EDIUS HD

The Canopus HQ Codec

White Paper

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Canopus HQ Codec

This document describes the advantages of the Canopus HQ Codec, the latest addition to the acclaimed Canopus Media Technologies codec family. The Canopus HQ Codec is one of the main components powering EDIUS HD, Canopus's new realtime HD editing solution. Not to be confused with the Canopus HD codec, which is equivalent in quality to the Panasonic DVCPRO HD codec mentioned below, the Canopus HQ Codec provides the highest resolution and best HD image quality available today.

Image Quality

The chart that follows this paragraph compares sampling characteristics used by the Canopus HQ Codec and the two main HD-VTR formats – Panasonic's DVCPRO HD and Sony's HDCAM. Prior to compression, the luma information in 1080i/30 HD is sampled with 1920 samples/line and the chroma is sampled with 960 samples/line. When the HD image is compressed, the resolution is usually down sampled to a certain value before applying the compression. The down-sampling process reduces the width of the frequency spectrum of the image, which affects overall image quality. In addition, the down-sampling process itself might introduce artifacts in the image depending on the sampling algorithm.

	DVCPRO HD	HDCAM	Canopus HQ
Luma sampling (pixels)	1280	1440	1440
Chroma sampling (pixels)	640	480	720
Bitrate	100Mbps	140Mbps	Variable

(chart 1) Sampling resolutions by Codec (1080i/30)

With DVCPRO HD, the luma is down sampled to 1280 samples per line and the chroma sub-sampling follows the 4:2:2 scheme, resulting in 640 chroma samples per line. As a result, the frequency range goes down to two thirds of the original uncompressed image. With HDCAM, the luma is down sampled to 1440 and the chroma sub-sampling follows the 3:1:1 scheme, resulting in 480 samples per line. Conclusively, the luma frequency range for HDCAM is wider than DVCPRO HD, but the chroma frequency range is narrower.

Compared to these codecs, the Canopus HQ Codec keeps the chroma sub-sampling at 4:2:2 and down samples the luma resolution to 1440. This means the luma resolution is equal to that of HDCAM, and the chroma resolution is higher than both DVCPRO HD and HDCAM. Fig. 1 shows a test signal sweeping from 1MHz to 30MHz to illustrate the frequency response.

Variable Bitrate

Another important characteristic of the Canopus HQ Codec is variable bitrate support. Bitrates may be varied to allocate the maximum amount of data to the images that require it, such as very complex scenes, and a minimum amount of data to images with minimal complexity. Variable bitrate encoding is an efficient way to ensure that each frame gets the appropriate amount of data required to produce high-quality HD video.

EDIUS HD is also designed to support various sub-sampling methods to ensure scalability. Image quality and performance can increase in the future on systems with higher specifications and faster performance. This means that it will eventually be possible to compress the video image without having to down sample the original resolution.

Canopus made its reputation on its original video technologies and the introduction of the new Canopus HQ Codec shows a clear path to future possibilities. By developing a proprietary HD codec, Canopus provides a cost-effective HD editing solution to the marketplace. Currently, there are no software or hardware HD codecs available that are considered the industry standard. Also, most inexpensive HD editing systems are editing uncompressed HD, which results in very large file sizes that are inefficient to work with and tax system resources. For an HD editing system to be truly efficient, a high-quality HD codec solution with an emphasis on processing speed and image quality is essential, and the Canopus HQ Codec fulfills both of these requirements.

Canopus HQ Codec

Sweep Test Signal comparison (1-30MHz)

> *DVCPRO-HD: Left:Y-1280, Right: CbCr-640*

> *HDCAM: Left:Y-1440, Right: CbCr-480*

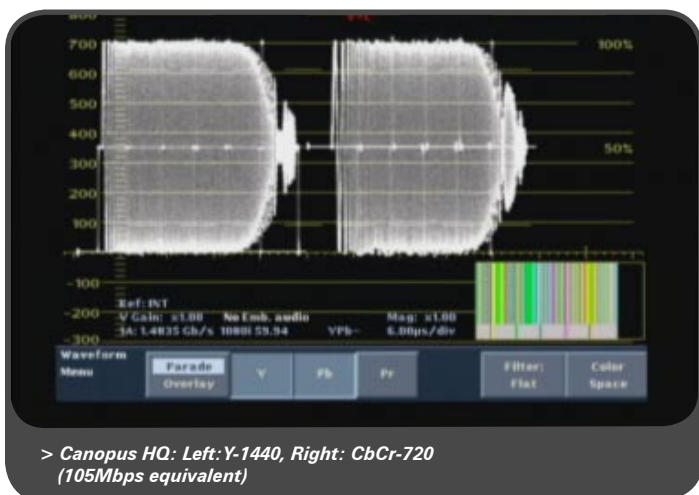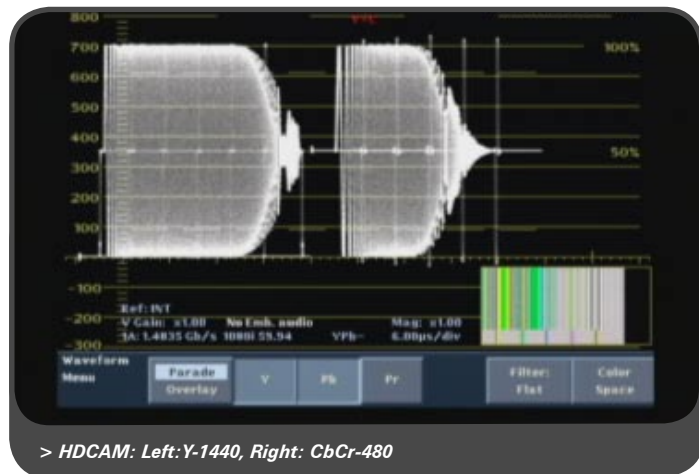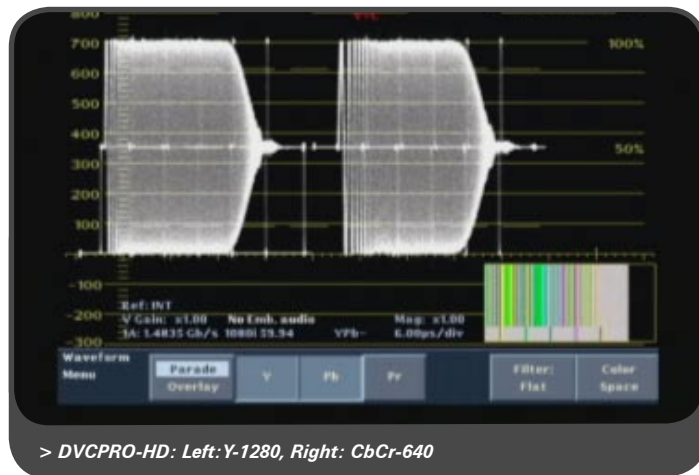> *Canopus HQ: Left:Y-1440, Right: CbCr-720*
> *(105Mbps equivalent)*

Image comparison by bitrate

Enlarged Areas

> *Original Image*

Canopus HQ Codec

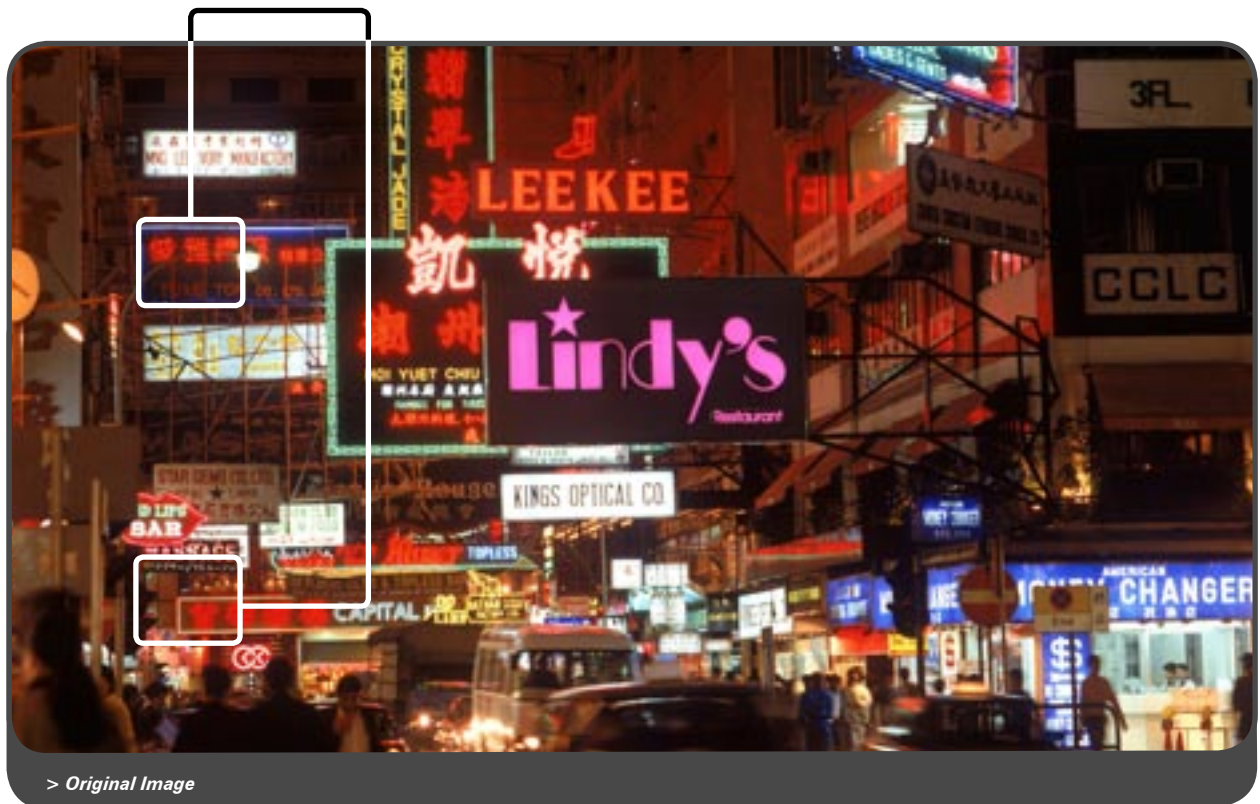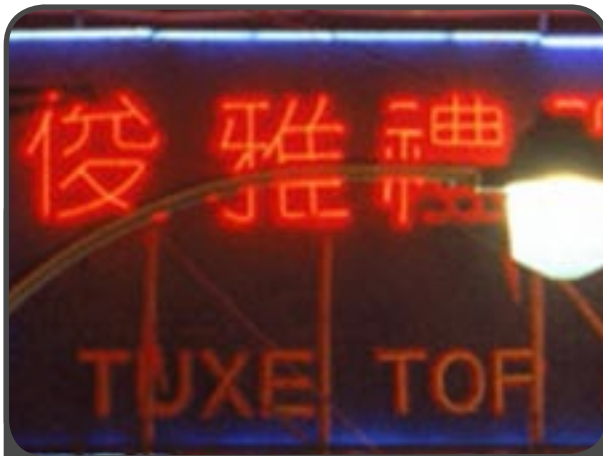**Image comparison by bitrate**

> Original Image

> Original Image

> Canopus HQ 180Mbps
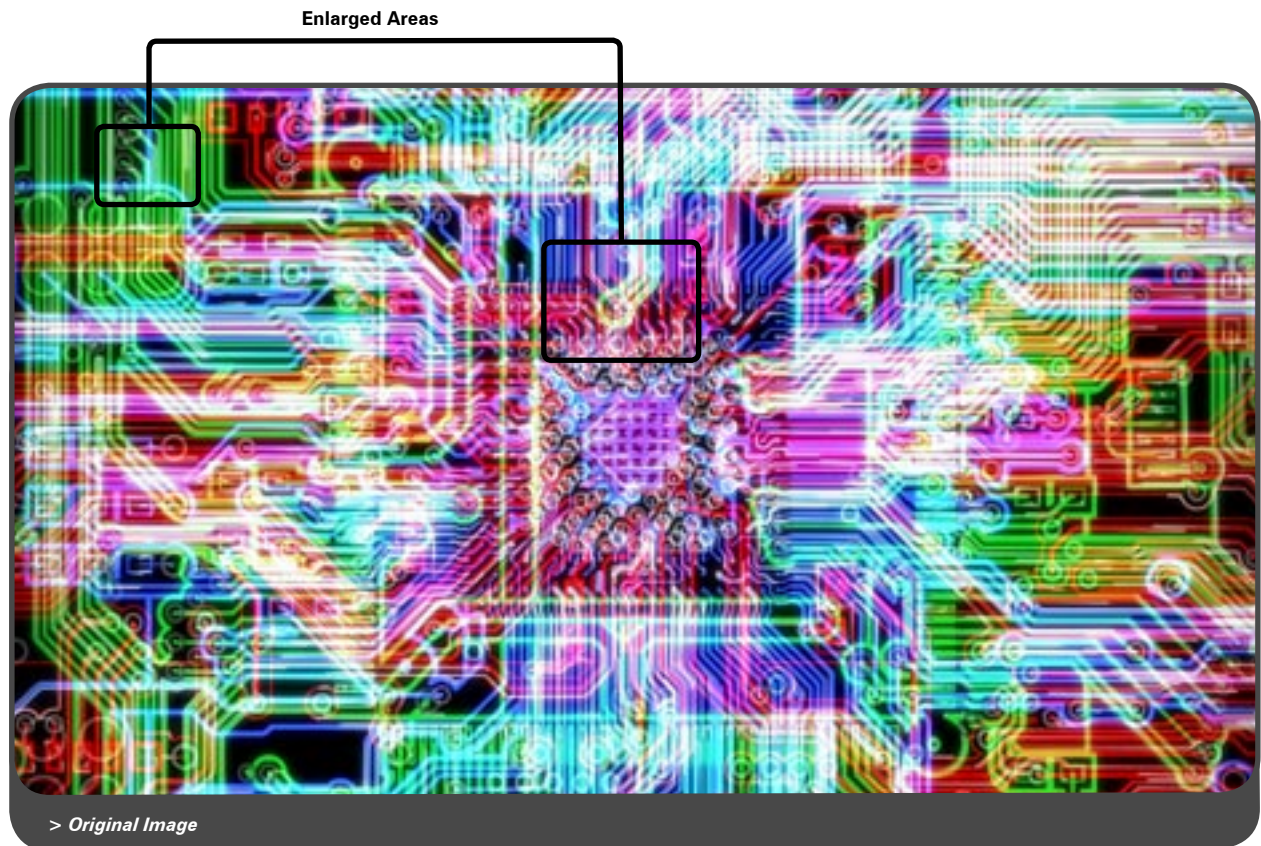

> Canopus HQ 180Mbps

> HDCAM 140Mpbs

> HDCAM 140Mpbs

Canopus HQ Codec

Image comparison by bitrate

Enlarged Areas

> *Original Image*

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Image comparison by bitrate

> *Original Image*

> *Original Image*

> *Canopus HQ 180Mbps*

> *Canopus HQ 180Mbps*

> *HDCAM 140Mpbs*

> *HDCAM 140Mpbs*