal of Electrical Engineering & Computer Sciences, pp. 3342-3355, 2019.
[4]. Sukamto and R. Gaguk Pratama Yudha, "Analysis of Digital Video Broadcasting - Terrestrial Second Generation (DVB-T2) Based on OFDM System on Transmission Aspect," International Research Journal of Advanced Engineering and Science, Vol. 3, Issue 3, pp. 135-139, 2018.
[5]. Anugrah Nair, Gaurav Gupta and Kartik Srinivas, "Review on Multiple Access Techniques Used In Mobile Telecommunication Generations", International Research Journal of Engineering and Technology, Vol. 5, Issue 10, pp. 350-354, 2018.
[6]. Syed Gilani Pasha and Vinayadatt V Kohir, "Implementation and Performance Analysis of OFDM Based DVB-T System Using Matlab and HDL Coder", International Journal for Research in Applied Science & Engineering Technology, Vol. 5, Issue 9, pp. 466-477, 2017.
[7]. K. Sambasivarao, N.V. Ramana and M. Venkata Manikanta, "Effect of Time Interleaving Parameters in Mobile DVB-T2 Systems", International Journal Of Engineering Sciences & Research Technology, pp. 175-181, 2017.
[8]. Monika Kapoor and Dr. Anubhuti khare, " Performance Analysis of Reed Solomon Code & BCH Code for various Modulation Schemes over AWGN Channel", International Journal of Applied Engineering Research, Vol. 12, No. 24, pp. 15801-15813, 2017.
[9]. Syed Gilani Pasha and Vinayadatt V Kohir, "Performance Analysis/Study of OFDM Based DVB-T System under AWGN, Rayleigh and Rician Channels", National Conference on Advances in Computing and Communications, pp. 96-102, 2016.
[10]. Aasheesh Shukla and Vinay Kumar Deolia, "Performance Analysis of Chaos Based Interleaver in IDMA System", International Journal on Communication Technology, vol. 7, issue 4, pp. 1397-1401, December 2016.
[11]. Prakash Patel, Dr. Snehlata kothari and Dr. Dipesh Kamdar, "Performance of Digital Video Broadcasting (DVB-T) using Filter for 64- QAM", Inte rnational Journal of Engineering Trends and Technology, Vol. 38, No. 2, pp. 71-74, 2016
[12]. Sneha Pandya and Charmy Patel, "Comparative Analysis and Simulation of various QAM Techniques as used in DVBT2", Indian Journal of Science and Technology, Vol. 9, pp. 1-9, 2016.
[13]. Ankita Jhamb, "A Review on Interleave Division Multiple Access in Underwater Communication", International Journal of Engineering Development and Research, Vol. 4, Issue 4, pp. 873-876, 2016.
[14]. Shweta Bajpai and D. K. Srivastava, "Performance Analysis of IDMA Schemes using different Coding techniques with receiver diversity using Random Interleaver", International Journal of Science Research Engineering & Technology, vol. 3, issue 6, pp. 1008-1012, September 2014.
[15]. Sweta Singh and Parul Malhan, "A Review Paper on Multiple Access Techniques for Mobile Communication", International Journal For Innovative Research in Technology, Vol. 1, Issue 6, pp, 1244-49, 2014.
[16]. Pramod Movva and A Krishna Chaitanya, "Analysis of Different Pilot Patterns in Various Channels for DVB-T2", International Journal of Advanced Research in Computer and Communication Engineering, Vol. 3, Issue 9, pp. 7979-7981, 2014.