DVD recording time - Toshiba - RDXV59DT

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Introduction (Toshiba - RDXV59DT)
Old-fashioned video cassette recorders (VCRs) allow you to record in different quality modes (SP, LP, etc.). They run the video tape through the recorder at different speeds, giving higher quality with faster speeds, in exchange for shorter recording times on a given length of tape.

Similarly, modern DVD recorders allow you to record in different quality modes, by changing the amount of compression of the digital video data. Less compression produces a better quality image, but the resulting data files are bigger. A DVD has a fixed capacity in terms of file size (about 4.2 gigabytes), so there is a tradeoff between image quality and the length (in time) of the video that can fit on it.

My Panasonic DMR-EH75V DVD recorder has four fixed recording quality modes, corresponding to four different (time) capacities per DVD:

ModeDisc Capacity
(hr:min)
HQ

XP
1:00

SP
2:00

LP
4:00

EP
8:00
SLP

It also has a FR (flexible recording) mode, in which the user specifies the desired capacity of a DVD, in the range 1:00 to 8:00 hours, down to the nearest minute, and the recorder adjusts the compression accordingly.

On this recorder, if the disc capacity is set to more than 4:00 hours, the image is recorded with pixel dimensions of

352x240 (instead of 720x480 as for the higher-quality modes), which has a dramatic effect on the image quality when viewed on a fixed-size TV screen. In effect, the image has to be scaled back up to 720x480 when it is played back, which cannot recover the detail that was lost in the original down-scaling.

It's obviously useful to have some idea of the image quality of different recording modes, so I generated some sample images.

Procedure
I recorded a high-definition over-the-air broadcast on a Sony DHG-HDD500 high-definition hard-disk based digital video recorder.

I dubbed the recording to the hard disk of a Panasonic DMR-EH75V DVD recorder via an S-video connection, repeating it several times using different recording modes. I used all four of the fixed modes (XP, SP, LP and EP), and I used FR mode three times with DVD-capacity settings interpolated between the fixed modes: 1:30, 3:00 and 6:00 hours.

I copied the samples to a DVD in high-speed mode, which simply copies the data files, leaving the video at the same quality as on the hard disk.

I read the DVD on a Macintosh computer and used MPEG Streamclip software to extract frames from the same point in each sample, to TIFF files in a 16:9 aspect ratio. The original images on the DVD have rectangular (not square) pixels, so MPEG Streamclip has to re-scale them to get the proper aspect ratio on a computer screen. Modes up to 4 hours produced 852x480 pixel images; the 6- and 8-hour modes produced 426x240 pixel images.

I used Photoshop CS2 to re-size the 6- and 8-hour mode images from 426x240 to 852x480 pixels, to match the others; then converted the images from TIFF to JPEG (quality level 8).

Results
I repeated the procedure above for two different frames, taken from an October 2007 baseball World Series game broadcast on Fox. Follow a link below to see a page with all the images for one frame:

Frame #1 is a relatively static image, showing a pitcher standing while preparing for the next pitch. There's very little difference from XP through LP modes, then a sudden drop in image quality for the last two (6:00 and 8:00 hour) modes.

Frame #2 is a more dynamic image, a close-up view of the pitcher raising his hands (with glove and ball) in front of his face as he begins a pitch. His head is stationary but his hands and glove are moving rapidly. Compression artifacts start to appear at the 3:00-hour mode setting.

I don't think these static images tell the complete story. When watching these recordings on my 32" LCD TV, I can see slight differences between the various modes, up to LP, especially when there's a lot of motion. Baseball is rather static overall, so it's not as sensitive to motion artifacts.

HSP (high standard play): Falls between HQ and SP in quality. Good quality with a reasonable size.

SP (standard play): The wise choice. This setting tries to hit the fine balance between quality and duration. In this setting, the compression is not that big to ruin the video, but not that small to make the video too big. It can fit 2 hours of video in a single sided (4.7gig capacity) dvd. This is the lowest quality setting I accept to use, as everything below this looks like and old VCD.

LP (long play): Can fit 3 hours and 40 minutes on a 4.7gig capacity dvd. This kind of quality looks like a video CD. Use only if it's your last resort.

EP (extended play): Even worse that LP

SEP/SLP/[insert-idiotic-cryptic-name-here]: These are usually names for the minimum quality setting a program/device offers (the exact name depends from the device/program you will use). They all have cute cryptic names like "super extented play", "super long play", "super ultra long play"

Standalone DVD recorders that can record from television (as well as from VCRs and cameras) have several recording modes usually labeled after the amount of time you can record on a DVD, such as XP mode, SP mode, EP, LP, etc.

I understand why they label them as such because it makes it easier to determine recording length. For example, SP mode is about 2 hours per single layer DVD-R.

But I also understand the real deal is all about bitrate. SP mode is really a different name for a bitrate between 5000kbps to 5500kbps or so.

However are these XP, SP, EP, LP standards necessary when it comes to DVD compliance standards? Are they just there for the average consumer to identify with the older VCRs or do they have a bigger role with compliance than just that?

Just look at what each mode actually means:

For example,

SP might mean 720x480 (D1) @ 29.97fps, with Vid bitrate=7.9Mbps, 2ch Aud br=256kbps

Assuming GOP lengths etc are valid (which they should be), this WILL be standard DVD-Video compliant.

But,

"XLP" might mean 480x480 (SVCD aka 2/3D1) @ 29.97fps, with V br=2Mbps, A br=128kbps

While this might actually be "playable" on some machines, it's just luck (or the fact that they may already know how to play SVCD's), because it's NON DVD-Video compliant, and I'm sure there are a number of machines where it won't play. And if it's got Extended GOP lengths, then that'll make it much less compatible.

The "What Is" <--- topic to the left will tell you what is DVD-Video compliant, just match them up with what you've got on your machine. The manual will go into further depth about that (usually if no where else, then at the very back where the "specs" are).

Blank DVDs are typically marked as 120 minutes and this assumes they are being used with standard type dvd recording softwares and protocols which would dictate time limits. DVD recorder units such as you have can and do record video at lower qualities which require less data so longer record times can be achieved, plus in addition they most likely employ some sort of compression technique as well.

I have a DVD recorder with several speed modes also. I typically used the 2hour mode when transfering VHS tapes, unless the VHS was recorded in a longer format. Then I chose a matching time mode to the source.

I don't believe my unit can use dual layer discs and you should verify that yours does if you are considering using them.

Basically, all DVD recorders have 1,2,4, and 6 hour recording modes, and some may also have 2 1/2, 3, 3 1/2, 4 1/2, and 8 hour modes as well.

Keep in mind that if you want the recording to be of "DVD quality" you need to use either the one hour or two hour modes.

If all you want is VHS quality, the 4 hour mode would be similar to the VHS SP 2 hour speed. Recordings made at 6, 8, or 16 hours would be of very poor quality.

Personally, I never, if at all possible record more than two hours on a DVD or 4 hours on the newer blank dual layered recordable DVDs.

After all, the main reason for DVD reocrders is to record better quality video, not just longer video, and also have it compatible for play in other DVD players.

A commercial DVD can hold approximately 130 min of video information per layer. Most commercial DVDs have two layers at 130 min per layer, which is why it seems that the DVD is holding a lot more than two hours of information.