DVD-Audio and DVD-Audio Recording Specifications

Bike H. Suzuki

Technology Planning Group, Corporate Planning Headquarters
Victor Company of Japan, Limited (JVC)
Suzuki-hiroaki@jvc-victor.jp

Abstract
Two Specifications for next-generation audio, DVD-Audio and DVD-AR (Audio Recording), which have been developed by DVD Forum are described. The two Specifications, closely correlated with each other, will surely bring a new dimension in the way people appreciate music.

1. Introduction

DVD-Audio, developed by Audio Working Group WG-4 of DVD Forum, uses the large capacity of DVD-ROM to provide a music carrier or disc with supreme audio quality and better sound-field reproduction. The DVD-Audio Specification was produced through the dialogue between WG-4, consisting mainly of CE manufacturers, and the music industry represented by RIAA, RIAJ, and IFPI. High-quality audio in stereo and multichannel, multimedia functions are what the music industry required of DVD-Audio Specification.

DVD-AR (Audio Recording) Specification has been developed in close correlation with DVD-Audio. It allows several kinds of sound sources to be recorded onto DVD-R, -RAM, and -RW discs in a very secure manner. Recording with the same quality as with DVD-Audio is possible with DVD-AR. In addition, recording with audio compression codecs is possible, allowing several tens of hours of music to be recorded on one DVD writable disc.

DVD-Audio and DVD-AR will surely provide people with completely new enjoyment of audio playback and recording.

2. DVD-Audio Specifications

The main features and technical specifications of DVD-Audio are described.

2.1. Core Specifications of DVD-Audio

The cores of the DVD-Audio specifications are 2-channel audio with audio quality superior to CD, and multi-channel audio for new forms of music entertainment.

- Sampling Frequencies (Fs)
  A total of six frequencies, 48 kHz / 96 kHz / 192 kHz, 44.1 kHz / 88.2 kHz / 176.4 kHz, are defined. A family of 44.1 kHz would be useful in making use of the legendary CD library. Adoption of 192 kHz and 176.4 kHz will bring music with extremely wide frequency range.

- Quantization Bit (Qb)
  16 bits / 20 bits / 24 bits are supported.

- Number of Channels
  Home theaters have gradually become popular with an increasing number of video software titles available on DVD. The basic concept incorporated into the DVD-Audio Specifications is that the playback infrastructure for multi-channel audio, such as Dolby Digital, DTS, should be fully utilized. Thus, six as the maximum number of multi-channels are specified. However, for the sampling frequencies of 192 kHz or 176.4 kHz, only 2-channel is defined.

- Bit Rate
  The maximum bit rate is 9.6 Mbps.

- Stereo Presentation of Multi-channel Music
  A major feature of DVD-Audio is multi-channel. However, many people are still satisfied with 2-channel stereo playback. The Down Mix Control function enables people enjoy DVD-Audio multi-channel music through only two loudspeakers. Downmix from multi-channel to two channels is automatically performed by the player with Downmix coefficients which are recorded on a DVD-Audio disc.

- Lossless Compression
  The music industry requested that the playback time of high quality audio at any combination of sampling frequency and quantization bit be more than 74 minutes that is the maximum playback time defined for CDs. To
meet the request, DVD-Audio specifications adopt the lossless coding system, MLP (Meridian Lossless Packing). MLP enables longer playback time than for CD and also the recording of high quality multi-channel (96 kHz-24bit-6ch, etc.) programs which are impossible with LPCM.

**Multiple Still Picture Capability**

To enrich the audio experience, multiple still pictures (MPEG I-picture, normally about 20 pictures) can accompany one music tune of super high-quality. In "Slide Show" mode, multiple still pictures are displayed automatically as music goes by. In "Browsable" mode, display time of still pictures can be controlled by the user.

**DVD-Video compatible contents**

On a DVD-Audio disc, contents compatible with DVD-Video Specifications can be recorded mainly for two purposes: (1) To record moving pictures such as video clips, (2) To record music tunes to be played back on DVD-Video (legacy) players. Thus, DVD-Audio turns the compatibility with DVD-Video to good account for the propagation of the format.

**Other features**

Figure 1 shows contents of DVD-Audio discs. The still pictures and the DVD-Video compatible contents are optionally stored on a DVD-Audio disc. Text Information can include title names, artist names, lyrics and so on. Visual Menu can provide selection-menu function and other visual information such as discography. With these value-added contents, users can enjoy the new style of high-quality audio experience.

**Copyright Management System**

Illegal copying damages the rights of content owners. While DVD-Video compatible content makes use of CSS (Content Scramble System), DVD-Audio adopts a state-of-the-art copy protection system, CPPM (Content Protection for Prerecorded Media), for high-quality audio content, still pictures and menu. CPPM guards assets on discs in both CE and PC environments.

### 3. DVD-AR Specifications

#### 3.1 What the DVD-AR Specification is

An Audio recording application format in DVD family, DVD-AR has a direct relationship with DVD-Audio. It was developed through consensus among music Industries and CE& IT companies. The purpose of the DVD-Audio Recording Specifications is to realize recording, editing and playback of audio content on writable discs, RAM, R, and RW. Special features include high quality recording by Linear PCM and MLP, and long time recording using six lossy codecs. In addition to audio contents, this format enables the recording of still pictures and text as found on DVD Audio discs. This specifications support both real-time and non-real-time recording modes.

#### 3.2 Features of Audio Recording Specifications

**High Quality Recording**

DVD-Audio Specifications is defined for commercial discs with high quality audio content. DVD-AR specifications allows the copying of DVD-Audio disc contents if copying is permitted. Accordingly it supports the same audio specifications as that of DVD-Audio (See section 2.1).

**Long Time Recording**

DVD-AR accommodates for recording of many music pieces or music of very long playing time. To implement long-hours of recording, six audio compression codecs are defined as optional (See Table1). This also allows for recording of EMD (Electric Music Distribution) contents.

**Other features**

DVD-AR supports JPEG as still picture format to accommodate for those in EMD service and those taken with Digital Still Camera by users. DVD-AR also supports Text information such as title names, artist names.

### 4. Conclusion

New Audio Specifications, DVD-Audio and DVD-AR will bring people the new way they enjoy reproducing and recording of music.

### 5. References