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DVE D-Theater Q & A

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Will the D-Theater tapes of DVE play on all D-VHS Machines?

No. A D-VHS machine with the D-Theater capability is needed to play the DVE tapes. Currently those machines are only available from retailers providing JVC and possibly Marantz products. Marantz announced their intention to support the D-Theater format at the January 2003 Consumer Electronics Show. We haven't yet seen their players.

This question is primarily coming from first time purchasers of tapes in the D-Theater format. Many own standard D-VHS machines from Panasonic and Mitsubishi and are looking for test and setup materials for their high definition audio and video systems. The D-Theater versions of DVE won't play in their machines.

The D-Theater format is a subset of the D-VHS family. It has capabilities beyond ordinary D-VHS machines such as being able to decode a higher bit rate MPEG encoded video signal. It has a higher level of security and has a capability of accessing program index points recorded on the tape. Only machines with the D-Theater logo will play D-Theater tapes. This is true for all D-Theater tapes, not just DVE.

Currently available D-Theater machines will also record and play conventional D-VHS tapes. When D-VHS tapes are played in a D-Theater machine the analog and digital outputs are active. When a D-Theater tape is placed in the machine only the analog outputs are active. The digital IEEE 1394 output is turned off.

Why is DVE only available in the D-Theater format? Why not standard D-VHS?

The problem is that D-VHS is so easy to copy, and copies are just as good as the originals. This doesn't provide us with any security in placing an expensive program to produce on the market. Our already limited opportunity to recover any of our production costs for this program might be close to zero if we didn't include the copy protection of the D-Theater version of D-VHS.

Why is DVE available in the D-Theater format in both 720p and 1080i?

In the world of high definition broadcast television there are currently two formats being transmitted, 720p and 1080i. DVE is available in both formats, each with format-specific test signals, so that display devices can be properly set up for each.

Will all D-Theater machines play 720p tapes at 720p?

Current D-Theater machines can indeed play back 720p at 720p, without format conversion, however this option must be specifically activated from the player menu. Secondly, the display device itself must also be capable of showing 720p at 720p.

There are instructions that come with the D-Theater version of DVE telling you how to set up 720p playback of a 720p tape on the JVC HMDH30000U D-VHS player.

As D-Theater machines come from the factory their output rate is set so that all D-VHS and D-Theater tapes will play back at 1080i no matter what source rate is on the tape. Initially the 720p tape of DVE will play back at 1080i. This can be corrected in the player's Menu system. You need to set the video output so that it won't convert 720p to some other rate. Of course the display device must also be capable of showing 720p at 720p. There are instructions that come with the D-Theater version of DVE telling you how to set up a 720p playback capability for a 720p tape on the JVC HMDH30000U D-VHS player.

Which format is better?

Joe Kane Productions is strongly backing all progressive formats over any interlaced video option; progressive images are superior for moving pictures.

A progressive video frame is complete in and of itself. By contrast, an interlaced video image is comprised of consecutive fields, separated in time. Motion updates from one field to the next expose the image structure as interlaced- image information on the vertical axis varying in inverse proportion to the amount of vertical motion. Image differences between consecutive fields are generally categorized as "interlace artifacts".

An interlaced signal has to be vertically softened in order to reduce the visibility of interlace artifacts. This further reduces the real image resolution below the scan numbers associated with the format. Digital compression of images, which is necessary to make them fit into the space allocated for a broadcasting TV channel or a D-Theater tape, is far more efficient with progressive video at the source than interlaced video.

If JKP is so strongly backing progressive images why are you also making DVE available in the 1080i format?

In video signal path calibration, each television system requires format-specific test signals. JKP acknowledges the preponderant quantity of consumer television systems limited to the 1080 interlace format. Legitimate calibration of these displays is impossible without proper test signals.

Furthermore, HD Digital Video Essentials serves as a platform to educate the HDTV industry, including consumers, manufacturers, and production personnel alike. Demonstrable qualitative differences among the formats will impart industry wide movement toward the superior platforms.

Are the two versions of DVE good for showing the differences between interlaced and progressive HDTV?

We believe the best demonstration of progressive versus interlaced HD video can be done with ever-day video from the networks broadcasting each format. DVE can be used for such demonstrations with the limitation that it was produced in 1080p and does not have as many of the artifacts that would be present if it had been shot in 1080i/60. The quality of the display is an important factor. Many so called "DTV or HD Ready" sets don't have the capability of showing any of the HD formats for their real capability, let alone adequately show the differences between interlaced and progressive video. Of course in these early days of DTV not all programming comes up to the capability of either 720p or 1080i.

If most "HD Ready" sets aren't good enough to show the differences between interlaced and progressive video, why should I be concerned about the 720p tape of DVE being available?

It's all part of viewers not knowing what they are missing until there is a new reference. We recall a time when broadcasters rightly claimed that consumers had no idea of just how good composite NTSC video could look. That was the impetus for the consumer display device calibration industry. Along came the best of laserdisc and suddenly the consumer had the potential to see better quality NTSC than most broadcasters. What was referred to as "the best that standard def could offer" was rendered inferior as component DVD was introduced.

In this light, the 720p tape serves as a reference for the capability of progressive high definition TV. On a good monitor, it will show the difference between 1080i and 720p. It helps make a strong case for going progressive in high definition.

Why is it that when I watch ABC, which broadcasts in 720p, I don't see much of a difference between it and the other networks broadcasting in 1080i?

The majority of displays currently available to consumers aren't capable of displaying 720p at 720p. The signal gets converted to 480p or 1080i. There are real picture quality losses in either of these conversions, beyond the "progressive to interlace" problem. The answer to this question is also dependent on the quality of the display itself, even if it can sync up to 720p. Most "HD Ready" sets available in the mass market are not good enough to show off either 720p or 1080i to their fullest.

Then there are individual programs that, for what ever reason, don't look as good as we would expect for demonstrations of the capability of HDTV. If you go to index point 21, you'll see an example of the kind of detail we expect from HDTV programs. It was shot on 35mm film and transferred to video on a Spirit DataCine at 1080p/24. It was then down converted to 1080i and 720p for our D-Theater master. This production process exemplifies what should be happening for all film based TV programs.

With all of the discussions of DTV being able to present much better image quality there are often times when upconverted standard definition material looks better from the analog feed from the station than the digital feed? Why is that?

All things being equal, DTV transmission of an NTSC original signal should be superior to the conventional analog broadcast. A DTV station should have better NTSC to component decoding than the average consumer has. Furthermore, the DTV image does not suffer what are traditionally analog artifacts, such as ghosting, noise, and frequency band limitations.

When you see something different it is most likely a problem at the station in their choice of equipment to convert standard definition material to digital high definition. All things being equal the analog path should not look as good as the digital path. This sort of thing is bound to happen in the early days of DTV where there is a lack of equipment and or experience in the new digital medium. Even when the signal originated in the composite domain the station should have better equipment to convert that to the component signal required for digital transmission than is available to most consumers. That step alone should account for their having a better picture. Then there are all of the typical analog artifacts, such as ghosting and lower detail capability that shouldn't be a part of the digital signal path.

Why are you always putting “DTV or HD Ready” in quotes?

Over the past ten years we've written many articles explaining our position on what needs to be present in a display device to properly reproduce a high definition signal. In the late 90's we proclaimed that if a CRT based set wouldn't do 720p, it's not HDTV. Most so-called "HD Ready" sets that are currently available in mass market retail stores are modifications of standard definition designs. Had they been specifically engineered for HDTV, they would include a 720p display capability.

In oversimplifying, TV set manufacturers and the Consumer Electronics Association (CEA) would like you to believe that good HDTV sets are easily available and inexpensive. On the other hand, DVE will give consumers better tools, a better understanding of real display parameters.

Along with the CEA, JKP has proposed identification of quality levels of TV sets, essentially saying that not everything can be true HDTV- that there are steps of quality between standard definition and high definition. There is value in sets that do a lot better than current standard definition without going all of the way to HDTV. JKP is offering more stringent specifications for these categories than the CEA. We are taking the position that in the evolution of HDTV our first obligation is to make TV sets as good as they can be in their category. Making them less expensive comes after we have a firmly engrained expectation for quality.

Will the Hollywood studios bring movies out in 720p in addition to 1080i?

We don't anticipate that happening in the foreseeable future. DVE will probably be one of a few D-Theater titles to be presented in 720p. We expect the studios will support the 1080 line progressive (1080p) format when they join the progressive bandwagon. The 720p format is ideally suited to fast moving action captured in video. ABC and ESPN have understand its value for sports- a lower MPEG bit rate required for a higher quality picture. Additionally, this is attractive to cable and satellite operators. We hope they will keep us company in supporting 720p in D-Theater but have no knowledge of that being in their plans.

The majority of movies that Hollywood is making available in the D-Theater format are transferred to video at 1080p/24, then converted to 1080i/60 before they are mastered and duplicated. The irony of this is that the majority of 1080p film transfers only have enough resolution to support the horizontal capability of 720p. Horizontal resolution of most film masters in 1080p is in the area of 800 to 1300 pixels. The horizontal capability of 720p is 1280 pixels- the top end of what's on the 1080p master.

We suspect the major reason Hollywood studios are not using 720p is that the majority of older HD equipment, based on earlier implementations of high definition, are more easily adapted to 1080i. Similarly, the majority of TV set manufactures have yet to step up to a progressive HD signal.

We believe many of the studios know 720p can look better than 1080i. When more equipment is available which accommodates 1080p, the studios and manufacturers can tout the improvement over interlace. At that point, the film transfer itself becomes the only limiting factor in the quality of the image provided for mastering D-Theater tapes.

You mentioned vertical filtering in 1080p to 1080i conversion. Is the 1080i version of DVE vertically filtered?

Yes, the 1080i version of DVE is vertically filtered. In the early stages of high definition it is important to us that the 1080i and 720p versions of DVE closely represent the best of what is being done in each of the two formats. We're still trying to make "True Progressive Mastering" work for standard definition DVD, let alone 1080i HDTV.

What about the horizontal resolution of the 1080i and 720p tapes?

The question that prompted this revised version of an answer was several paragraphs long. It sited many places in the production and distribution chain where image resolution can be lost. It recognized that the broadcast limitation of horizontal resolution for the 1080i system is about 1400 lines. That same system seems to do really well with 1280 by 720 or 720p, which is part of the reason it can look so much better than 1080i. We've covered those details in several articles.

So what about DVE? We've made measurements on the horizontal resolution of moving graphics in the 1080p/24 master tape of the program and found that we are able to go right out to 1920 lines, even if it is a bit noisy. The small amount of compression applied by the D5 in recording the signal even introduced an unexpected amount of noise in the signal when there was a lot of high frequency motion in the image. Add MPEG compression to that and you'll see noise in the saturated reds in our montage of graphic images.

We don't yet know what horizontal resolution made it to the D-Theater tape. We believe the player to be a limiting factor in what we can measure. This applies to 1080i and 720p. High frequency information is being filtered, probably to reduce the visibility of noise in the image.

In theory it should be easier to reach the 1920 horizontal resolution capability of the system in the 1080p/24 frame format than in 1080i/60. Converting 1080p/24 video to 1080i/60 is asking for at least the addition of noise in the image if not a reduction in horizontal resolution. We know that even in static images the current generation of D-Theater machines will not support a true 1920 horizontal resolution at the 19.3 Mbps rate. D-Theater runs at a high bit rate, but that alone won't improve the situation. The quality of the MPEG encoder is equally important.

As we've stated several times in the past, none of this is important for film content because it usually doesn't get much above the 1300 line mark in horizontal resolution. It's probably one of the reasons that D-Theater can look remarkably close to the D5 master in image quality. You

might see a larger difference if you look at the DVE master versus the D-Theater tape of the program. But that's part of what JKP brings to the table.

We'll be looking at all of the models of D-Theater players that appear on the market and eventually reporting on our findings. We want to be careful about anticipating what's on the tape until we've made lots of measurements.

Will DVE be available in 1080p?

We have already expressed a strong interest to the D-Theater mastering facility in our being able to provide DVE to consumers in the 1080p format. Our master tape is in that format, as are the majority of movies now being transferred to high definition. We anticipate that Joe Kane Productions and will be among the leaders in supporting the 1080p format. At the same time we are also looking forward to improvements in the MPEG encoding, which will improve the capability of all three formats. We will continue to support 720p in future versions of DVE.

Even though 1080p software isn't generally available in the consumer market there are video projectors capable of displaying rates of 1080p and above. Which of the current versions of DVE is appropriate for the calibration of these displays?

Display devices that run at rates of 1080p and above have to be able to up convert the incoming signal to the rate of the display, if for no other reason than there isn't much true 1080p software available in the consumer market.

Setup of these projectors will have to be done from both 1080i and 720p sources so that the projector can properly represent what's currently available in high definition program material.

The quality of up conversion will be equally critical to the quality of the image setup. The setup person will need the test materials in each version of DVE to determine the performance of the converter.

Is the quality of the converter going to be an issue in 1080p sets?

We have reason to believe that the first generation of up converters used in consumer priced 1080p displays aren't going to be perfect and that test signals in DVE will help to determine their actual performance capability.

In assembling DVE we've had the opportunity to look at several high definition converters costing between \$60,000 and \$120,000. One in particular caused different errors depending on

the HD conversion requested. It also harmed the signal when we tried to route 1080p directly through the box without any conversion.

Cameras that capture 720p at a 24 frame rate insert the 2-3 repeat frames and record the signal on tape at 720p/60. We wanted to up convert that material to 1080p/24. One of the converters couldn't find the 24 frame video within the 720p/60 signal unless we significantly softened the picture prior to trying to convert it. Needless to say we used another converter for the program content.

How soon is 1080p/24 going to be important to the average consumer?

Once we are past the issues of "HD Ready", D-Theater players, set top decoders, DVI and or HDMI connections and display devices making claims of 1080p, we feel that true 1080p will be expensive for a long time to come. We hope for a surprise in LcoS and other technologies but now feel they are a long way off from being truly JKP certified as good. We want to be on the market with 1080p test material as soon as possible so there will be a reference for determining the true quality of the 1080p display products.

Is there any difference in the D-Theater and DVD versions of DVE?

Yes, and the differences are significant. Most important, video test patterns have to be run in real time on tape as opposed to single frames on a DVD. As an example, we've determined that convergence patterns need to be on screen for at least an hour in their entire sequence to begin to allow time to properly set up a CRT projector. In a DVD that's a just few frames, far less than one second of material. On tape it's one hour of time.

The tape is 145 minutes long with more than 90 minutes of video test patterns. Even at 90 minutes we feel the test patterns might have been run longer. Add in audio and video demonstration materials and not much time is left for the tutorial. Some of the cuts were easy. Sections of the DVD devoted to DVD player operation were the first to go in the D-Theater version. After that the cuts got more difficult.

The original program was scripted for DVD. When D-Theater came to our attention in December of 2001 we added material to the DVD script that included a discussion of the format. In deciding to release the program in that format we were faced with the problem of the program being scripted for an interactive, non-linear format. The D-Theater format couldn't play the tricks we scripted for the DVD. The format is not yet big enough to justify a completely new script, especially since it would run well over the 150 minute maximum program length.

The solution to cutting the program came down to eliminating the non-linear, interactive material. Among the cuts were the instructions on how to set up the front panel controls for video. The DVD allows picture stops on test patterns or still images at points where the viewer

gets to play with the controls. They can be up on screen as long as they are needed and there is an easy ability to shift among many images where they are provided. The D-Theater format doesn't allow this. Running those patterns and images in real time would have put us way over our maximum program length.

The complete tutorial on how to use the test patterns can be found in the DVD of DVE. Once you've learned how to use the test signals from the DVD skip forward in the D-theater tape to the test patterns and use them as instructed in the DVD.

Many of the video test patterns in the D-Theater tape are different from what we've seen in *Video Essentials*. Do we have to wait for the DVD of DVE to find out how to use them?

Most of the patterns included in the D-theater and DVD of DVE have been updated since *Video Essentials* came on the market in 1996 for the laserdisc and 1997 for the DVD. We think you'll like the changes, especially in the light of new solid state, light bulb based displays. For some the changes will be easy to understand and you won't need the DVD to figure out how to use them. Our new color bar pattern is a good example. We got close to it in VE but perfected it for DVE. The pattern is universal, working in all of the formats in which DVE will be issued.

Some will only become apparent when you see the explanation in the DVD. Still others are designed for the experienced installer. After all, more than half of the D-Theater program is designed for their use in getting you a better picture from HD sources.

Beyond the scan rate differences do the video test patterns in the DVD and D-Theater program match?

Not in a lot of cases. The differences in the formats alone require their own set of patterns. As an example, there are no 2 - 3 motion patterns in the PAL DVD. Then there is the difference in what is available in test patterns between standard definition and high definition. There are even differences between the 1080i and 720p tapes. Patterns testing geometry and pixel count had to be constructed at the individual rates. Since all of the patterns are frame based the original patterns were constructed at 1080p. The down conversion to 1080i included the 30% vertical filter.

All of this will eventually be outlined on the VE web site. It may be into 2004 before a lot of that work is finished. Up to this point we haven't had the time to write that part of the program.

When can we expect to see the DVD of DVE?

It is our current hope to have the consumer versions of the PAL and NTSC versions of the DVD on the market by the beginning of August 2003. The English language PAL version may arrive ahead of the NTSC disc as it is being authored first. DVE on DVD in French, German, Italian, and Japanese should be available sometime during the third quarter of 2003. We have an ability to deliver all of these languages in D-Theater if the market is opened in those countries.

Joe Kane