

ISDB-TB – REDEFINING VIEWERS’ EXPERIENCE

Providing Cost-Effective, High-Quality Digital TV Experience for Third World Countries



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Abstract

Analog sunset is rapidly gaining ground with many countries in the world opting for the switchover to digital TV, and the rest of the world is also in the process of following suit in the immediate future. Four major digital television (DTV) standards – namely, ATSC, DVB, DTMB and ISDB – are widely used all across the world. Whereas the major players in North America, namely the United States of America and Canada have adopted ATSC. Europe, Australia, India, South Africa and some other countries have adopted DVB. China, Hong Kong and Macau have adopted Chinese-developed DTMB. Japan has developed a new digital television standard of its own called ISDB which is being patronaged by Brazil in the form of a derivative standard called ISDB-Tb, and is being adopted in many South American countries, few Asian countries like Philippines, Maldives and few African countries like Botswana, Zambia, Democratic Republic of Congo, Angola, Mozambique. Several third world countries that are yet to see the onset of analog sunset are very keen on adopting ISDB-Tb and have already started the assessments. This paper brings out the view on why ISDB-Tb became a more preferred standard over its popular counterparts DVB and ATSC.

Introduction

Analog switch-off or analog sunset is the replacement of analog television broadcasting by digital television broadcasting. The intent of the same is to provide enhanced viewer experience in addition to freeing up the radio spectrum for introducing new services. With regard to this, most of the countries have set deadlines for the analog sunset [1]. In the United States, the Department of Commerce's National Telecommunications and Information Administration (NTIA) had come up with Television Subsidy Coupon programs regardless of any consumer criteria including the income limits [2]. Few European countries like Italy followed the path of the United States and announced subsidy for the consumers [3].

There are four terrestrial DTV standards that are prevalent across the

world; North America (ATSC), Europe (DVB-T), Japan (ISDB-T) and China (DTMB). These standards are not compatible with each other. This situation has forced countries to choose the most appropriate standard that will cater to their specific objectives. Countries which are promoters of respective standards compete against each other in order to lure the countries where digital switchover has not yet started. Interestingly, vast majority of the countries where digital switchover is yet to happen are spread across third world countries, namely the continents of Asia, Africa and Latin America. Out of the four DTV standards, DVB and ISDB have locked horns in persuading these countries to adapt their respective standards. The stiff competition between these two standards has tilted the debate from technical comparison to other criteria like cost benefits and social aspects.

In order to select a suitable DTV standard, several Latin American countries have carried out studies on major DTV standards. These studies yielded results in favor of ISDB-T, as it offers viewers better quality and indoor reception [7]. The adaptation of ISDB-T by Brazil led to the evolution of a derivative standard called ISDB-Tb with more superior benefits added to the existing Japanese standard. With the advent of DVB-T2, technical comparisons slowly drifted towards ISDB-Tb and DVB-T2. Differentiating factors are miniscule when it comes to DVB-T2 and ISDB-Tb.

Subsequent sections describe ISDB technical features, evaluation of ISDB-T by SET and ABERT by clearly stating the superiority over its counterparts, and enhancements made to ISDB-T by the SBTVD Forum that led to the birth of ISDB-Tb. Discussions on other factors, such as cost benefits and social aspects, which substantiate the claim of ISDB in the countries where the onset of analog sunset is yet to begin are also covered in the subsequent sections.

Further sections discuss recent adaptations by third world countries and the reasons that have prompted them to do so and why more and more third world countries may follow them. Counterviews from DVB promoters by leading an active campaign against ISDB-Tb with the help of DVB-T2 are also presented.

ISDB-T Technical Features

ISDB-T, terrestrial digital broadcasting was started in Japan on December 2003 by NHK and other commercial broadcasting stations. Technical features of ISDB-T system in comparison with other two standards are provided in Table I [6].

The differentiating factor about ISDB-T system is that it is designed to provide reliable high-quality video, sound, and data broadcasting not only for fixed receivers but also for mobile receivers. Several studies have shown that it is robust for any multipath and fading interference encountered during mobile reception [6].

Error correction system is an important aspect in digital transmission as it is intended to reduce the degradation caused by any kinds of interference. Impulse noise is an interference factor with sources attributed to car engine, use of electric switches etc. and is pre-dominant in the urban space. For tackling this, ISDB-T introduced the feature of Time Interleave which is very effective in its defense against impulse noise.

ISDB-T ensures efficient use of transmission capacity and the system is flexible enough to accommodate different service configurations.

ISDB-T system provides great flexibility of hierarchical transmission by using OFDM modulation technique associated with band segmentation. Another distinguished technique used is TMCC (Transmission and Multiplex Configuration Control) that provides optimized performance depending on the type of broadcasting such as HDTV and mobile reception.

System		ISDB-T	DVB-T	ATSC
Modulation		Segmented OFDM (DQPSK, QPSK, 16QAM, 64QAM)	OFDM (QPSK, 16QAM, 64QAM)	8VSB
Interleaving	Bit/Symbol	Yes	Yes	Yes
	Frequency	Yes	Yes	-
	Time	0S, 0.1S, 0.2S, 0.3S, 0.4S	-	-
Excess Bandwidth/Guard Interval		1/4, 1/8, 1/16, 1/32	1/4, 1/8, 1/16, 1/32	11.50%
Configuration		TMCC	TPS	-
Information Bit Rate		3.65 - 23.2 Mbps	3.69 - 23.5 Mbps	19.39 Mbps
Channel Bandwidth		6 / 7 / 8 MHz	6 / 7 / 8 MHz	6 / 7 / 8 Mhz

Table I: Technical Features Comparison

ISDB Evaluation by SET and ABERT

Extensive laboratory and field tests were carried out by Brazilian Association of Radio and Television Broadcasters (ABERT), Brazilian Television Engineering Society (SET) and Universidade Presbiteriana Mackenzie to select a suitable terrestrial standard meeting specified requirements. As per the studies conducted by these agencies, ISDB-T demonstrated superior performance in indoor reception and flexibility to access digital services and TV programs through non-mobile, mobile or

portable receivers with impressive quality [7].

Another key factor in favor of ISDB-T was its suitability for disaster management as there is a provision for Emergency Warning System (EWS). In many of the countries that are prone to natural calamities like Tsunami, river flooding, typhoons etc., EWS is very effective and can save many lives before the disaster hits. Portable EWS receiver for One-Seg is also available and this makes EWS an effective system for delivering disaster information to the general public at any time anywhere. Figure 1 illustrates the same.

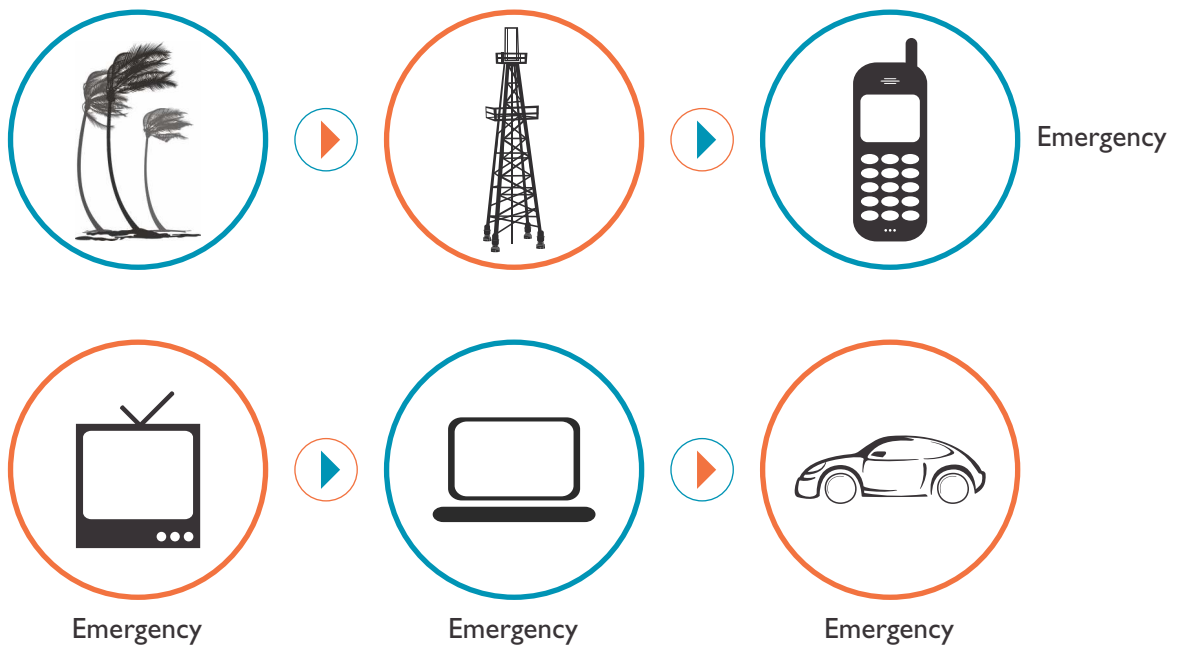


Figure 1: EWS in ISDB-T responding quickly to natural calamities



Enhancements to ISDB – Birth of ISDB-Tb

SBTVVD forum was founded in 2007 for overseeing the digital TV deployment aspects in Brazil. This was a non-profit organization comprising of private and public companies that were related to digital TV deployment in Brazil. SBTVD forum had the responsibility of addressing all technical issues for ISDB-T deployment. The SBTVD forum took one step further and recommended further enhancements to ISDB-T system to derive a new standard called ISDB-Tb. ISDB-T was enhanced with features like MPEG-4 video compression (in place of MPEG-2) and Ginga interactive middleware. Ginga interactive middleware provides an excellent support platform for those social requirements intended by the Brazilian Government (digital inclusion, educational and cultural support, e-governance etc.). The ISDB-Tb system presents some adaptations from ISDB-T [7];

Presentation rate of 30 frames/sec even for portable receivers assured highest possible quality in all classes of devices.

Implementation of open reception instead of CAS protection present in ISDB-T standard. Ensuring open reception is very critical in third world countries as entertainment should be available to the common man in a free manner.

Emission masks of transmitters were specially adapted in order to comply with more hostile scenarios for interference from other station. This is critical for implementation purposes in many countries where the spectrum is congested.

Included character sets for Latin derived languages.

Features like dubbing and LIBRAS (Brazilian sign language).

ISDB-Tb Patronaged by ARIB and SBTVD Forum

Each of the DTV standards has some technical peculiarities that make them more appropriate for certain contexts that are relevant for a particular country. Governments may want to improve the quality of the television signal or increase the number of channels. Similarly, they may want to facilitate free access or conditional access on mobile phones. They may want to extend coverage to peripheral areas or focus on the urban demand. Several countries in Latin America have assessed feasibility of realizing their requirements against three DTV standards, namely ATSC, DVB-T and ISDB-T, in different geographical environments, and assessments reveal that the ISDB-T option scored well above its counterparts. It is also important to mention that the countries interested in promoting a standard usually offer several types of socio-economic cooperation and technical assistance to potential adopters in order to influence their decision. Elimination of royalties by the Japanese Government on the use of ISDB-T, the transfer of technology from Japan to Brazil, the creation of a Japanese-Brazilian work group for ongoing developments, and financial help for the initial implementation from the Japanese Development Bank influenced Brazil to choose ISDB-T over other DTV standards [6][7]. After Brazil had launched the ISDB-Tb in 2006, significant efforts have been made by Japanese-Brazilian work groups to persuade other countries to adopt ISDB-Tb. Technical help, financial incentives and low cost digital television receivers are a huge boost for the underdeveloped countries that are yet to make the transition to DTV transmission. This will enormously soften their financial burden.

Recent Adaptations of ISDB-Tb

The enhancements integrated into ISDB-T system made the Japanese digital receivers useless in Brazil. This in turn helped the development of manufacturing industry in Brazil with approximately 57 million sets of receiver requirement nationwide [4]. It is therefore easy to understand why Brazil has made significant efforts to promote the ISDB-Tb in Latin America. With the active promotion campaigns made by Japanese-Brazilian work groups visiting each country and making the authorities understand the benefits of adapting ISDB-Tb, ISDB-Tb has been chosen by several Latin American countries such as Argentina, Costa Rica, Chile, Paraguay, Peru and Venezuela and could soon be adopted by Bolivia and the Portuguese-speaking countries in Africa like Mozambique and Angola [6] [7]. Other countries like Democratic Republic of Congo, Zambia and Botswana have also announced their decision to adopt ISDB-Tb. It is interesting to note that the mentioned African countries are part of SADC (South African Development Community) and have switched sides to ISDB [7] despite signing 2006 ITU Geneva agreements [8] for switching over to DVB. More African countries are expected to follow ISDB-Tb adaptation in the near future. As of December 2012, 35.3% of TV Homes in Sub-Saharan Africa, which amounts to about 14 million, have switched over to Digital Reception. The Digital TV Sub-Saharan Africa report [19] forecasts that the total volume of digital switch over will peak to 49 million by 2018.

Thailand is assessing ISDB-Tb as its DTV system by considering key points like cost efficiency, disaster management, and solving of economic and



social issues [9]. Interestingly, calamity prone Asian countries like Maldives and Philippines have also adopted ISDB-Tb based on Emergency Warning Systems in addition to the technical superiority [6].

Competition from DVB-T/T2

Since 2009, many countries have adopted DVB-T2 as their DTV standard [13]. DVB-T2 networks have become operational in Russia, South Africa, Sweden, UK, Uganda, Ghana, Italy, Kenya, Namibia, Nigeria and Zimbabwe. Millions of DVB-T2 receivers have been sold worldwide by competing manufacturers and this contributed to reduction in DVB-T2 receiver prices dramatically [5].

University of Stellenbosch, South Africa had conducted independent studies on DTT systems comparison in 2010 and concluded that DVB-T slightly outperforms ISBD-T and DVB-T2 is way superior to ISDB-T and DVB-T [14]. With this study as the base reference, SADIBA criticized Botswana's decision to embrace ISDB-T. SADIBA in its statement [15] counters each of the advantages cited by DIBEG and SBTVD forums and even questions the need for the evolution of new standard ISDB-Tmm. Cost claims of ISDB-T also have been questioned in the SADIBA statement. It also warns that if any African country in the region adapts ISDB-T, it will only isolate the country from the rest of SADIBA.

In Philippines, there were criticisms on Philippines' National Telecommunications Commission's decision on selecting ISDB-T over DVB-T/T2. Players like GMA-7 and ABS-CBN had strongly opposed NTC decision to adopt ISDB even though later reports say that both GMA-7 and TV5 are testing their ISDB-T equipments. Decision of Philippines embracing ISDB is subject to the final verdict by Malacanang (Office of Philippines President) which is examining the claims from GMA-7 that recent developments in DVB-T provide it an edge over ISDB-T [18].

Conclusion

While it is interesting to note that there is no conclusive study on which standard is superior, the reasons that will dictate the choice of many underdeveloped third world countries could be based on financial and technical support aspects. ISDB-Tb seems to do much better than DVB-T/T2 in those aspects along with the active campaigning through technical delegations and media propaganda. These efforts by ISDB-Tb

promoters have already seen huge success in penetrating majority of Latin American and few of the Asian and African countries. ISDB-Tb got a further boost when many countries from SADIBA switched over sides to ISDB-Tb even though they had signed an agreement to switch over to DVB-T/T2. It may be concluded that the rest of the third world countries will soon follow this trend.

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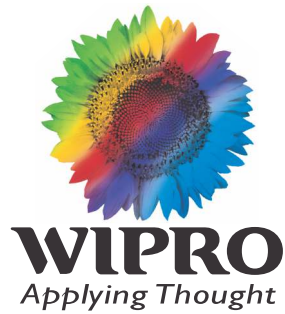
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