Best digital tv standard

Sociology, Communication

The quality of broadcasting is changing by the appearance of the services which fuses broadcastingcommunicationtechnologies. Different standard has been developed for this purpose to improve the quality of service. The aim of my investigation is to find out the development path of the digital broadcasting standard in Europe, USA and Japan. In this paper I also outline the operation of each standard and present their comparison based on their services and technical parameter. * Table of Contents 1Abstract: I 2LIST OF TABLE & FIGUREII 3Introduction: 2 4Standard3 .

1DVB-T (Digital Video Broadcasting-Terrestrial)3 4. 2ATSC (Advanced Television Systems Committee)5 4. 3ISDB-T (integrated service digital broadcasting-terrestrial)7 5Comparison: 10 5. 1Comparison from the service aspect10 5. 2Technical comparison11 5. 3The summary comparison of the three standard11 6Conclusion12 7References13 LIST OF TABLE & FIGURE Table 1: Broadcasting service of 3 DTTB systems. 11 Table 2: Technical Services of 3 DTTB systems.

12 Table 3: Summary of 3 DTTB systems comparison13 Figure 1: worldwide deployment4 Figure 2: DVB -T SFN Network Architecture5Figure 3: ATSC Tuners7 Figure 4: ATSC System7 Figure 5: ISDB-T System in Japan8 Figure 6: ISDB-T Segmentation9 Figure 7: ISDB-T Operation9 Introduction: Digital broadcasting set to transform the communication landscape now a day. The digital switchover will leapfrog existing technologies to connect the uncorrected in underserved remote communities and close the digital divide. The goal of this achievement is to bring structural development of digital terrestrial broadcasting and sufficient flexibilities for adoption to the changing telecommunicationenvironment. The switchover will create new

distribution network and expand the potential and multimedia data making application and services. The digital dividend accruing from efficient in spectrum usage will allow more channels to be carried across fewer airwaves and lead to greater convergence of services. The digital broadcasting will support mobile video internet and multimedia data making application, services and information accessible and usable anywhere and at any time. Its inherent flexibility opens the door for newtechnologysuch as high-definition television and handheld TV broadcasting.

StandardThe digital television standard describes a system designed to transmit signal by means of digital modulation technique. Moreover it permit’s a level of quality and flexibility and enable a significant step up performance, services. The level of standardization of the DVB is quite advanced, and relevant recent international standards and related documents are introduced and referred to for easy access to the agenda seeking technical details. Each standard proposed and established by the regional consortium, research centre and Telecommunication Company according the local broadcasting consumer needs, demand and different parameter. There are several digital TV standards developed and deployed in different countries: * ATSC standard for US * ISDB-T in JAPAN * DVB-T in Europe. Fig 1 shows the globally deployment of the above standard [1] Figure [1]: worldwide deployment Source: http://dev. emcelettronica.

com/digital-tv-standards-dvb-t-atsc-isdb-t DVB-T (Digital Video Broadcasting-Terrestrial) In early 1990 European broadcaster, equipment manufacturer and regulatory agencies have managed to develop a standard for digital TV

for this region. A memorandum of understand has been launched by the stake holder and was signed September 1993. The mission of this group is to protect inter operable standards for the global delivery of digital media service [1]. The DVB-T standard has been designed for stationary and portable terrestrial reception with multi path fading. It uses OFDM with guard interval because it uses large number of carrier per channel modulated in parallel via an FFT process. There are two transmission modes; the first one is 8k mode which requires smaller symbol length and 8192-point FFT. It is suitable and design for single frequency network (SFN).

An SFN is a network where a number of transmitters operate on the same RF frequency [Fig2]. An SFN can cover a country and offer better utilization of the available spectrum. Figure [2]: DVB -T SFN Network Architecture The second mode is called 2K mode which use 2048-point FFT. It can be use for single transmitter operation and small SFN with limited distance between two transmitters. The guard interval is 25% of the total symbol length but shorter guard interval is also possible [1] [2]. source 1, 2 The total bandwidth for the terrestrial 8MHz TV channels is 7. 6MHz but the system parameters can be scaled for 6/7 MHz TV channels.

The bit rate for the 8MHz is 4. 98Mbits/s to 31. 7 Mbits/s but this range is depends on channel choosing, coding parameters, modulation techniques and guard interval duration. DVB-T use coherent modulation. Different signal constellations need to be considered between QPSK and 64-QAM. In the receive side estimated channel amplitude and phase are required and use 10% of the total bandwidth [2] [3] . Source 2, 3.

It also has the capacity of using hierarchical modulation technique where two completely separate data stream are modulated onto a single DVB-T signal. A high priority stream is embedded within a low priority stream. As a result the broadcaster can target two different types of receiver with two different services. “ For example, DVB-H mobile TV services optimized for more difficult reception conditions could be placed in the HP stream, with HDTV services targeted to fixed antennas delivered in the LP stream [7]. ” Terrestrial DVB-T implement coded orthogonal frequency division multiplexing (OFDM) because of its tolerance to multipath. It provide data payload up to 19Mbps which allow transmitting one HDTV program and up to 4SD program. The channel coding is based on convolution code and the range of code rates are ? , 2/3, 5/6, 7/8.

In DVB-T system the data and transmission level separated in order to ignore unequal error protection (UEP). For video coding where low bit error rates are required use outer Reed-Solomon (RS) code where a block of 188 byte data is coded into block of 204 byte data. The error which is produced by the decoder has eliminated by inserting short byte interleaver between the outer RS code and inner convolutional code [2]. Source 2 DVB-T2 is a new transmission standard which is the upgraded version of DVB-T. It offers 30% increase in multiplexing capacity then the DVB-T standard. ATSC (Advanced Television Systems Committee)In the USA the broadcasting environment is considerably different from the rest of the world. The technical parameter of the station resulting in different coverage area and quality of audio or video service appear to be important economic factor that are the vital to the

broadcaster in which many of them think it has to be preserved in the transition to the digital system.

After a decade of intense research and development by the Advanced Television System Committee and a consortium of electronics and telecommunications companies has develop a standard for this region which is ATSE standard. In early 1990 ATSE standard was developed and offer high quality of video and audio transmission and ancillary data over single 6MHz terrestrial television broadcast channel [2]. Source book This standard use single carrier modulation scheme and adopted eight level vestigial sideband amplitude modulation technique. In this technique the data are encoded by varying the amplitude of a single carrier frequency. Portions of one of the redundant sidebands are removed to form a vestigial sideband signal. A significant advantage of 8VSB for broadcasters is that it requires much less power to cover an area. VSB is also more resistant to impulse noise.

Some stations can cover the same area while transmitting at an effective radiated power of approximately 25% of analog broadcast power [9]. Source http://en. wikipedia. org/wiki/8VSB . In ATSE system Multiple MPEG programs are combined then sent to a transmitting antenna. In the US broadcast digital TV system, an ATSC receiver then decodes the TS and displays it on a TV [Fig 3] [11]. Figure 3: ATSC Tuners Source: http://www.

answers. com/topic/atsc-tuner This standard can reliably deliver 19. 4 Mbits/s of data throughput in a single channel and 38. Mbits/s in 6MHz cable television channel. This means encoding HD video essence at 1. 106 Gb/s

(highest rate progressive input) or 1. 244 Gb/s (highest rate interlaced input) requires bit rate reduction by a factor of 60.

ATSC use compression technology to achieve the bit rate reduction. It uses minimum bits of video, audio and data for the compression to optimize the scarce resource of the transmission channel. During the compression scheme it also preserves the level of quality of the application [5]. Figure [4]: ATSC System ATSC have two modes of operation. One is 8-VSB simulcast terrestrial mode and the other is 16-VSB high data rate mode. It use huge data ‘ pipeline’ to support a wide Varity of application. In a 6Hz channel a broadcaster can transmit HD program or an HDTV program with one or more simultaneous standard definition program or multiple simultaneous SDTV program or a virtually limitless array of data service or various combination of all three[5].

ISDB-T (integrated service digital broadcasting-terrestrial) Figure [5]: ISDB-T System in Japan NHKScienceand Technical Research Lab in Japan have proposed the concept of ISDB standard. From this approach a system was created and configured for the terrestrial broadcasting. The most important aims were to establish this terrestrial system to achieve frequency efficient coverage and flexibility by using Single Frequency Network (SFN), portable and mobile receiver with rugged reception. To establish this concept a variant of OFDM was developed in order to build Band Segment Transmission (BST) OFDM. In BST-OFDM each signal consists of frequency block with bandwidth of 571500 or 428 KHz corresponding to 1/14 of the terrestrial television channel spacing [2]. It could be 6, 7 or 8 depending on region. It

uses different carrier modulation scheme and coding rates of the inner code on the different BST-Segment for its hierarchical transmission [3].

Figure [6]: ISDB-T Segmentation Source : http://en. wikipedia. org/wiki/ISDB ISDB-T use UHE 470MHz to 77MHz and has 6MHz width fifty two channel. Each channel are the combination of 13 segment. The TV station uses the combination of the segment for broadcasting the TV program. For example they combine one 12segment for HDTV program, one 8segment for MDTV and three 4segment use for SDTV program[fig6][10]. seg use single segment for mobile terrestrial digital audio/video broadcasting services.

The transport stream used for 1seg is MPEG-4AVC [Fig 7]. Figure [7]: ISDB-T Operation Source http://dev. emcelettronica. com/digital-tv-standards-dvb-t-atsc-isdb-t Each case the basic modulation and coding modes of segment are QPSK, DQPSK, 16QAM and 64QAM and codes rates between 1/2 and 7/8 are available. Time interleaving technique has been implementing for enhancing reception performance in the noisy, mobile indoor environment. It also use Emergency Warning System (EWS) feature to warn the population in emergencies. ISDB-T can transmit one HDTV and up to 4 SDTV by using MPEG-2 transporting stream while the transport stream used for 1seg is MPEG-4 AVC.

Comparison: Each standard have their unique features, techniques and performance depending upon the geographical infrastructure, consumer demand. Therefore, countries and its administrations does the intense research before deploy them. The selection mainly based on modulation technique, the use of spectrum resources, coverage requirement,

transmission network structure, reception condition, type of service required, cost to the consumers and broadcasters[3]. After my investigation I tried to establish a comparable analysis by considering different impairments and operational conditions. Comparison from the service aspect The following table 1 shows the summary of the performances of 3 DTTB system standards from their service aspect: The SFN operation uses a cluster of transmitter in DVB-T and ISBD-T to cover a designated service area and provide strong field strength throughout the core coverage area. ATSC system does not design to support SFN operation, because ATSC Standard has adopted single carrier system [1]. Item | DVB-T| ATSC| ISBD-T| HDTV/SDTV fixed reception | Yes| Yes | Yes | Data Broadcasting| Possible1| possible1| In service| SFN(Single Frequency Network)| Yes | No | Yes | HDTV mobile reception| Not possible2| Impossible | Good | Portable reception by cellular phone| possible3| Impossible | Good | Internet access| possible| Not good| Good | Table 1: Broadcasting service of 3 DTTB systems.

Note: 1. For ATSC and DTV-T, actual commercial service is not popular. 2. For DVB-T, SDTV mobile reception is possible. 3. In the case of DVB-T, another frequency required for portable reception service. Technical comparison This table shows the comparisons based on their technical parameters [1]: Systems | ATSC| DVB-T| ISDB-T| Transmission | Single carrier | Multiple carrier(OFDM)| Multiple carrier(OFDM)| Bandwidth | 6/7/8 MHz| 6/7/8 MHz| 6/7/8 MHz| Modulation | 8-VSB| QPSK/16QAM/64 QAM| DQPSK/QPSK/16QAM/64 QAM| Error Correction| Trellis code + RS| Convolutional code + RS| Convolutional code + RS| characteristic| Distributed transmission capability | SFN capability | SFN capability

Segmented OFDM Time interleaving| Table 2: Technical Services of 3 DTTB systems.

The summary comparison of the three standard After all discussion I can summarize the comparison of the three standard the following way [8]. Requirements | System conform to requirements| Maximum bit rate under Gaussian noise environment| ATSC| Robustness against multi-path interference | DVB-T and ISDB-T| Robustness against impulse noise | ISDB-T| Wide area Single Frequency Network operation| DVB-T and ISDB-T| Mobility and portability | ISDB-T>> DVB-T | Hierarchical transmission(Multiple modulation systems simultaneously in same channel is possible)| ISDB-T>> DVB-T | System commonality with digital terrestrial sound Broadcasting | ISDB-T| Table [3]: Summary of 3 DTTB systems comparison 1. Under the static multipath condition, DVB-T and ISDB-T are almost same, but under the dynamic multipath condition ISDB-T is superior than DVB-T because ISDB-T support the time interleave 2. DVB-T has a offered hierarchical transmission function (non-uniform transmission), but it has no practical service in the world because of it degrade performance of the receiving side. Source : Published in June, 2007 http://www. dibeg. org/techp/techp.

htm Conclusion The merits of the digital TV standard has been recognized in worldwide because of its offer like more TV channels, better images and improved sound quality. These broadcasting standards also allow new possibilities like pay TV, video-on-demand and interactive contents. But neither of these technologies will appear as conquering over the other, and neither will be forced to accept a role as thefailurein the records of

broadcasting history. In fact, all these standards can and likely playing equally important roles in the terrestrial TV broadcasting industry. Therefore, the choice will be based on how those digital TV standards meet the particular requirements or priorities of each country as well as the nontechnical factors such as geographical, economical and political condition of the country need to be considered. The broadcasting industry is going through a massive technical up gradation phase. This phase brings many open door opportunities for various players across the value chain of digital broadcasting.

Proper government policies and regulation are essential to protect unlawful abuser. Decisions by the government, companies, competitors and consumer are playing critical roles in the development and promoting of digital terrestrial television technology. References 1. Diego Villa, “ Digital TV Standard: DVB-T, ATSC, ISDB-T,” Your Electronic Open Source, Nov 26th, 2008[online]. Available: http://dev.

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