A T T A C H M E N T 2

F L E X I B I L I T Y

System's flexibility essential to future broadcasting businesses

In this age of rapid advancement of IT revolution, an increasing number of digital media products with novel functions, such as portable terminals, the Internet, home servers, and the like, are being introduced on the market.

One essential aspect of the broadcasting business in terms of exploiting the vast potential of these technologies is how flexibly terrestrial digital broadcasting systems can adapt to such digital media, and what new needs and business models can be created.

As ISDB-T and DVB-T systems both adopt MPEG-2 Systems to multiplex digital signals, this paper focuses on their transmission schemes and illustrates the differences between the two systems in an attempt to forecast the future prospects for broadcasting businesses.

1. Flexibility and characteristics of hierarchical transmission

ISDB-T

The transmission band of one TV channel consists of 13 OFDM segments. This scheme is one in which transmission parameters can be set independently for each segment by fully utilizing the properties of the OFDM scheme, in which the carriers are arranged so as to be orthogonal to one another.

Therefore, in hierarchical transmission in which programs are transmitted with different robustness, the capabilities of transmission parameters for the respective hierarchical levels, that is, of modulation-scheme/error-correction/temporal interleave, can be thoroughly demonstrated. A single channel can be set so as to have up to three hierarchical levels.

DVB-T

On the other hand, hierarchical transmission using the DVB-T is a scheme in which, with 64QAM or 16QAM modulation, the two most significant information bits are allocated to an upper (i.e., robust) hierarchical level corresponding to that of QPSK, and the remainder are allocated to a lower hierarchical level.

As this scheme divides only the signal points of multi-value QAM modulation into two hierarchical levels, the distances between signal points on the upper hierarchical level and those on the lower hierarchical level both inevitably become smaller than those of the simple QPSK and those of non hierarchical 64QAM/16QAM. Therefore, the

capability of modulation/error correction in each layer is not as great as expected from a specific parameter.

With non-uniform setting, [*1] as the coefficient increases to 2, 4, the signal points tend to gather near average power level, and the distances between signal points on the lower hierarchical level further decrease, thereby degrading the transmission characteristics.

*1 - ETSI EN 300 744 - Digital Video Broadcasting; Framing structure, channel coding, and modulation for digital terrestrial television, ETSI, 1999.

2. Reception Bandwidth

An examination of the reception bandwidth is required for evaluation of the flexibility of each system. The ISDB-T system provides a reception bandwidth as narrow as approximately 430 kHz (one segment), in addition to the normal transmission bandwidth of 5.6 MHz. As power consumption is proportional to the reception bandwidth, the function of receiving one segment is extremely important in realizing a portable receiver with sufficient battery capacity.

The one-segment service performed on a portion of the TV broadcasting wave can be a powerful tool in the construction of a new business model for a portable-reception-oriented service accompanied by video, on its own or when integrated with communication media such as IMT2000.

3. Others

3.1 4K mode

The ISDB-T system has a 4K mode in addition to a 2K mode and an 8K mode. The 4K mode supports the transmission characteristics required for both fixed and mobile reception, and is therefore most appropriate for such programming combining fixed/mobile/portable reception.

3.2 Common receiver

ISDB-T_{SB} (ISDB for Sound Broadcasting) is a broadcasting system that uses one segment of the same structure as the ISDB-T. A one-segment portable receiver is capable of receiving the broadcasting service of both radio stations and TV broadcasting stations, due to the compatibility of the systems. This capability not only enables a wide array of services to be offered, but also provides significant advantages to broadcasters and manufacturers of receivers in terms of popularization of digital broadcasting and cultivating a new market.

4. Reference matters regarding the business model

4.1 Flexibility of program offering

System	Typical example of a program composition per channel
ISDB-T	- An HDTV program using 12 segments and a program using one segment intended for portable reception - SDTV Program #1 intended for non-mobile reception, SDTV program #2 intended for mobile reception (arbitrary allocation of 12 segments), and a program using one segment intended for portable reception - Multiple programs multiplexed by the MPEG-2 Systems, with the transmission parameters being set uniformly within a channel (for 13 segments)
DVB-T	- A plurality of programs multiplexed by the MPEG-2 Systems, with the transmission parameters being set uniformly within a channel - Program composition divided into two hierarchical levels. (It is assumed that it is difficult to secure the transmission characteristics required to effect fixed reception and mobile reception simultaneously.)

4.2 Adaptability to portable reception

System	Transmission bandwidth	Power consumption	Feasibility of portable terminals and compatibility with other media	Example of transmittable content
ISDB-T	Narrow 430 kHz (One segment of 6-MHz TV)	Small - 256-512-sample FFT - MPEG-4 decoder - Low frequency clock	Large (Soon) The circuit integration scale is small, and miniaturization is easy. Moreover, integration with various communication terminals and mobile terminals is feasible. Completely compatible with DSB (ISDB-T_{SB}) receivers	In the case of 16QAM with 1/2-convolutional coding, a stereophonic-sound program with CD quality achieved through AAC coding, and a simplified moving-picture program provided through MPEG-4 coding can be transmitted simultaneously.
DVB-T	Wide 6 MHz	Large -2k-8k sample- FFT -MPEG-2 decoder - High frequency clock	Small The circuit integration scale becomes the same as that of TV receiving sets, thereby hampering this system's realization. The system differs from that of DAB receivers.	