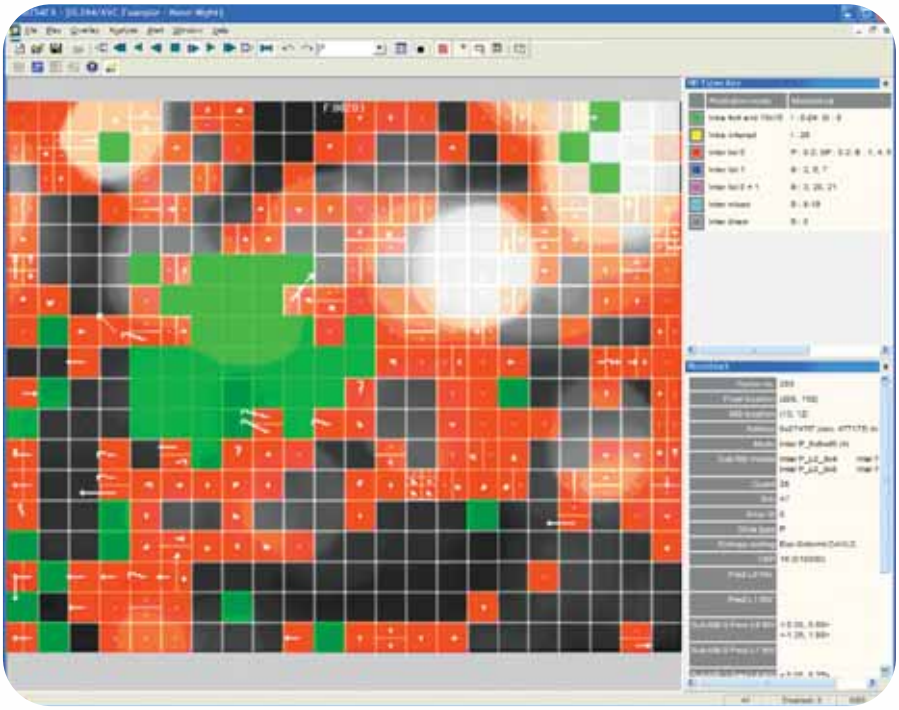
# Next Generation Compressed Video Elementary Stream Analyzer

▶ Elementary Stream Analysis Software for VC-1, H.264/AVC, MPEG-2, MPEG-4, H.261, H.263, H.263+, and 3GPP Standards



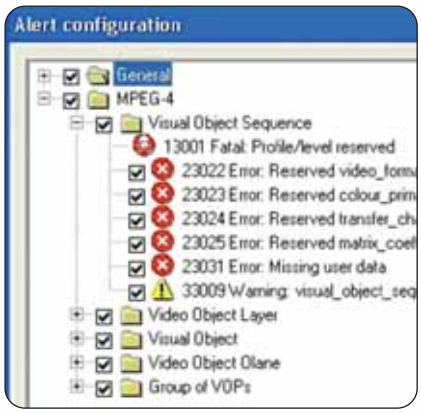
### Deferred Time Elementary Stream Analysis Software for Windows NT 4, 2000, or XP

PC-based software package, unique in its capability to display and analyze encoded video streams for the VC-1, H.264/AVC, MPEG-4, MPEG-2, H.263+, H.263 and H.261 video compression standards. Available for AD95X and MTS400 series MPEG Test Systems and as Standalone Software for users' own PCs.

### Real-Time Error Checking and Reporting

Real-time checking is made on a video stream, looking for errors or noncompliance to the standards. If an error is found, there is an alert "pop-up" as shown in Figure 1. Alerts can be "Fatal" or "Error" level or "Warning" or "Info," and can be individually disabled or enabled, as shown below. This capability is vital as it may already be known that a particular video sequence has a particular error which can be disabled to identify other unknown errors.

▶ Figure 1.




▶ Figure 2.

## ▶ Features & Benefits

Next Generation (VC-1, H.264/AVC, MPEG-4 and 3GPP) and Legacy (MPEG-2, H.261, H.263 and H.263+) CODEC Support

Frame-by-Frame and Block-by-Block Analysis to Allow Easy CODEC Comparison

Easy-to-Interpret Detailed Graphical Displays (Requires User-installed Microsoft Excel)

Comprehensive Semantic Trace File Output to Determine Block-by-Block Encoder Decision Making

Real-time and Non Real-time Decoding and Analysis of Compressed Video Streams (Dependent on PC Performance)

Batch Mode to Allow Automated Testing

YUV Decoded Video Output for Baseband Video Analysis

Elementary Stream Editing

Extraction of Elementary Stream from Transport Stream

Audio Extraction and Playback for MPEG-2 Layer 1 and 2, AAC and HE AAC

Available as Single User Local License or Server-based Floating License

## ▶ Intended Users and Applications

Equipment Manufacturers
- Semiconductor Device Designers and Manufacturers
- Video CODEC Software and Hardware Developers
- STB, PVR, DVD Consumer Electronics Developers for Cable, Satellite, Terrestrial and IP
- Video Conferencing and Communications Equipment Developers
- Mobile Video Infrastructure and Handset Developers

Video Content Transmission and Distribution
- CODEC and Equipment Evaluation and Comparison in Cable, Satellite, Terrestrial, and IP Applications
- Network Operators
- Network Equipment Providers
- Application and Service Providers
- Streaming Media applications

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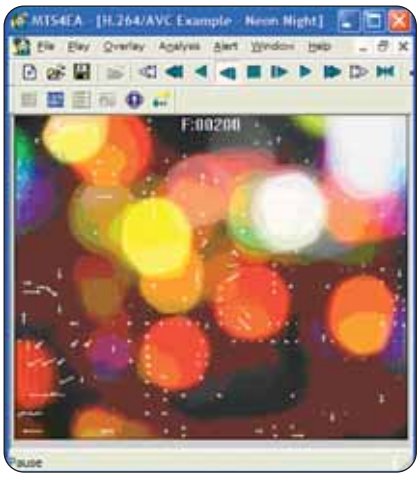
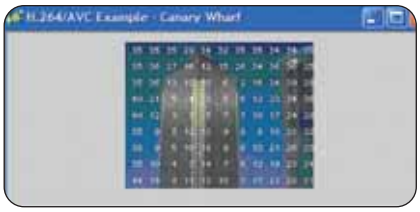
► Macroblock Display.

## Real-Time Analysis Displays

User-selected Macroblock attributes can be overlaid onto the playback of the bit stream. There are many other attributes that can be displayed including those shown on this page.

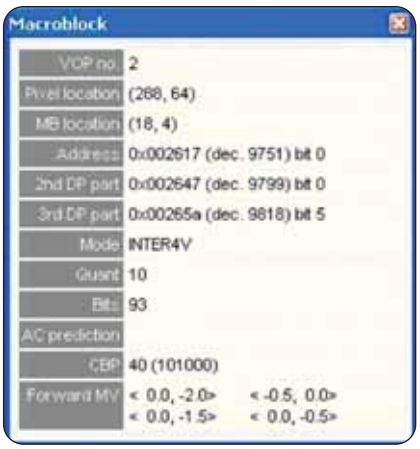



► Motion Vector Display.



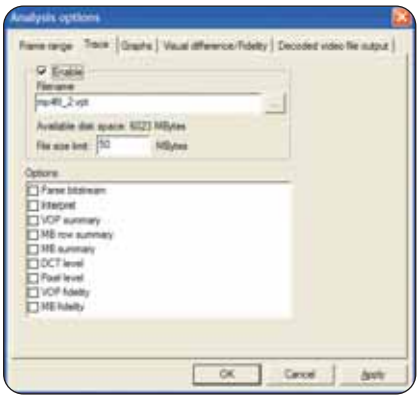

► Macroblock Intra-Coding Frequency.


► Summary Tooltips.

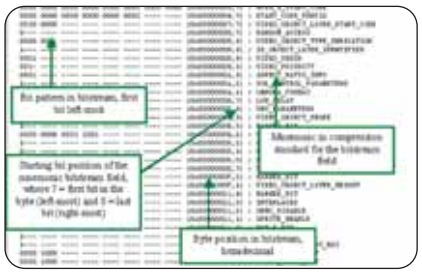



► Macroblock Tooltips.

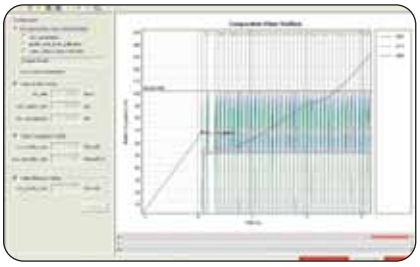
► Figure 3.



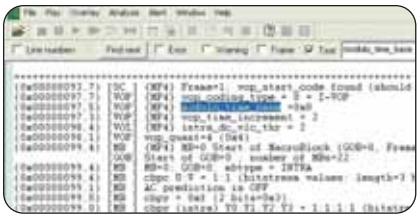
► Figure 5. Analysis options dialog box.



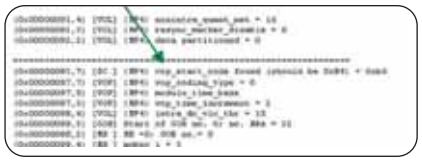
► Figure 7. Trace/Parse Bit stream display of the start of an MPEG-4 bit stream.



► Figure 4. Main Buffer Analysis Window.



► Figure 6. Mnemonic Display of Video Stream.



► Figure 8. Example of a Trace/Interpret output, at the start of an MPEG-4 VOP.

### Buffer Analysis

Buffer standards conformance can be checked as well as user-entered values to simulate specific decoder hardware. When a conformance error is found, there is an alert “pop-up” such as shown in Figure 3.

The main Buffer Analysis window is used to analyze buffer conformance and allows the following capabilities:

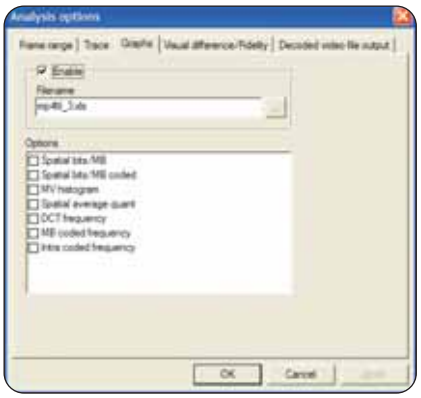
- View all of VBV/VCV/VMV or only one or two graphs
- Build the graphs in real-time, as the video is decoded
- Zoom in to any area of the graph, or see it all at once
- Quickly see the count of number of frames where VBV/VCV/VMV has overflowed/underflowed (as appropriate)
- See the source of the VBV/VCV/VMV parameters and the values
- Enter custom values and immediately see the effect in the graph
- Display pop-up alerts based upon the stream values or based upon custom values

### Trace Analysis

Trace analysis outputs a wide variety of diagnostic information to a file to enable detailed logging of encoder performance. Using the analysis options dialog box, It is possible to select both single and multiple Trace outputs for the following:

- Frame summary
- VOP summary
- Macroblock summary
- Parse bit stream
- Interpret
- DCT level
- Pixel level

Two examples of this analysis are given above. Each of these Trace outputs is displayed in a View Trace window, as shown in Figures 7 and 8, making it easy to search for particular errors or specific data. The ability to see a mnemonic representation of the parsing of the video stream reduces the time to problem resolution, when investigating misinterpretation or compliancy issues.




► Figure 9.

## Macroblock Summary

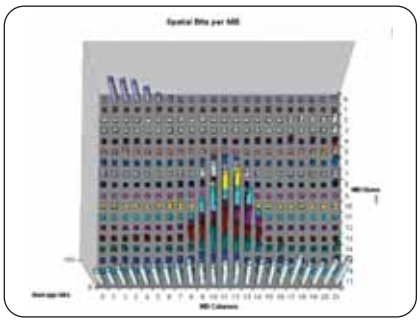
Macroblock Summary information is available for the following:

- Location of Macroblock
- Type of coding used
- Segment
- Quantizer
- Number of bits used

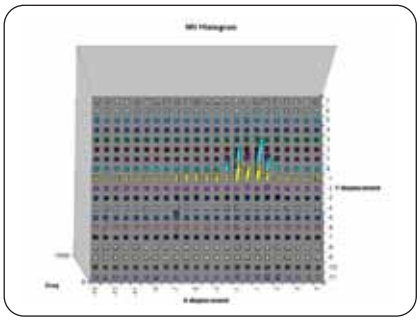
## Macroblock Spatial Summary

Macroblock Spatial Summary information is available for the following:

- Average bits
- Average bits/Macroblock
- Average quantizer
- Frequency of coding Macroblock
- Frequency of intra-coding Macroblock



► Figure 10. Spatial Bits/Macroblock.

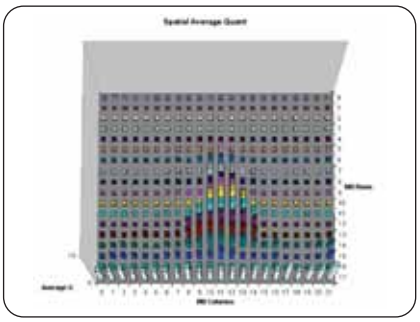


► Figure 11. Motion Vector Histogram.

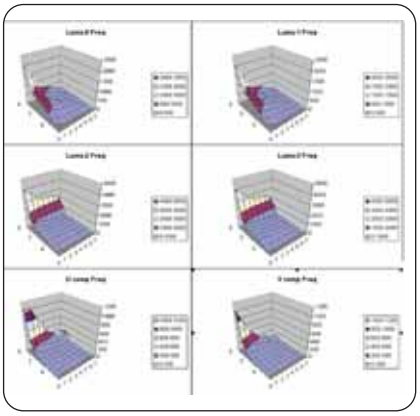
## Graphical Analysis (requires user-installed Microsoft Excel)

The exported data for the graphical display is selected from a built-in menu, shown in Figure 9, and it is possible to select both single and multiple graphical analyses.

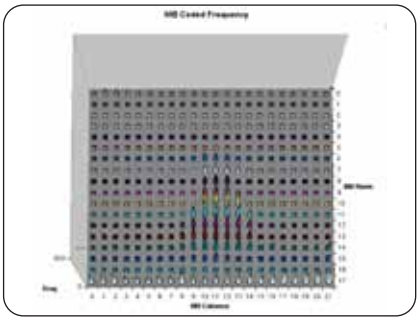
Figures 10 through 14 are just some of the examples of the analysis displays that can be produced.



► Figure 12. Spatial Quantizer Deviation.



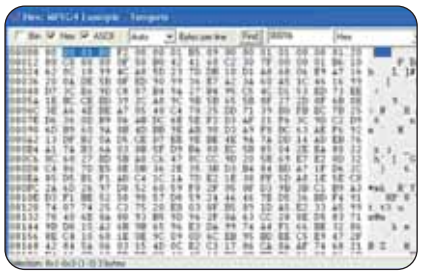
► Figure 13. DCT Frequencies.



► Figure 14. Macroblock Coding Frequency.

► Figure 15.


► Figure 16.



► Figure 17.

### Opening and Viewing Structure of MPEG-2 Transport and Program Streams, MP4, 3GPP and ASF Files

MP4, 3GPP, ASF and VOB "container" files, as well as MPEG-2 Transport Streams and Program streams, can be opened and the video tracks extracted from within them. When one of these files is opened, the list of tracks or programs in the file is shown, as above in this MPEG2 Transport Stream example shown in Figure 15.

The structure of the MP4/3GPP/VOB/ASF/MPEG-2 TS/PS file can also be viewed, as in Figure 16 (more information is provided for MPEG-2 Transport Streams, where all the internal programs and video, audio, and metadata are listed).

The track number is displayed at the top of the video window: the extracted video can also be saved as a separate file.

### HexView – Binary, Hex and ASCII Views of the Video Bit Stream

Hexadecimal View of a video bit stream (or any other file) can be displayed and searched for specific addresses or data (binary, ASCII or hex).

In the example in Figure 17, the wildcard "." character is used to search for any MPEG-4 Start Codes in the hexadecimal data that begin with: '"00 01 B" (this will locate "00 01 B0" and "00 01 B5").

### Batch Mode Processing

When debugging video encoders and decoders, it is almost always necessary to keep repeating the same tests on the same video sequences, to see what has changed/improved/got worse with each decoder/encoder change. To repeat these tests, it is not desirable to have to interact with a user interface.

A "Batch" mode is provided, whereby the user can set up a batch process to:

- Automatically repeat tests
- Output Trace files
- Produce output report files only if there are warnings/errors/fatals in the video
- Create a YUV decoded video output file

These outputs can be used to undertake automated comparisons and regression tests (for example, to compare what changes between different versions of an encoder/decoder).

## Supported Compression Standards

- H.264/AVC Bytes Streams, including:
  - All elements of H.264/AVC Baseline Profile at Levels 1 to 5.1
    - Slice types I and P
    - NAL unit types 1, 5 to 12
    - CAVLC entropy coding
    - Arbitrary slice order, slice groups 1 to 8, redundant coded pictures
    - Method 1/Method 2 quantization
  - All elements of H.264/AVC High Profile at Levels 1 to 5.1
    - FREXt (10-bit, 4:2:2, 4:4:4)
    - All above elements for Baseline Profile plus
    - Slice type B
    - CABAC entropy coding
    - Chroma formats 0 to 1, 0 to 3
    - Weighted prediction flag, bipred_idc >0 direct_8x8_inference_flag in B-frames (L3 to 5.1)
  - All elements of H.264/AVC Extended Profile at Levels 1 to 5.1
    - All above elements for Baseline Profile plus
    - Slice types B, SP, and SI
    - NAL unit types 2 to 4
    - Data partitioning
    - Interlace (permitted in levels 2.1 to 4.1 only)
    - Weighted prediction flag, bipred_idc >0
    - Direct_8x8_inference_flag in B-frames
  - All elements of H.264/AVC Main Profile at Levels 1 to 5.1
    - All above elements for Baseline Profile plus
    - Slice type B
    - Interlace (permitted in levels 2.1 to 4.1 only)
    - CABAC entropy coding
    - Weighted prediction flag, bipred_idc >0
    - Direct_8x8_inference_flag in B-frames
- MPEG-4 Simple Profile/Levels 0 to 3, including the following tools:
  - VOP
  - P-VOP
  - 4 Motion Vectors
  - Unrestricted Motion Vectors
  - AC/DC prediction
  - Error resilience, including Slice Resynchronization, Data Partitioning and Reversible VLC
  - Short headers
- MPEG-4 Advanced Simple Profile/Levels 0 to 5, including 3b, with the following tools:
  - All tools of MPEG-4 Simple Profile, plus:
  - B-VOP
  - Quarter-pel motion compensation
  - Global Motion Compensation (GMC)
  - Method 1/Method 2 quantization
  - Interlace
- VC-1, including the following tools: Extraction of Simple, Main, and Advanced Profiles from ASF files
  - Analysis of Advanced Profile Elementary Stream files
  - All elements of Simple Profile at all Levels (Low and Medium)
  - All elements of Main Profile at all Levels (Low, Medium and High)
  - All elements of Advanced Profile at all Levels (L0 to L4)
- MPEG-2 Main Profile/Main Level including the following tools:
  - I-frames
  - P-frames
  - B-frames
  - Field-coded picture (Interlace)
  - MPEG-2 syntax elements, including:
    - Program streams
    - PES
    - Direct reading of VOBs/DVDs
- H.263+, including:
  - Annexes A, B, C, D, F, I, J, K, S and T
- H.263 baseline standard
- H.261 baseline standard
- MPEG-2 Transport Streams Systems containing:
    - H.264/AVC Byte Streams (all Profiles, all Levels)
    - MPEG-2 Elementary Streams (ES), Program Streams (PS), Packetised Elementary Streams (PES)
    - Multiple programs, multiple video, audio and meta-data

## ▸ System Requirements

The following PC configuration is required for installation. The hardware requirements detailed here are the minimum required. Additional processing power and memory will increase the performance of the analysis software, as will the use of fast hard disks and/or SCSI hard disk drives for data storage.

- PC with Genuine Intel Pentium class 1 GHz processor. (For real time decode and display a 1.2 GHz or faster processor is recommended)
- Intel or 100% compatible motherboard chipset
- Windows NT 4.0, Windows 2000 Operating System or Windows XP Operating System
- Internet Explorer 5.0 or above
- 256 MB of RAM
- 500 MB of available hard disk space for the applications and documentation. Additional space will be required for storage of test streams (that is, recorded data), trace files and decoded YUV files
- SVGA (800x600) resolution video adapter and monitor (XVGA (1024x768) or higher resolution recommended)
- CD-ROM or DVD drive
- 3.5" Floppy Disk drive
- Keyboard and Microsoft Mouse or compatible pointing device
- Detailed Graphical Displays requires user installed Microsoft Excel

**IMPORTANT NOTE –** Apart from those specifically authorized by Tektronix, there should be no other application installed on the PC. If other applications are installed, it is possible they may interfere with the operation of the software supplied. Software operation under these circumstances cannot be guaranteed.

## ▸ Ordering Information

MTS4EA

Base software with video standard package.

Includes: MPEG-4 Simple Profile, H.263+, H.263, H.261, CD and Manual.

Opt. 4EAB – Base software with video standard package including: MPEG-4 Simple Profile, H.263+, H.263, H.261, CD and Manual, Single user local license.[*1]

Opt. 4EAF – Base software with video standard package including: MPEG-4 Simple Profile, H.263+, H.263, H.261, CD and Manual, Floating license.[*1]

Opt. M4SP – MPEG-4 Advanced Simple Profile (Levels 0 to 5).

Opt. M2ML – MPEG-2 Main Profile Main Level.

Opt. M2HL – MPEG-2 Main Profile High Level and High Level 1440 (High Definition).

Opt. AVCE – H.264/AVC Baseline and Extended Profiles (Levels 1 to 5).

Opt. AVCM – H.264/AVC Main Profile (Levels 1 to 5).

Opt. AVCH – H.264/AVC High Profile with FREXt (10 bit, 4:2:2:, 4:4:4).

Opt. VC1 – VC-1 (all Profiles, all Levels) and ASF extraction.

Opt. AUD – Audio playout (includes MPEG2 Layer 1 and 2, AAC, HE AAC).

Opt. SWS – 12 Months Software Subscription Service.

Opt. PPD – Parallel Port Dongle[*2].

Opt. USB – USB Dongle[*2].

MTS4EA is also available as an option on the MTS400 series of MPEG Test Systems.

[*1] One of options 4EAB or 4EAF must be ordered.

[*2] One of options PPD or USB must be ordered.

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Elementary Stream Analyzer

- Elementary Stream Analysis Software for VC-1, H.264/AVC, MPEG-2, MPEG-4, H.261, H.263, H.263+ and 3GPP Standards


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