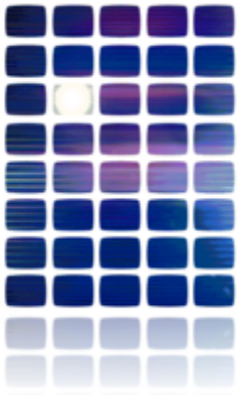

HardingFPA HD

User's Manual

Version 3.0.0

Cambridge Research Systems Ltd.
www.hardingfpa.tv

Help ensure video is safe to watch
for both diagnosed and dormant photosensitive epileptics

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Applicable Version:

This manual is applicable to the HardingFPA HD Version 3.0.0 (12th March 2010)

Document Revision: 11th March 2010

Table of Contents

Overview

The *HardingFPA HD* is the newest version of the HardingFPA Broadcast Flash and Pattern Analyser, which is capable of analysing High Definition (HD, up to 1080i60) material via capture card over SDI and HDMI connections depending on the capabilities of the installed *Capture Card*. It analyses using new Version 3 analysis algorithms, which have been designed specifically for HD standards and file analyses. For compatibility the software can be switched to use SD Legacy Mode, which allows SD material to be analysed using Version 2.5 analysis algorithms which are the same as in the previous 2.54/2.57 versions of the HardingFPA, and Version 1.x of the HardingFPA-X and HardingFPA-XL file-based systems.

An additional file-based add-on for the HardingFPA HD is available, which has the ability to analyse files from within the *HardingFPA HD*. It is compatible with many file formats including MXF, mov and AVI.

System Requirements

The HardingFPA HD will run on standard PC hardware, with a compatible capture card running either Windows® 7 (preferred) or Windows® XP. Windows Vista is not recommended for running the HardingFPA HD. The provided HASP USB software protection key will need to be inserted into the computer for the application to run, as it will not operate without one.

PLEASE NOTE that a full-height (but not necessarily full-length) PCIe non-graphics card slot is essential in order to accommodate the SDI data capture card. Note some computers although offering PCIe slots are programmed to only accept graphics cards in those slots.

Minimum hardware requirements:

The HardingFPA HD will run on a computer with the following minimum specification:

Intel Core 2 Quad Q9400 (2.66GHz, 1333MHz, 6MB)
Memory : 2048MB (2x1024) 800MHz DDR2 Dual Channel
Hard Drive : 250GB (7200Rpm) Serial ATAII 3Gb/s
Windows® 7 Professional 32 Bit
(Note future releases may require additional resources).

Recommended hardware requirements:

Intel Corei7-860 with VT (2.80GHz, 8M)
Memory: 4GB (2x2048MB) 1333Mhz DDR3 Dual Channel
Hard Drive: 320GB 3.5inch Serial ATA (7,200rpm)
Windows® 7 Professional 32 Bit

The software is intended for use on one computer only, and will lock itself to the machine it is running on (See *Licensing*).

To reduce the risk of dropped frames during capture (which causes the analysis to abort), it is recommended that the main hard disk drive in the computer is defragmented before running the software, as disk buffering and results saving creates significant disk activity.

If running the software under Windows 7, it is recommended that the following services are disabled on the computer in order to reduce the risk of dropped frames due to unnecessary disk activity:

Windows Search Indexing Service

Volume Shadow Copy Service (VSS)

SPP Notification Service

The *HardingFPA HD* optional file-based analysis module will analyse any movie file for which the computer it is installed on has the codec, and will attempt to open all files with the following file extensions:

.avi;*.mov;*.mpg;*.mpeg;*.m2v;*.mp4;*.vob;*.wmv;*.mxf;*.flv

QuickTime Codecs are not provided with the *HardingFPA HD*; therefore any required codecs will need to be installed on the computers to be used.

In general, if the file can be viewed correctly using QuickTime *or* Windows Media Player on the computer that the application is running on, then it will be able to be analysed, although the video must fall within the whitelist for *Accepted Video Formats*.

Accepted Video Formats

The HardingFPA HD will accept the following video formats over SDI:

NTSC	720x486i60 – i.e. 720 x 486 pixels interlaced at 60 fields per sec.
NTSC	720x486i50
PAL	720x576i48
HD	1280x720p50 – i.e. 1280 x 720 pixels progressive at 50 frames per sec.
HD	1280x720p59.94
HD	1280x720p60
HD	1920x1080p23.98
HD	1920x1080p24
HD	1920x1080p25
HD	1920x1080p29.97
HD	1920x1080p30
HD	1920x1080i50
HD	1920x1080i59.94
HD	1920x1080i60
HD	1920x1080p50
HD	1920x1080p59.94
HD	1920x1080p60

The optional file-based analysis module can analyse movie files with the following video formats:

1920x1080p23.98, 1920x1080p24, 1920x1080i24, 1920x1080p25, 1920x1080i25, 1920x1080p29.97, 1920x1080i29.97, 1920x1080p30, 1920x1080p50, 1920x1080i50, 1920x1080i59.94, 1920x1080p60, 1920x1080i60
1440x1080p23.98, 1440x1080p24, 1440x1080i24, 1440x1080p25, 1440x1080i25, 1440x1080p29.97, 1440x1080i29.97, 1440x1080p30, 1440x1080p50, 1440x1080i50, 1440x1080i59.94, 1440x1080p60, 1440x1080i60

1280x720p23.98, 1280x720p24, 1280x720p25, 1280x720p29.97, 1280x720p30, 1280x720p50, 1280x720p59.94, 1280x720p60
960x720p23.98, 960x720p24, 960x720p25, 960x720p29.97, 960x720p30, 960x720p50, 960x720p59.94, 960x720p60

768x576p25, 768x576i25, 768x576p27.97, 768x576i29.97

702 – 720 x 576p25, 702 – 720 x 576i25
702 – 720 x 486p29.97, 702 – 720 x 486i29.97
702 – 720 x 480p29.97, 702 – 720 x 480i29.97

640x480p29.97, 640x480i29.97
384x288p25, 384x288i25
352x288p25, 352x288i25
320x240p29.97, 320x240i29.97

In *SD Legacy Mode*, the optional file-based analyser will analyse movies with the following video formats:

702 – 720 x 576p25, 702 – 720 x 576i25

702 – 720 x 486p29.97, 702 – 720 x 486i29.97
702 – 720 x 480p29.97, 702 – 720 x 480i29.97

352x288p25, 352x288i25
384x288p25, 384x288i25
320x240p29.97, 320x240i29.97

Capture Cards

The *HardingFPA HD* is compatible with the following video capture cards. Support for more cards and other manufacturers is planned for the future.

- BlackMagic Design Decklink SDI
- BlackMagic Design Decklink HD Extreme 2
- BlackMagic Design Decklink HD Extreme 3
- BlackMagic Design Decklink Studio
- BlackMagic Design Intensity Pro

Only digital formats are currently supported, i.e. SDI and HDMI.

Licensing

The *HardingFPA HD* must be licensed with a USB hardware protection key in order to run (see below).

Once it has been run on a particular computer, it will ***only be allowed to run on that same computer***, although there is limited scope for de-registering the product to move it to another computer (once per week).

On first run, you will be asked if you wish to lock the software now:

Reregistering

If you move the USB protection key to a new computer and run the *HardingFPA HD*, you will be given the option to transfer the licence to the new computer, as long as one week has passed since the last re-registration / first registration. The re-registration screen is shown below:

Only one re-registration is possible in a week long period, so be certain that you wish to move the licence to the new computer, otherwise you will see the dialogue box below:

Installation

Before continuing, note that the HardingFPA HD software locks itself to the current machine, but can be moved once per week.

The *HardingFPA HD* requires the QuickTime framework in order to operate, which can be obtained from:

http://www.apple.com/quicktime/download/

Once this is installed, the drivers for your capture card must be installed. This may ask you to install unsigned drivers, in which case, click on "*Continue Anyway*" each time. The computer will also need to be restarted in order for the driver installation to complete. If you are upgrading from previous versions of the Decklink drivers, you will need to uninstall the old ones and restart first.

To install the *HardingFPA HD*, simply run the *HardingFPA HD Setup* installer.

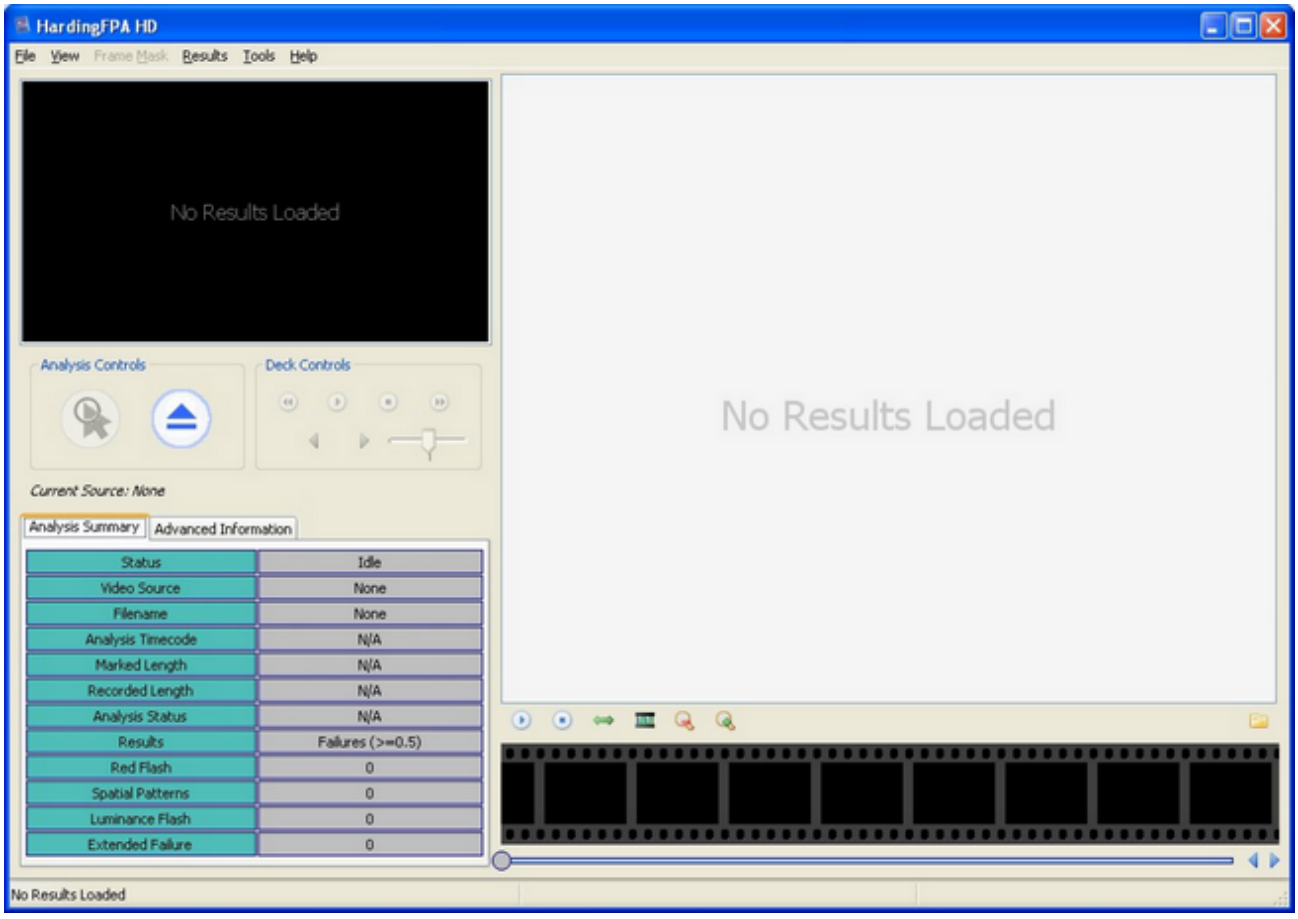
The application will be installed in the ***HardingFPA*** section of the Start Menu as *"HardingFPA HD"*.

Main Screen

Upon running the *HardingFPA HD*, the main screen will be displayed. This is the main and only screen for the *HardingFPA HD* and is shown below.

It displays a graphical representation of the characteristics of the analysed material, and some additional advanced diagnostic information, so that the user may quickly and efficiently view the locations of failures or cautions in the source material, and optionally play back the areas around these failures to aid in rectifying the offending material. Its appearance is similar to both the *HardingFPA-XL* and *HardingFPA-X Viewer* applications.

All functionality of the *HardingFPA HD* is performed from this screen.



The main HardingFPA HD screen

All of the buttons and sections of the *HardingFPA HD* screen have help text associated with them. To see what a particular part of the interface does, simply hover the mouse cursor over the button/section.

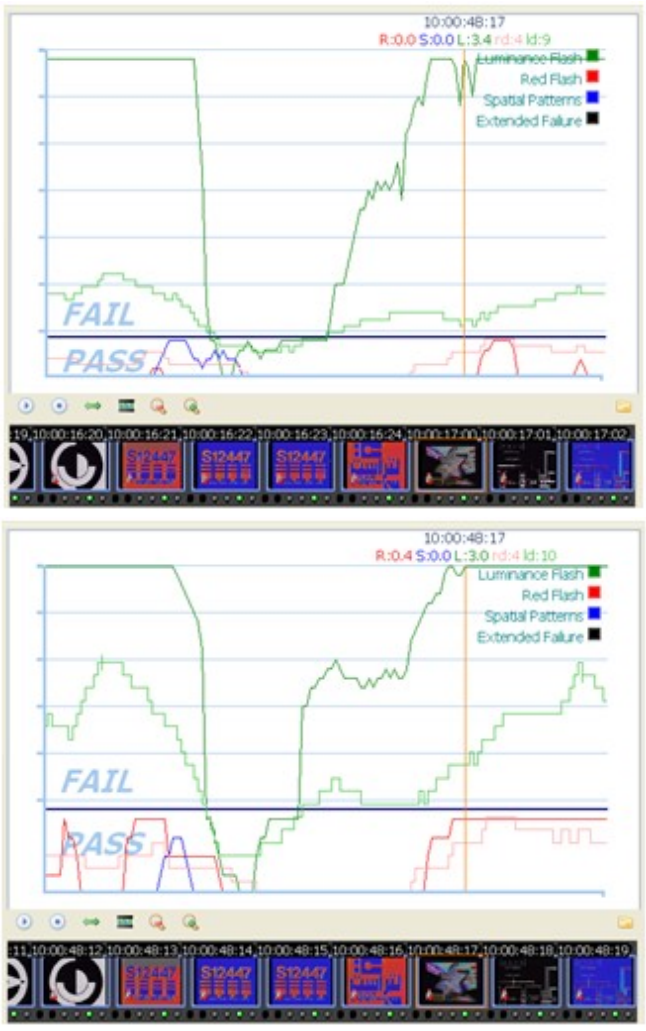
Version 3 Analysis Algorithms

The HardingFPA HD now features new analysis algorithms, which are better tuned to High Definition and File-based work. They are better suited to subtle changes in the image data, and provide much closer results when testing the same material repurposed either into a different video format, or encoded with a different codec. The main differences between the legacy algorithms and the new ones are detailed below:

Differences Between v2.5 and v3.0

Different Graph Scaling

The *HardingFPA HD* generates risk values using the same range as its predecessor (i.e. 0 to 3.4) but displays the graphical data using a revised vertical scale. This modified scale allocates much more vertical space for risk trace warnings and diagnostic trace steps but only displays risk traces up to the value of 3.0. Risk traces values from 3.1 to 3.4 are still logged as part of the results files but are graphically displayed capped at 3.0.

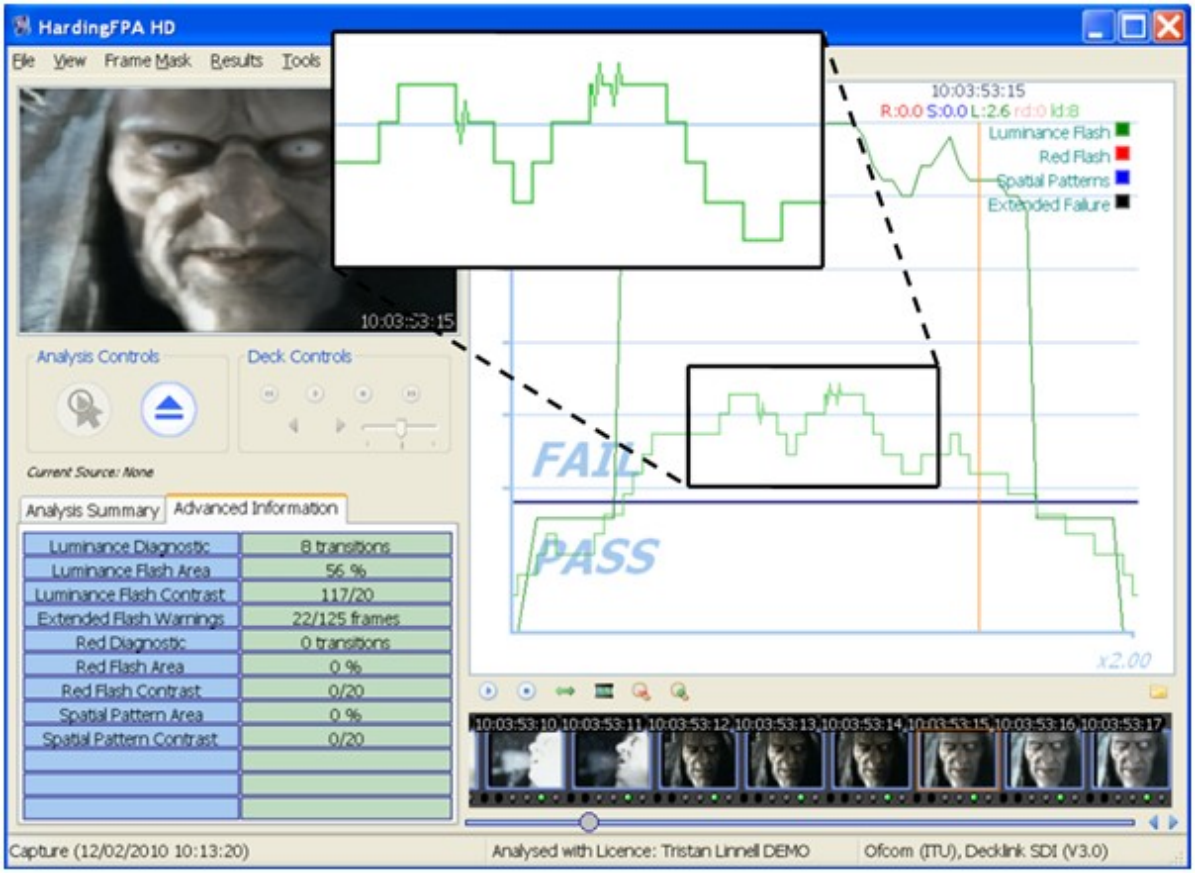


(left) Version 2 and (right) Version 3 Graphing

The Squiggle

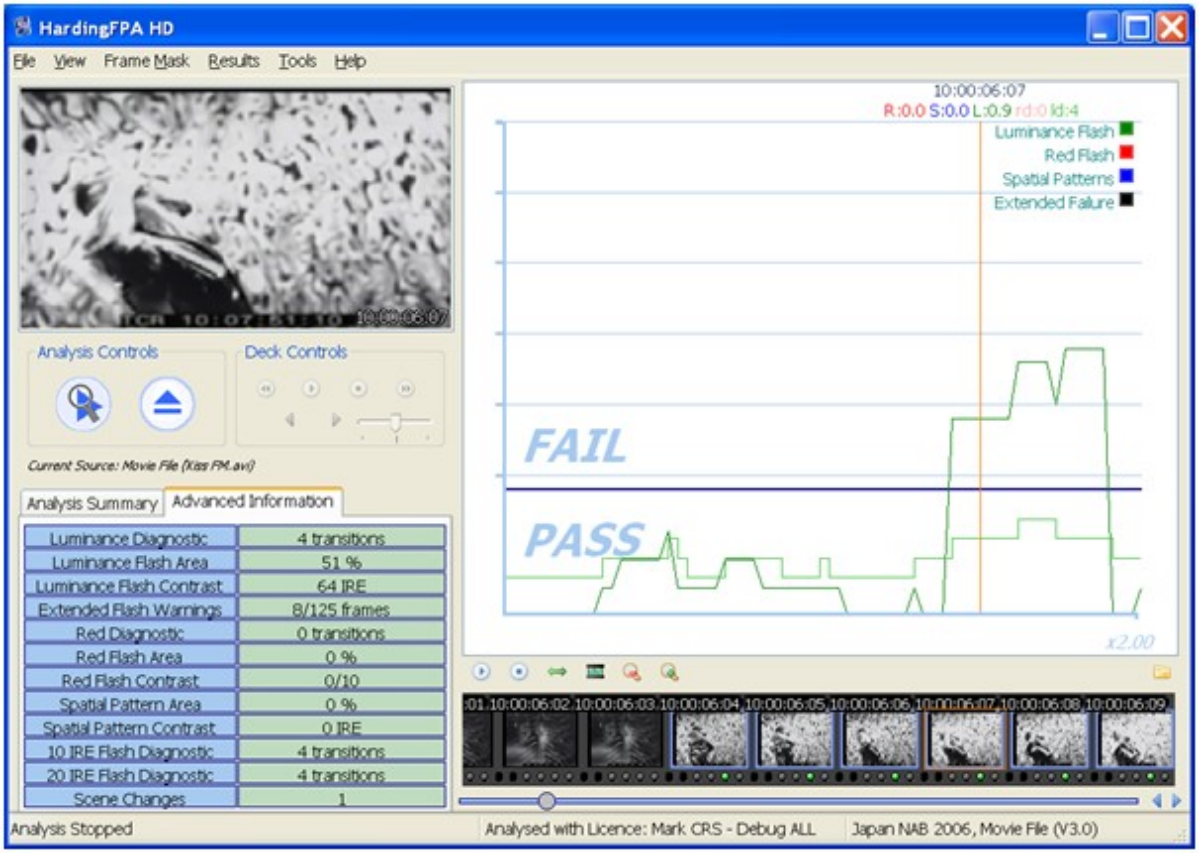
The *HardingFPA HD* gives enhanced visual diagnostics when an incoming transition coincides with an

outgoing transition from one exactly second earlier. The new version 3 algorithms insert a *squiggle* (see below) to indicate when the diagnostic trace has simultaneously gained and lost a transition over the most recent second between video frames.



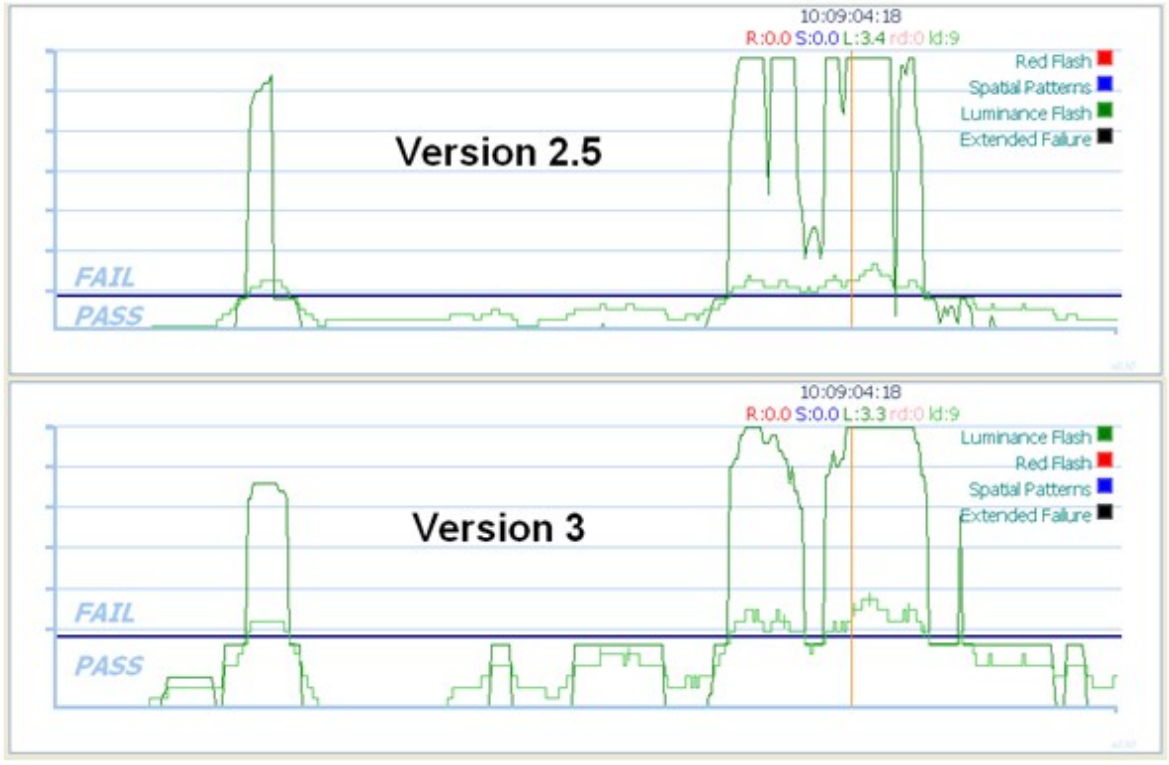
Scene Changes (Japanese NAB Analysis only)

When analysing under Japanese NAB guidelines, it is possible for the flash risk trace to go into failure while the diagnostic trace is still in the caution zone (see image). T his can occur if one of the transitions in the most recent second is classified as a “scene change” (see bottom entry of the Advanced Information tab) where 80% of the image has seen a significant luminance transition of 20IRE units or more. When this occurs, the maximum allowable number of transitions is reduced from 6 down to 3 and, in this example, failure took place when the 4th transition was detected.

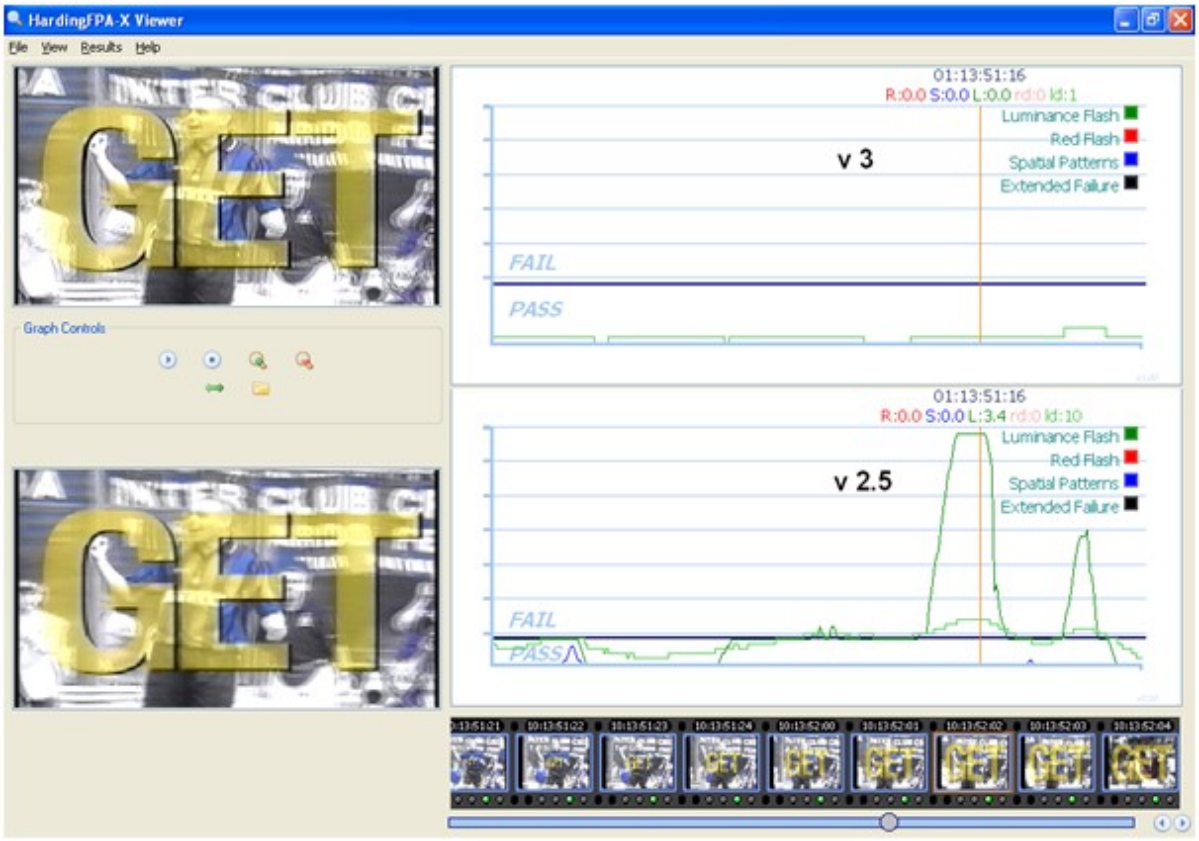


Analysis Results

The *HardingFPA HD* gives results which are broadly similar to those generated by version 2.5. The figure below shows the results of both versions when analysing the same video input under the same guidelines:

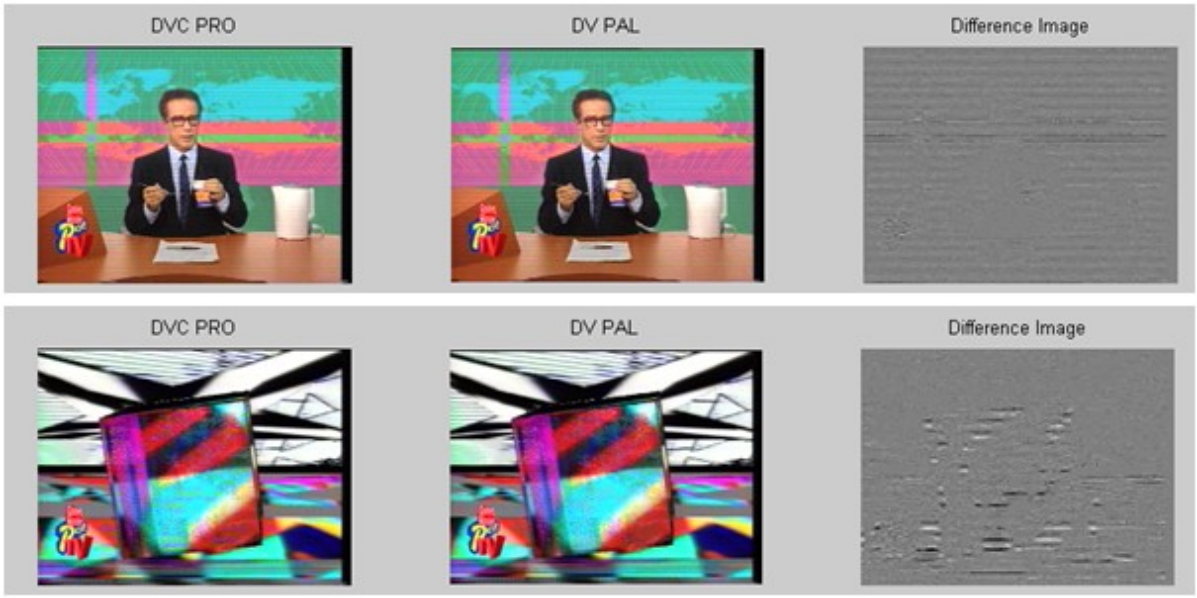


However, the results between the two versions will not be identical. The *HardingFPA HD* will, in general, be more lenient to complex, rapid motion:



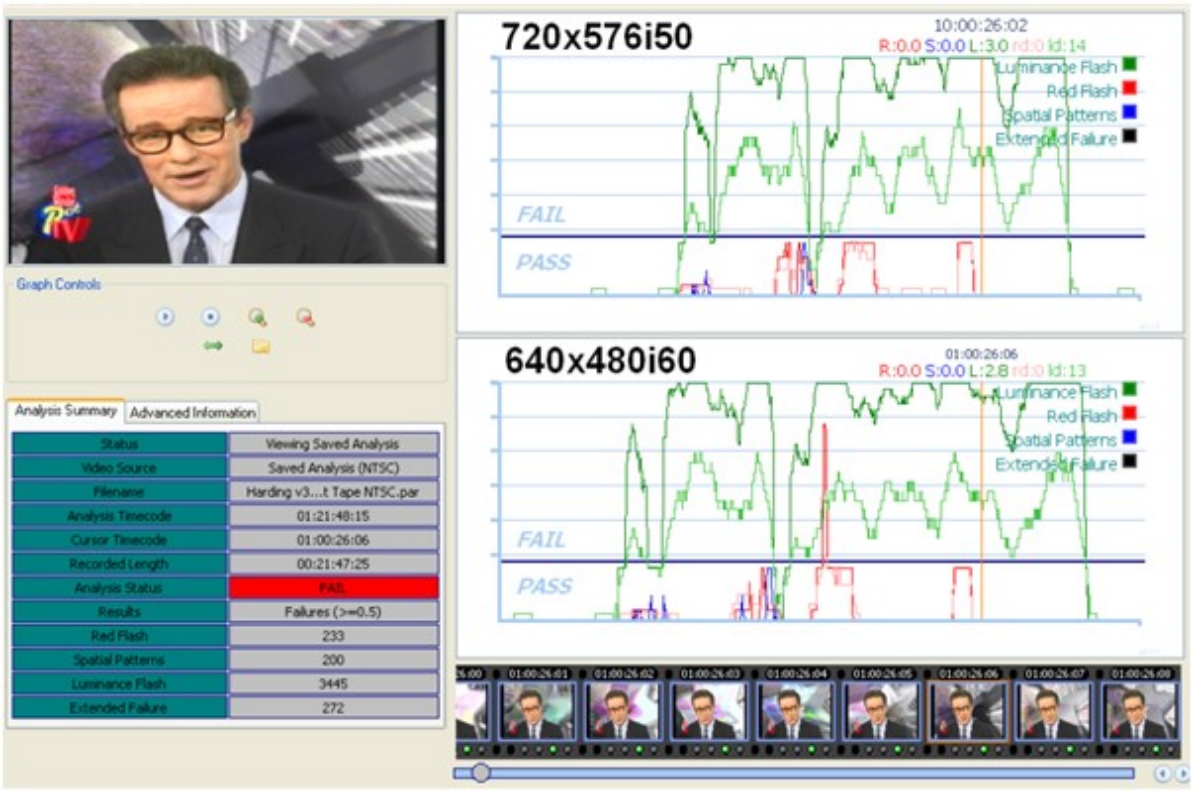
... but more strict to examples of powerful, localised flashing:

Most importantly of all, the *HardingFPA HD* has been designed to be as format-agnostic as possible. Changes in file formats or codecs will alter the underlying video data even if these changes are not visually apparent. Here, the same video has been encoded at the same resolution using two different codecs. The absolute differences between the two images are shown in the third image as deviations from mid grey.

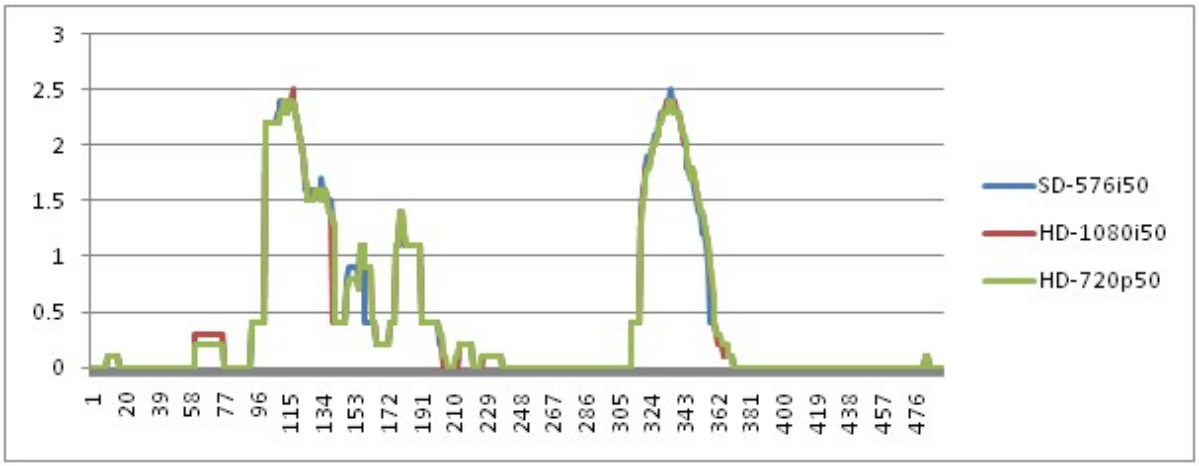


The new version 3 algorithms generate highly consistent results from different image resolutions and frame rates. Here, the same movie has been analysed in 720x576i50 and 640x480i60 formats with highly

consistent results. The only noticeable difference is the different horizontal graph scales as a result of the different frame rates.



The graph below shows three sets of luminance flash risk results of the same movie analysed in **SD-576i50**, **HD-720p50** and **HD-1080i50** formats. The results are sufficiently similar it is difficult to see that the graph contains three separate traces:



Operation

The next subsections detail the operation of the *HardingFPA HD software*, including new features such as Frame Masks.

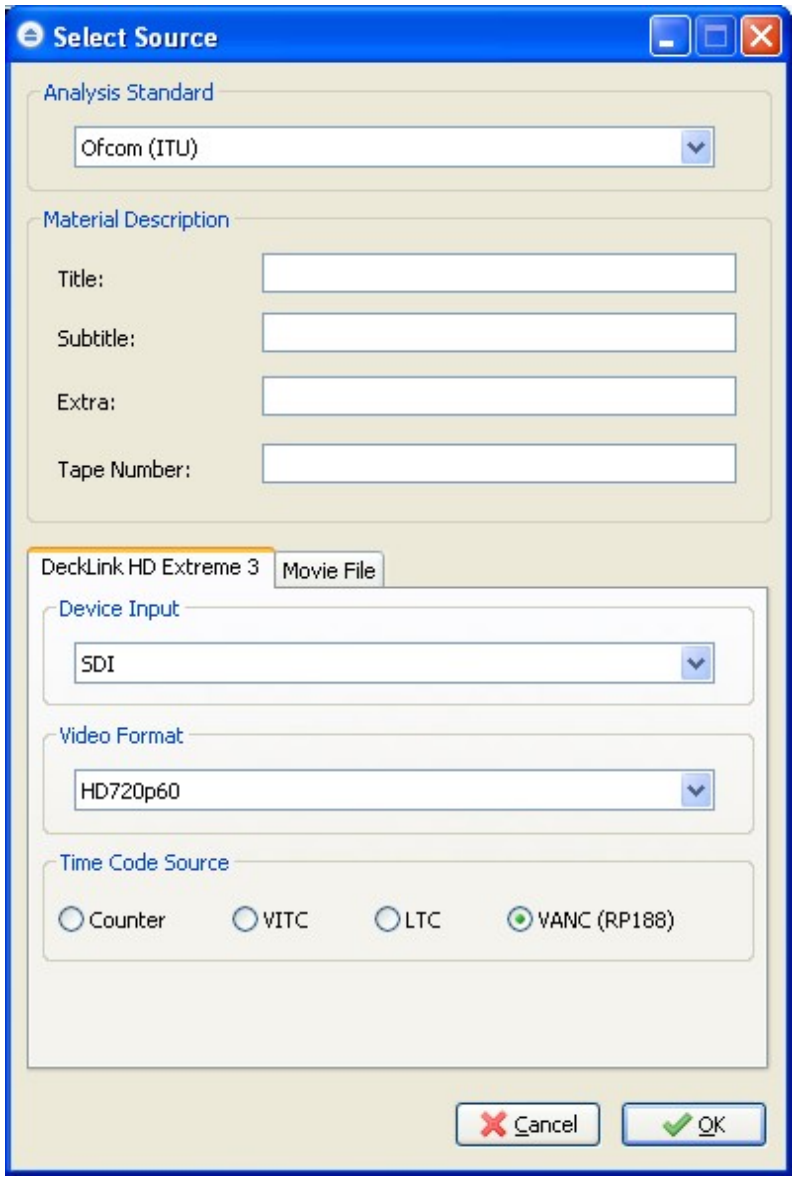
Opening a Source

The *HardingFPA HD* operates on a system of "Sources", whereby a source (which can be either a video feed from a tape machine, or (optionally) a movie file) can be opened, and is only analysed when the analyse button on the main window is clicked (movie files are automatically analysed once they are opened). The currently opened source is always displayed below the controls on the main window, and on startup displays "*Current Source: None*" to depict the fact that no video source has yet been opened. To open a new source, click the "*Open New Source*" button, shown below.

Clicking on the "*Open New Source*" button brings up the dialogue box shown below, where you can choose which source to analyse from and may enter additional information in the form of the "*Material Description*", that you require to appear on the PDF certificate or embedded into the results files that will be created from the analysis.

To open a feed from a capture card, select the tab with the name of your capture card and choose from the input options and video formats. A number of timecode sources are supported, although in order to use LTC, a working RS422 connection to a tape deck must be established. If you expect to see an input connection or video format that is not displayed, then check in the *Administrator* tab of the *Settings* that the option has been enabled.

If you have the optional file-based module enabled, you can select a movie file in the "*Movie File*" tab by clicking on the small button labelled "..", or choose a recently selected movie file from the drop-down menu box. If you would like to clear this list at any time, click the "*Clear List*" button underneath.



When ready to analyse the source, click OK and the "*Current Source*" notification on the main window will change to reflect the chosen source, and if *Movie File* was selected, the analysis will automatically start.

RS422 Tape Deck Control

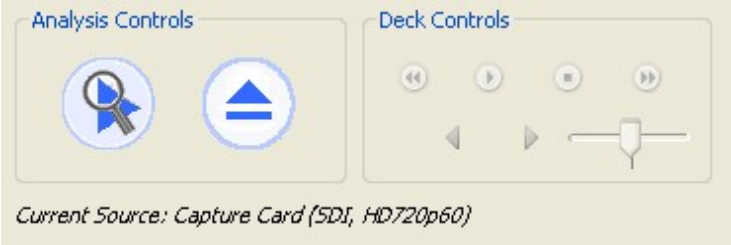
If the settings for Tape Deck Control are correctly configured and communications with the tape deck are established, the tape control interface to the right of the *Analysis Controls* can be used to control the attached tape deck (through a serial port via RS422).

These can then be used to cue the tape to the correct point before the analysis starts. From left to right and top to bottom these are:

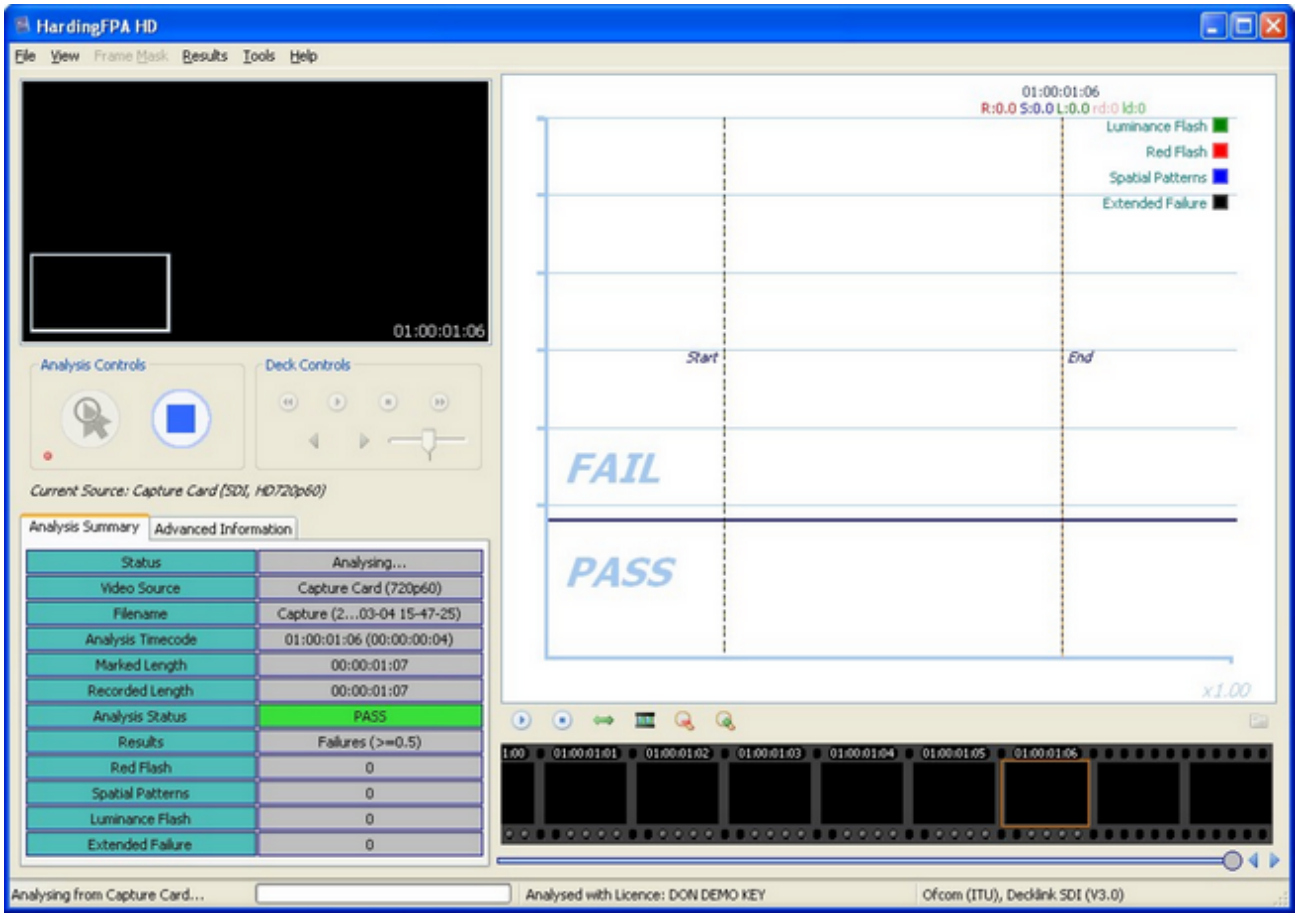
Rewind, Play, Stop, Fast forward,
Jog Back, Jog Forward and Shuttle (variable speed forward and back).

Analysing a Source

To start analysing the current source, click the "*Start Analysis*" button in the *Analysis Controls* section, on the left, shown below...



Once the source is analysing the screen will appear similar to that shown below, and the *Open New Source* button will change to a *Stop Analysis* button:



Whilst the analysis is being performed the small red LED light in the *Analysis Controls* will flash to let you know that a video source is still being analysed.

To stop the analysis, click the *Stop Analysis* button (the big blue square in the *Analysis Controls* panel). When analysing a tape feed, this may only stop the **capture**, and the analysis will continue - if the disk buffer (timecode in brackets under *Analysis Timecode*) has some frames left in it. To cancel the analysis

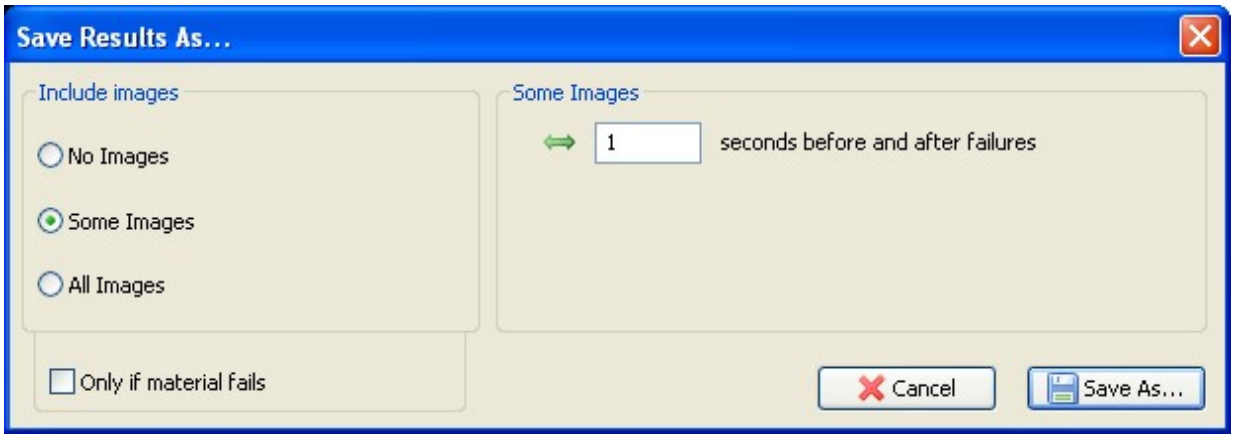
of these residual frames, press the *Stop Analysis* button a second time. Alternatively, wait for these frames to complete.

Autosaving

If the options are set in Autosave Options, the *HardingFPA HD* will automatically save out results files using those configurable options to the folder specified, ready to be viewed again (See Opening a Saved Analysis).

Saving an Analysis

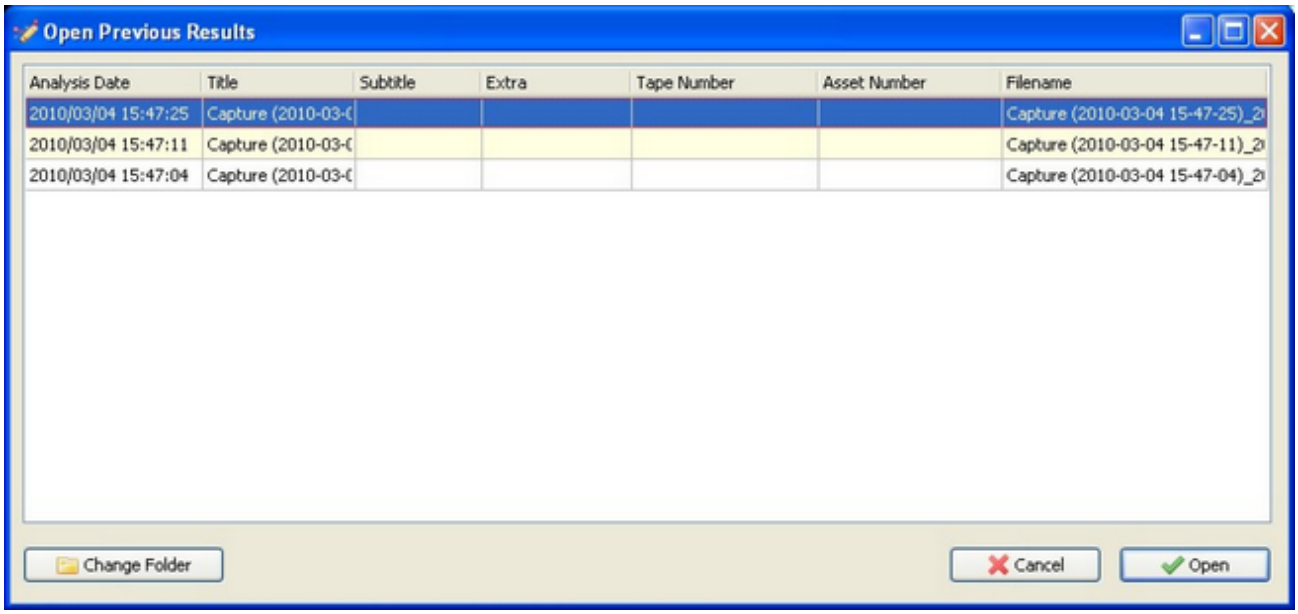
When results are loaded into the software, either from just performing an analysis or by loading results from another results file, these results can be saved out again with different options by clicking on File -> Save Results As. The same options are available as in the Autosave Options.



Note however that if the currently loaded results set does not have all images, then selecting *All Images* will only be able to save images where they exist on the currently loaded results.

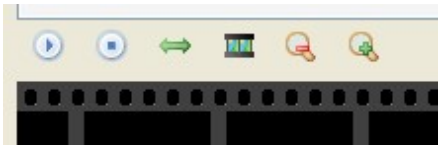
Opening a Saved Analysis

To open previously saved results, click on the *"Open results file"* button underneath the graph ( ) or click on the *File -> Open results file* menu. The following screen will then appear, showing all of the metadata attached to the results files in the currently configured results folder. To change the folder contents displayed in the table, click the Change Folder button and select the new folder.



Replay Functions

With results displayed in the graph window, the clip and graph can be played back to aid the rectification of problem areas in the clip. The *Graph Controls* panel underneath the graph contains buttons to facilitate this replay functionality.



From left to right, the buttons perform the following function...

Start Replay: Starts playback in real-time from the current position.

Stop Replay: Stops all playback.

Replay one second before and after current cursor position: Animate the images for one second before and one second after the current cursor position whilst leaving the graph positioned at the current cursor position. this is especially useful when you are looking for the causes of a particular failure and need to look at the graph in detail and yet still see the offending section being played back.

Replay marked region: Replays from the *Start* marker to the *End* Marker. Set marker positions by either right-clicking on the graph or pressing the *Page Up* and *Page Down* keys.

Zoom Out: Zoom the graph out.

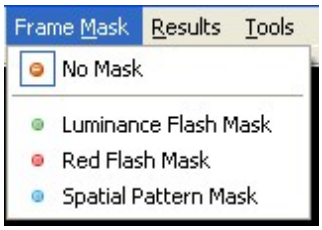
Zoom In: Zoom the graph in to see the results more clearly.

In all playback modes, the playback will loop when reaching the end (after a small pause). The playback can be stopped at any time with the *Stop Playback* menu item or button, by clicking anywhere on the graph, by dragging the seek slider or by opening a new file.

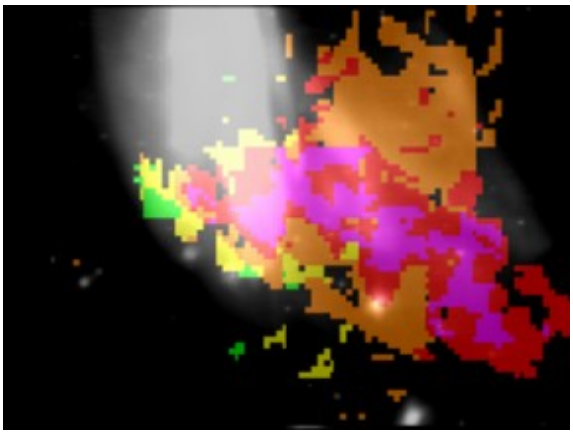
Frame Masks

The *HardingFPA HD* includes new visual information in addition to the results images in the form of *Frame Masks*. These mask images are overlaid on top of the frame images on the large image in the top-left of the main screen and depict the locations of problem areas in the sequence, to aid in the repair of failing sequences. This mask information will only be available once the analysis is either complete or stopped, and not whilst the analysis is still taking place.

When the results first appear on the graph, the large image in the top left hand side will appear as usual. In order to utilise the frame mask images, Click on the *Frame Mask* menu, and select the type of failure that you want to see the mask overlaid for:



When any of the frame masks are chosen from this box, the images will change and the mask will be overlaid onto a darkened, black-and-white (monochrome) version of the original frame image. An example is shown below:

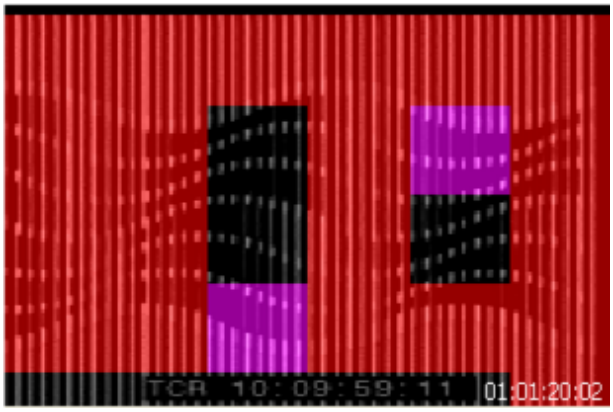


The colours represent the number of transitions which each pixel has experienced in the most recent second after allowing for motion. The analyser will issue a failure when more than one quarter of the image contains red or purple pixels. The same colour coding (shown below) is used for both *luminance* and *red flash* analysis.

Pixel Colour	Number of Transitions
none	0
green	1 or 2
yellow	3 or 4
orange	5 or 6

red	7 or 8
purple	9 or more

The spatial pattern mask data logs the activity which exceeds the spatial guideline limits as shown below.



The mask data appears as a set of uniformly coloured tiles in the image which represent how long they have persisted in the image sequence. Spatial mask data only appears for stationary, regular patterns which lead to failure. Any spatial patterns which drift, or are not regular, or do not persist in the video long enough to trigger a failure are excluded.

Pixel Colour	Persistence
none	no regular stationary pattern present
green	0 to 1/6 second
yellow	1/6 to 1/3 second
orange	1/3 to 1/2 second
red	more than 1/2 second = FAILURE
purple	outside of pattern regularity limit

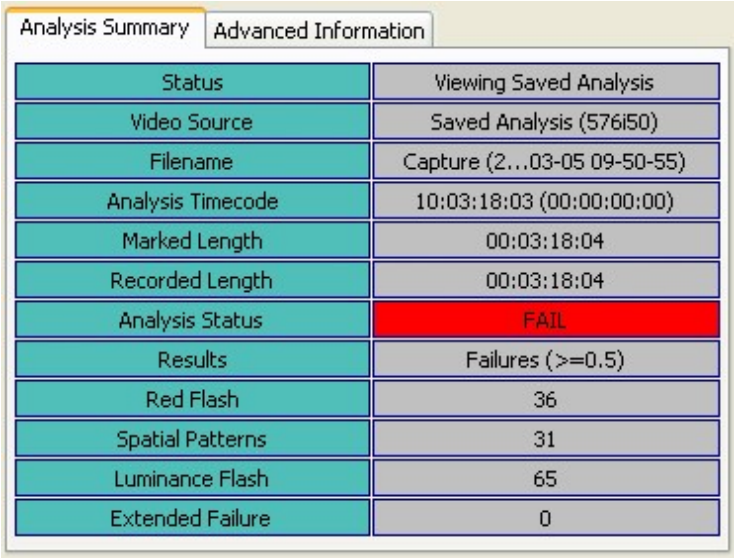
The actual colours used represent how close the spatial pattern is to causing a failure rated in terms of how long the pattern has persisted in the image sequence. When running under Ofcom guidelines, the *HardingFPA HD* analyser will only tolerate illegal spatial patterns to persist for up to half a second -- any longer than this will lead to a failure. Therefore the green, yellow and orange colours denote the build up to failure while red represents the actual failure itself. Purple is reserved for tiles which are part of the detected spatial pattern but whose pattern characteristics lie outside of the allowable range when compared with the rest of the spatial region. These purple tiles do not represent persistence and can accompany spatial masks of any colour.

It is important to note that the *HardingFPA HD* **only** presents mask colours for pixels which ***will*** go into failure within the next second. This allows the editor to focus on the region(s) of the image which lead to the failure rather than flooding the user with unnecessary information. As a result, many images will contain no masked / coloured pixels even though there may be some flash or pattern activity occurring.

In addition, pixel mask activity may suddenly disappear after an isolated failure sequence if the remaining pixel transition activity does not lead to a subsequent failure.

Analysis Information

The table on the left hand side of the screen contains two tabs which display diagnostic information about the clip. The *Analysis Summary* tab shows the following pieces of information, which are applicable to the entire clip:



The HardingFPA HD's Analysis Summary tab

Status: Shows whether the *HardingFPA HD* is reviewing results or in another state such as loading/results/analysing/not loaded etc.

Video Source: The video standard of the analysis being viewed.

Filename: The filename or title of the source that was analysed to obtain the results currently being displayed.

Analysis Timecode: The timecode of the final frame in the clip. This is expressed in hours : minutes : seconds : frames. The timecode in brackets is the amount of video stored in the disk buffer spoolfile waiting to be analysed.

Marked Length: The length of material currently marked off with *Begin* and *End* markers. This is expressed in hours : minutes : seconds : frames.

Recorded Length: The total length of the clip expressed in hours : minutes : seconds : frames.

Analysis Status: The Pass / Fail status of the clip with respect to the currently selected Flash and Pattern guidelines.

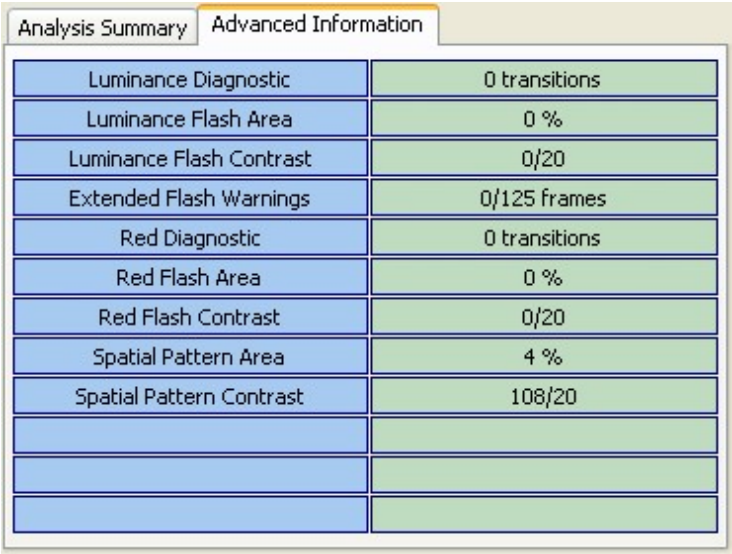
Red Flash: The number of frames that exceed the test guidelines for red flash.

Spatial Patterns: The number of frames that have exceeded the test guidelines for spatial patterns.

Luminance Flash: The number of frames that have exceeded the test guidelines for luminance flash.

Extended Failure: The number of frames that exceed the test guidelines for extended failure. This represents the number of frames for which the *black trace* has appeared or equivalently, the number of times that the maximum allowed number of flash warnings (levels 0.3 or 0.4) in the most recent 5 seconds has been exceeded.

In addition to this information, there is a second tab featuring *Advanced Information*. This tab contains detailed information corresponding to the individual frame at the current cursor position, and may be of use in determining the build up to a failure. The items described are as follows:



The Advanced Information tab

Luminance Diagnostic: This is the numerical value of the diagnostic plot shown on the graph. It represents the minimum number of transitions which the most active 25% of the image frame has seen in the most recent second.

Luminance Flash Area: The percentage area of the image frame which has exceeded the Flash Guidelines.

Luminance Flash Contrast: The average contrast of the area of the image frame which has exceeded the Flash Guidelines.

Extended Flash Warnings: The number of image frames which have generated flash warnings (levels 0.3 or 0.4) in the most recent 5 seconds.

Red Diagnostic: The number of red transitions which the most active 25% of the image frame has seen in the most recent second.

Red Flash Area: The percentage area of the image frame which has exceeded the Red Flash Guidelines.

Red Flash Contrast: The average amplitude of flash to and from saturated red of the area of the image frame which has exceeded the Red Flash Guidelines.

Spatial Pattern Area: The percentage area of the image frame which has exceeded the Spatial Pattern Guidelines.

Spatial Pattern Contrast: The average contrast of the area of the image frame which has exceeded the

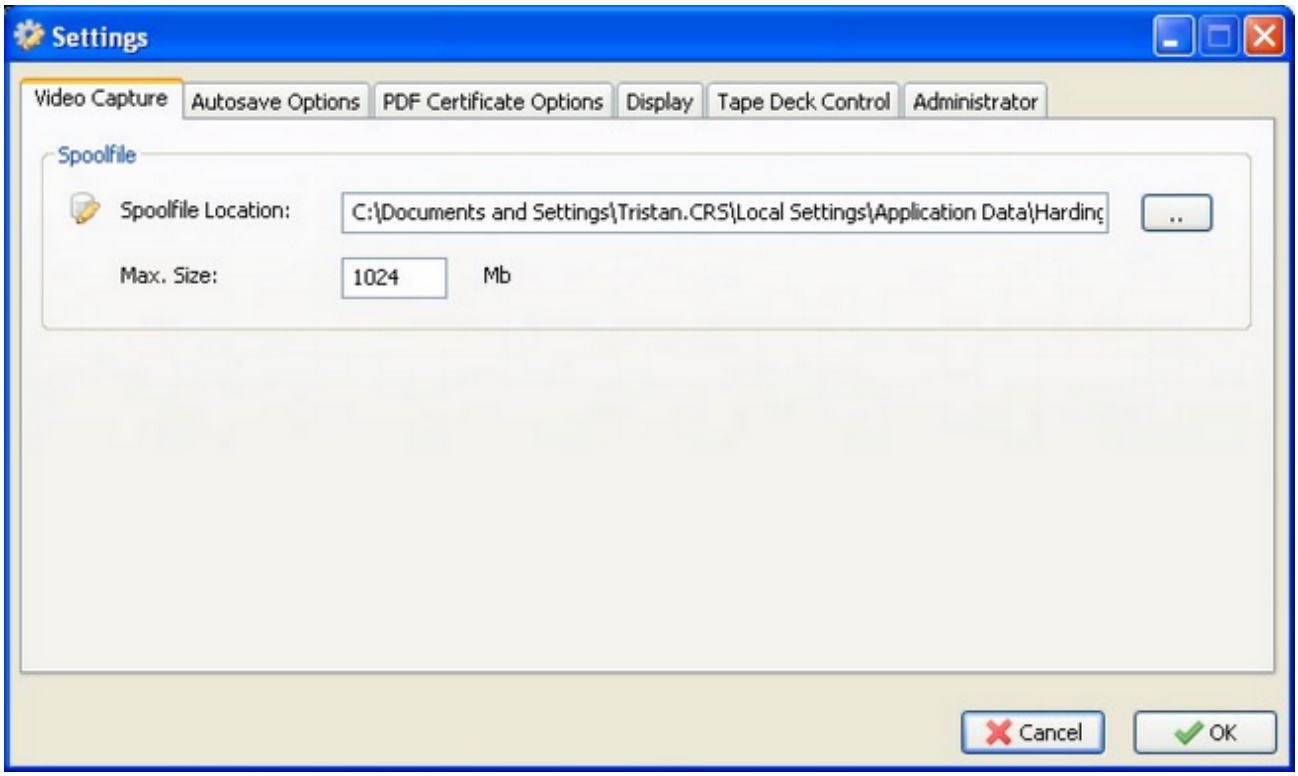
Spatial Pattern Guidelines.

Settings

The settings for the *HardingFPA HD* can all be found by clicking on *Tools -> Settings* on the main screen. The settings are seperated into tabs, and the final tab (*Administrator*) is only shown if you are running the application as an administrator user within Windows, and features administrative settings.

Video Capture

These are the settings relating to the tape-based capturing of video feeds via a Capture Card.

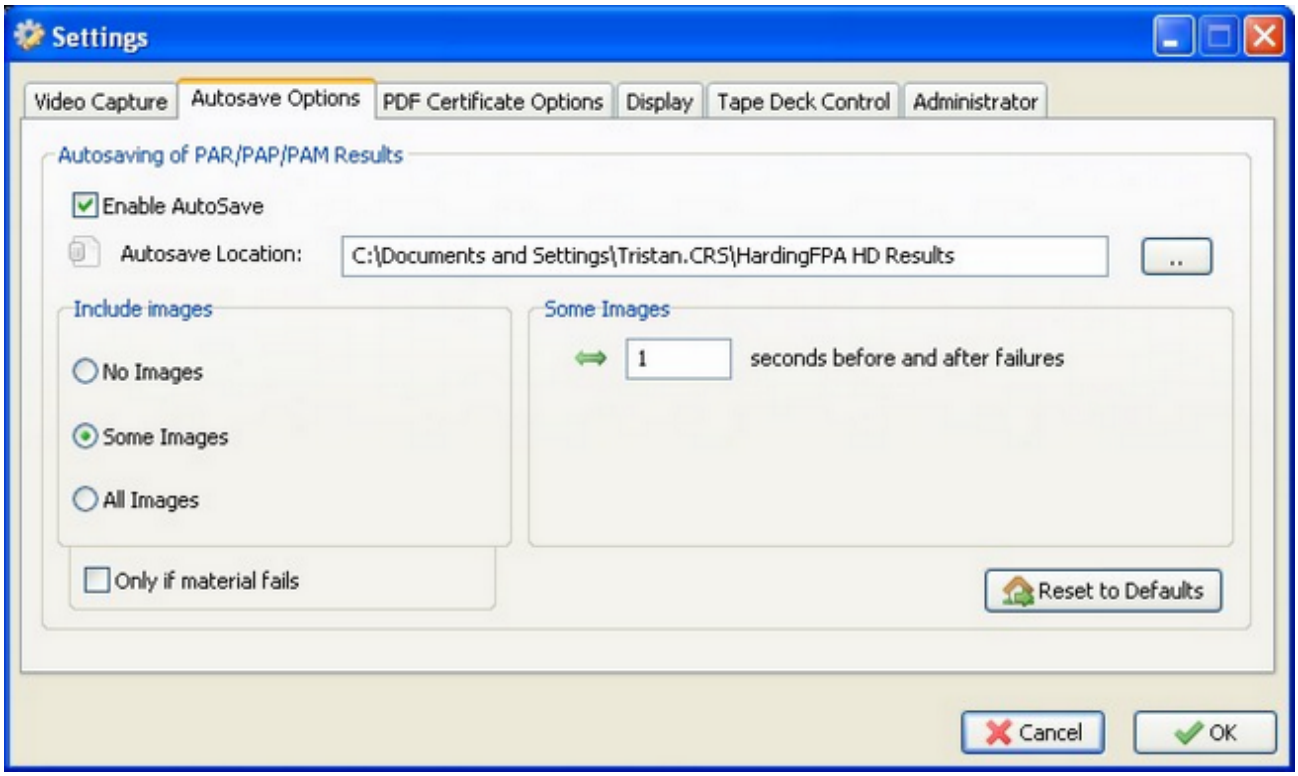


The *Spoolfile* in this case refers to the hard drive buffer that is used to store frames from the incoming video feed before they are passed to the analysis engine.

Spoolfile Location is the filename of the spoolfile on disk. For best performance when analysing High Definition material, it is preferable to have this file on a different physical disk to the *Autosave* location. *Max. Size* is the maximum size of the circular spoolfile buffer. This is generally best left at the default value of 1024 Mb (1 Gb), but if problems occur with dropped frames, this may be modified to alter the performance of the buffering scheme.

Autosave Options

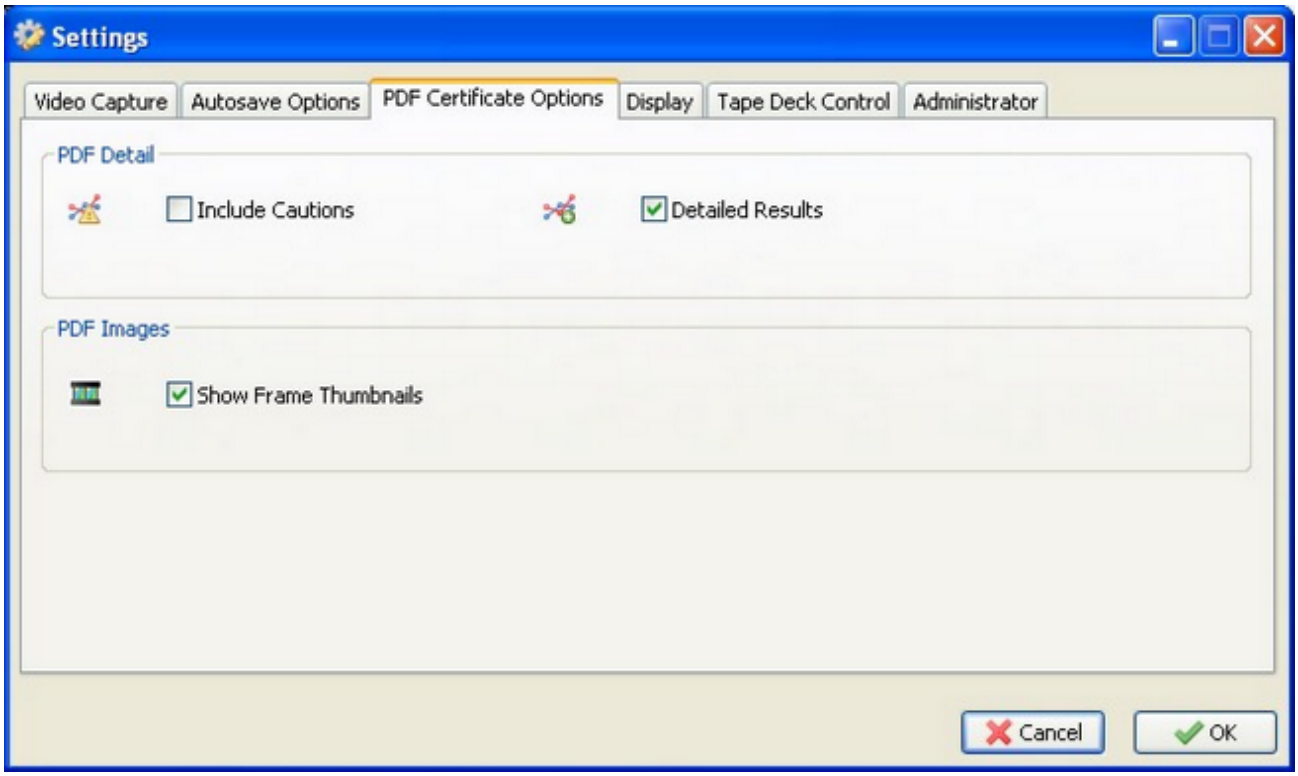
These are the settings relating to the *Autosave* feature, in which a results set is automatically saved during analysis. It specifies the location of the autosaved PAP/PAR/PAM files (results files used by the *HardingFPA HD* to display graph and mask data).



Here there are also the options of when to save images in the results files, which can be selected as a compromise between hard disk space and number of images saved. Images can be saved a configurable number of seconds around failures, and images can be omitted if the material passes (by checking the box "*Only if material fails*").

PDF Certificate Options

These are the settings relating to the generation of *HardingFPA* PDF certificates.



PDF Detail refers to how verbose the PDF is to be:

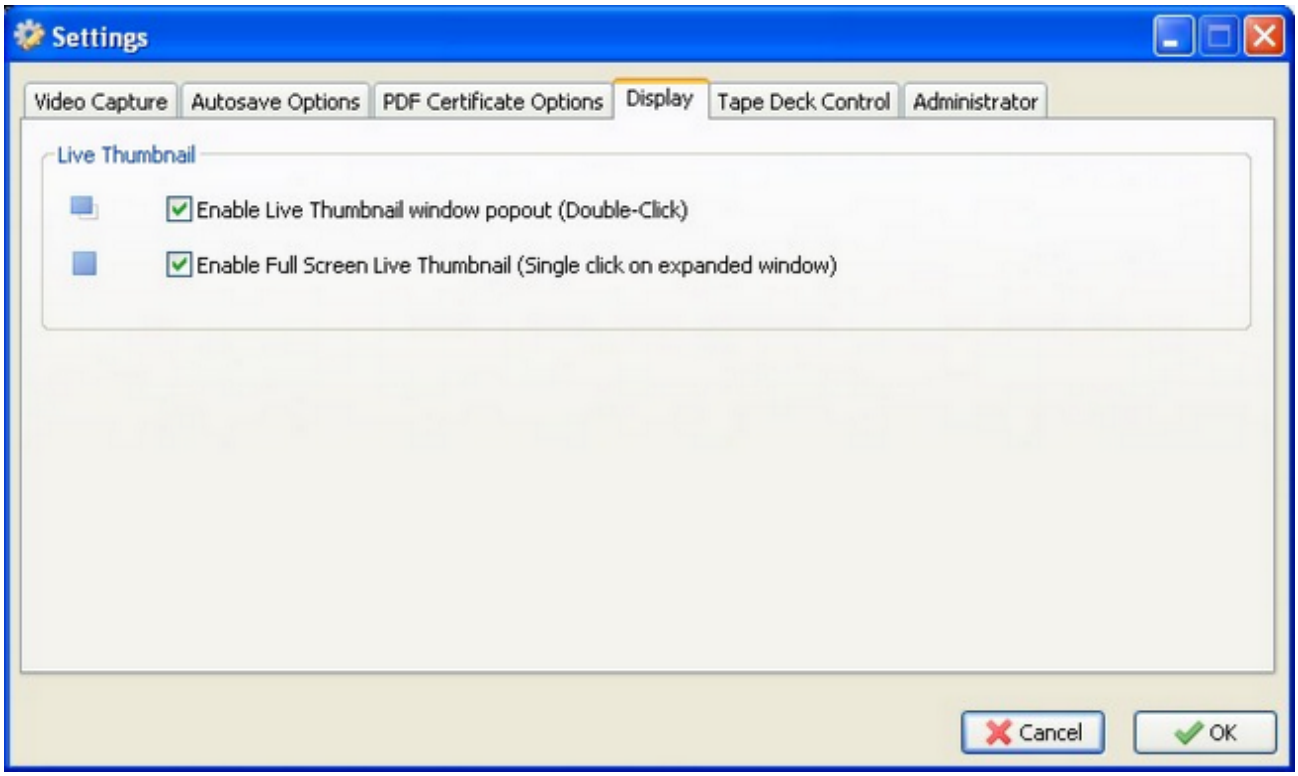
Include Cautions will include data for regions of the analysis which are in the *Caution* range, as well as the *Fail* range.
Detailed Results controls whether or not the PDF is to include data during failures. Without this being selected, only the beginnings and ends of failing regions are included in the PDF.

PDF Images controls the frame previews in the PDF:

Show Frame Thumbnails selects whether or not to include images in the PDFs.

Display

These are the settings relating to the display of video frames in the interface.

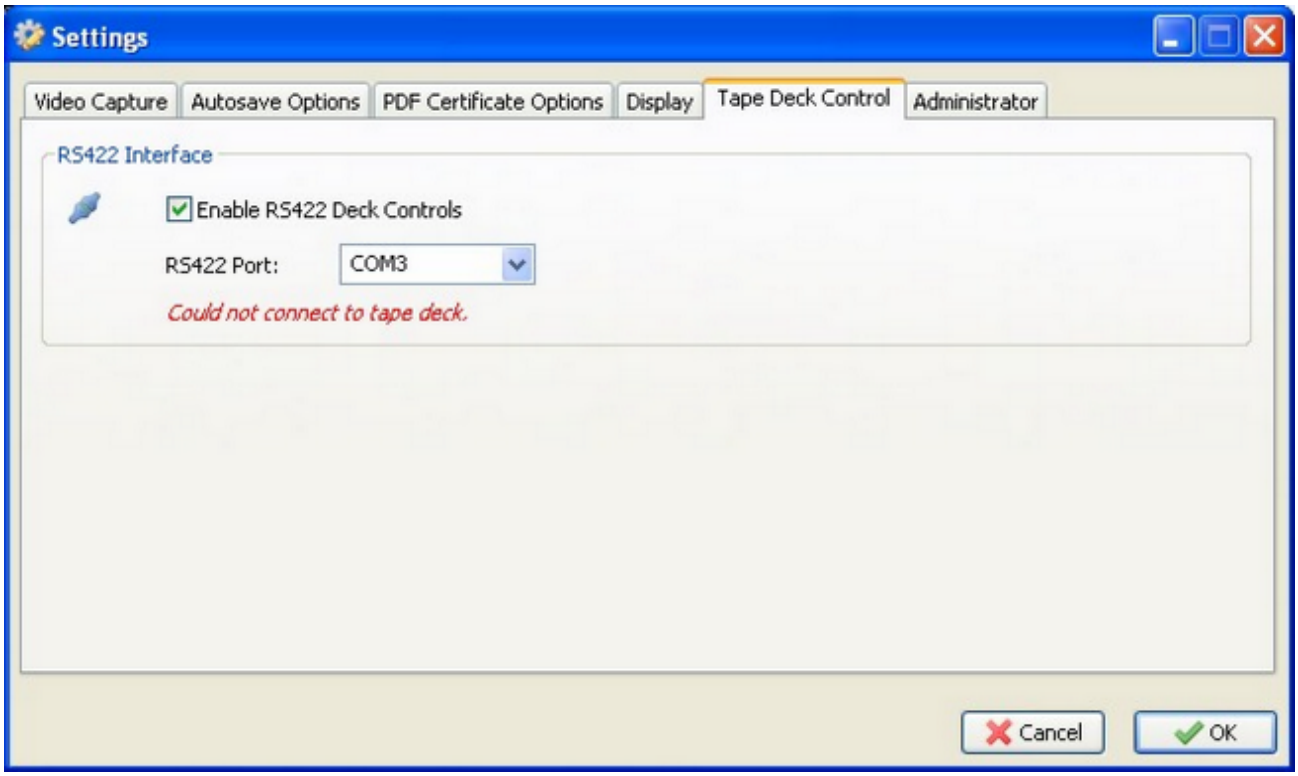


Live Thumbnail controls options relating to the smaller thumbnail image that displays the current live captured image from the *Capture Card* in tape mode:

Enable Live Thumbnail window popout (Double-Click) allows the small live thumbnail to be double-clicked to enable a pop-out hardware accelerated, resizable window.
Enable Full Screen Live Thumbnail (Single click on expanded window) allows the popped out window to be clicked and enter full-screen mode.

Tape Deck Control

These are the settings relating to the remote control of a tape deck through the serial port using the RS422 protocol.



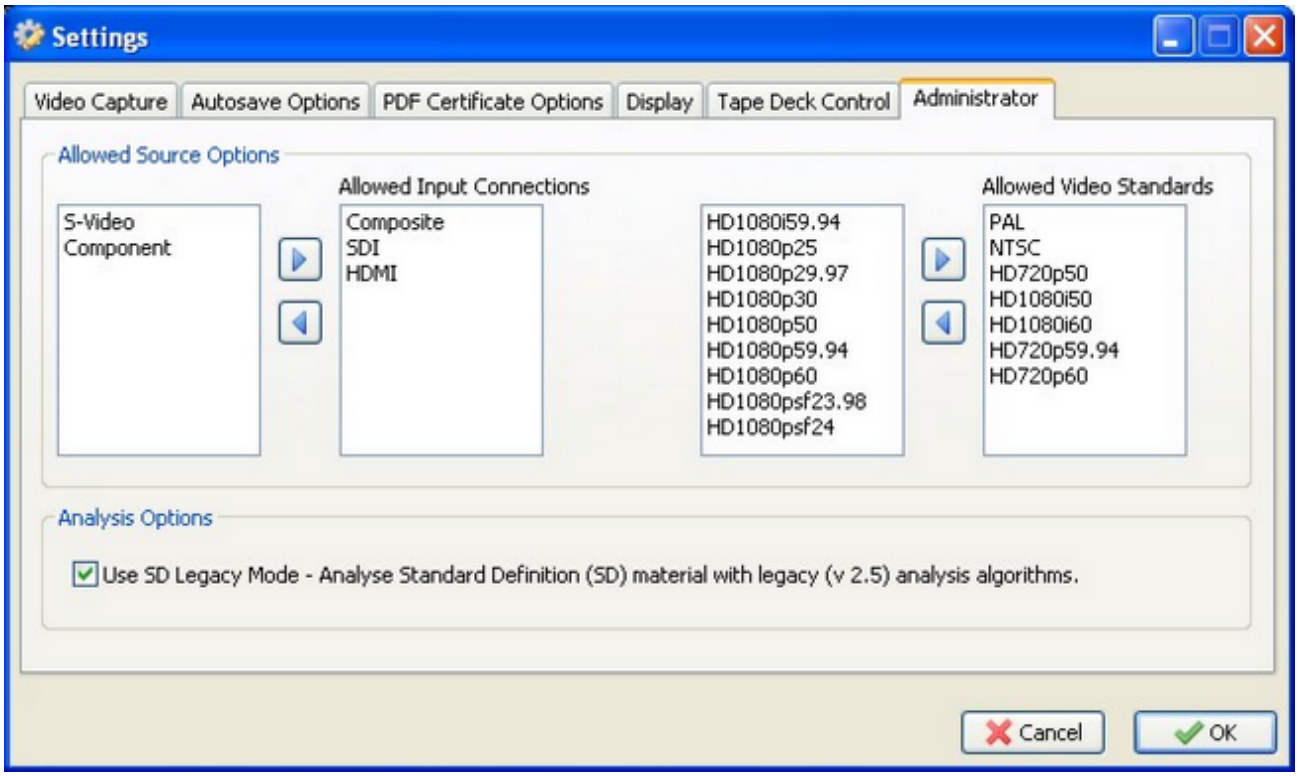
RS422 Interface details the settings for the connection to the tape deck:

Enable RS422 Deck Controls will enable this communication when checked.
RS422 Port defines the COM port (Serial) that the deck is connected to.

Note that correct communications must be established with the tape deck if you would like to use LTC timecodes.

Administrator

These are the administrator's settings that only appear when the application is being run as a Windows administrator user (i.e. one with write permissions to the HKEY_LOCAL_MACHINE registry).



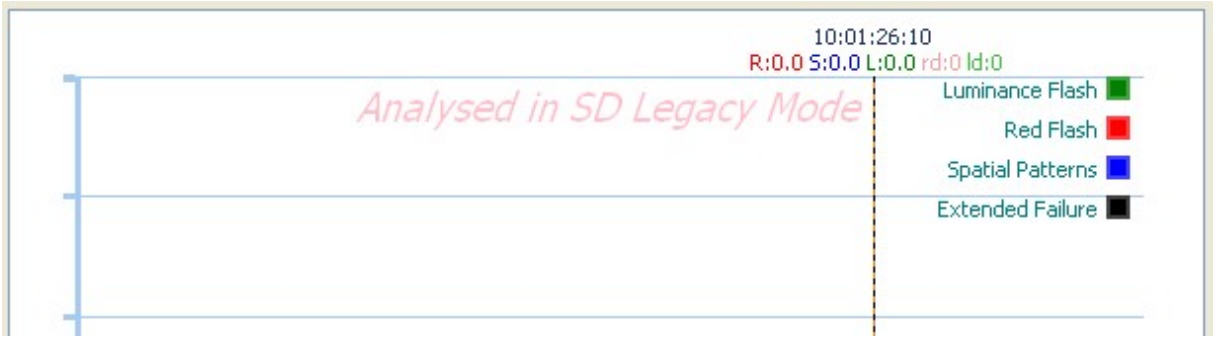
Allowed Source Options provides a way for administrators to *whitelist* the connections and standards that will be provided to the users. Use the arrow buttons to move the options between the Disallowed and Allowed lists.

Analysis Options provides options relating to the actual analysis of video content:

Use SD Legacy Mode switches on *SD Legacy Mode*.

SD Legacy Mode

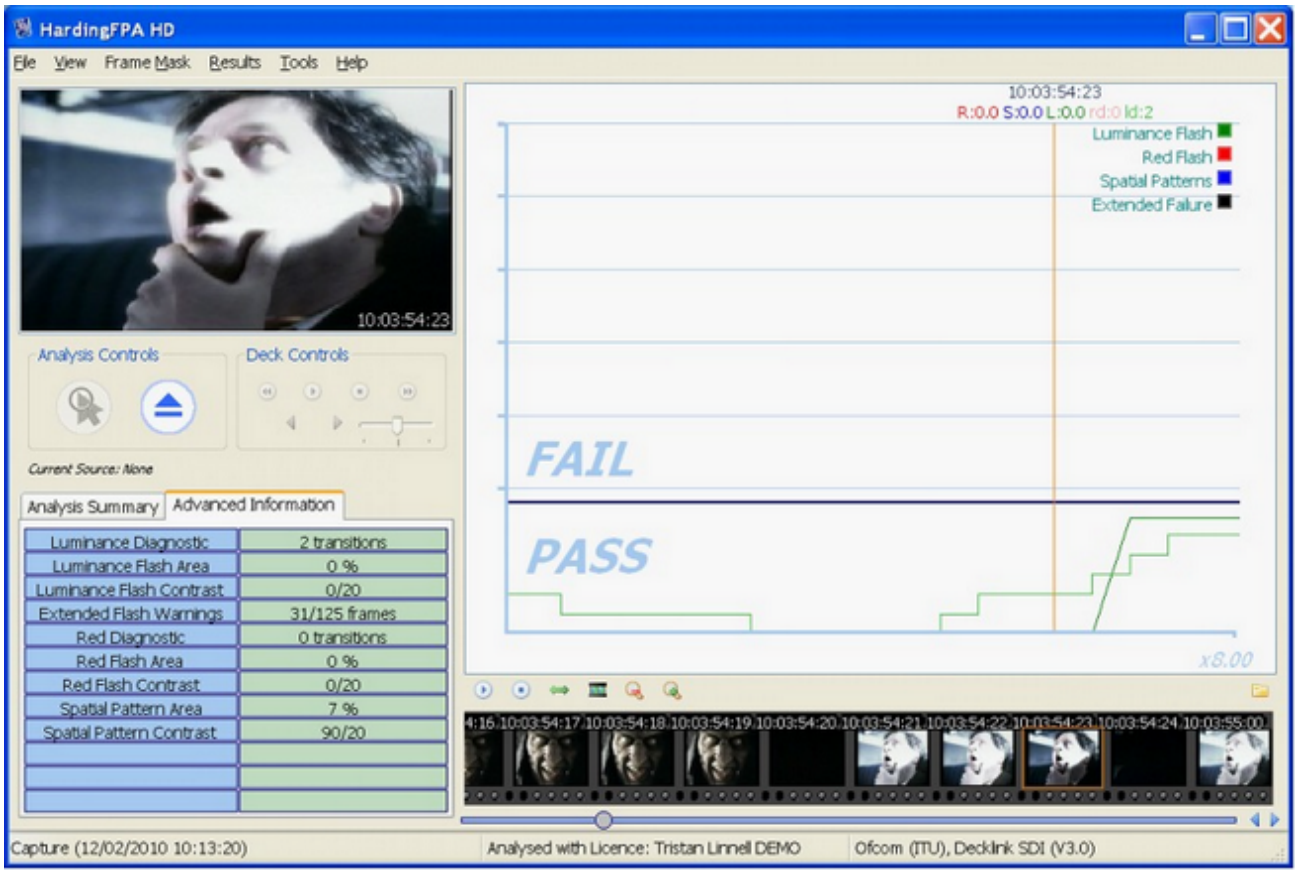
The *HardingFPA HD* has a version 2.5 legacy option for when comparisons with earlier *HardingFPA* analyses are necessary. To select legacy mode, select the *Settings* option on the *Tools* menu (as a Windows administrator user, so that the *Administrator* settings tab is visible), check the box to enable *SD Legacy Mode*, and then close and restart the *HardingFPA HD* application. Please note, Legacy Mode is only available for Standard Definition (SD) video analysis. All HD formats will be analysed with *Version 3 analysis algorithms*. Once the application is restarted, the *HardingFPA HD* will only analyse in legacy mode unless the above change is reversed. The *HardingFPA HD* will indicate legacy mode analysis both in the graph and on any PDF results certificate (see below).



Interpreting Results

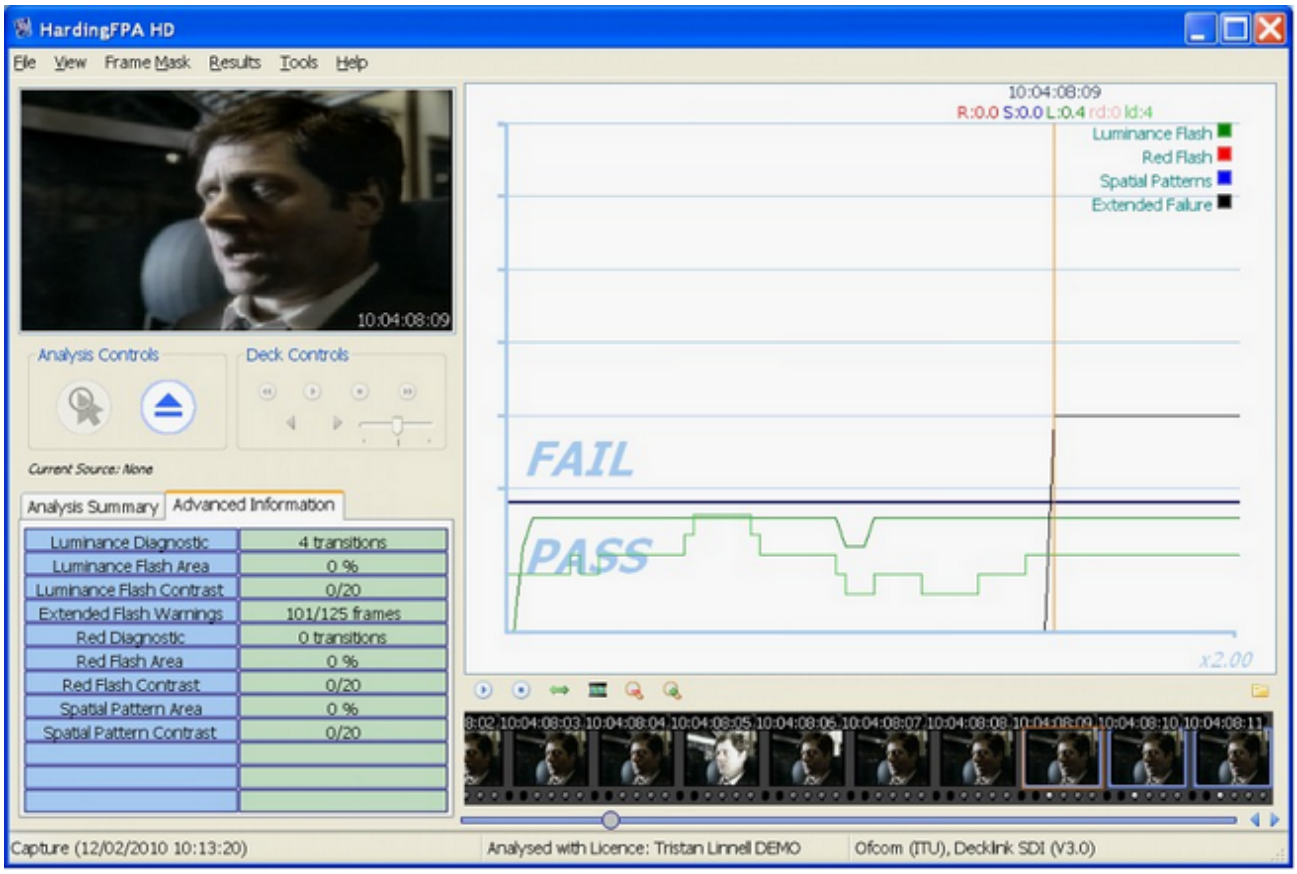
1) A flash occurred but the normal flash risk trace didn't appear – The main flash risk trace (dark green line) may not appear if flashing is less than 20cd/m² in contrast or if the flash frequency is significantly within guideline limits. Remember that 2 opposing transitions make up a single flash.

The example below shows that two transitions have been detected by the diagnostic trace (light green line) but that the main risk trace has not yet appeared because the flash frequency up to this point is not considered to be significant.



(1) Showing a flash but no flash risk trace

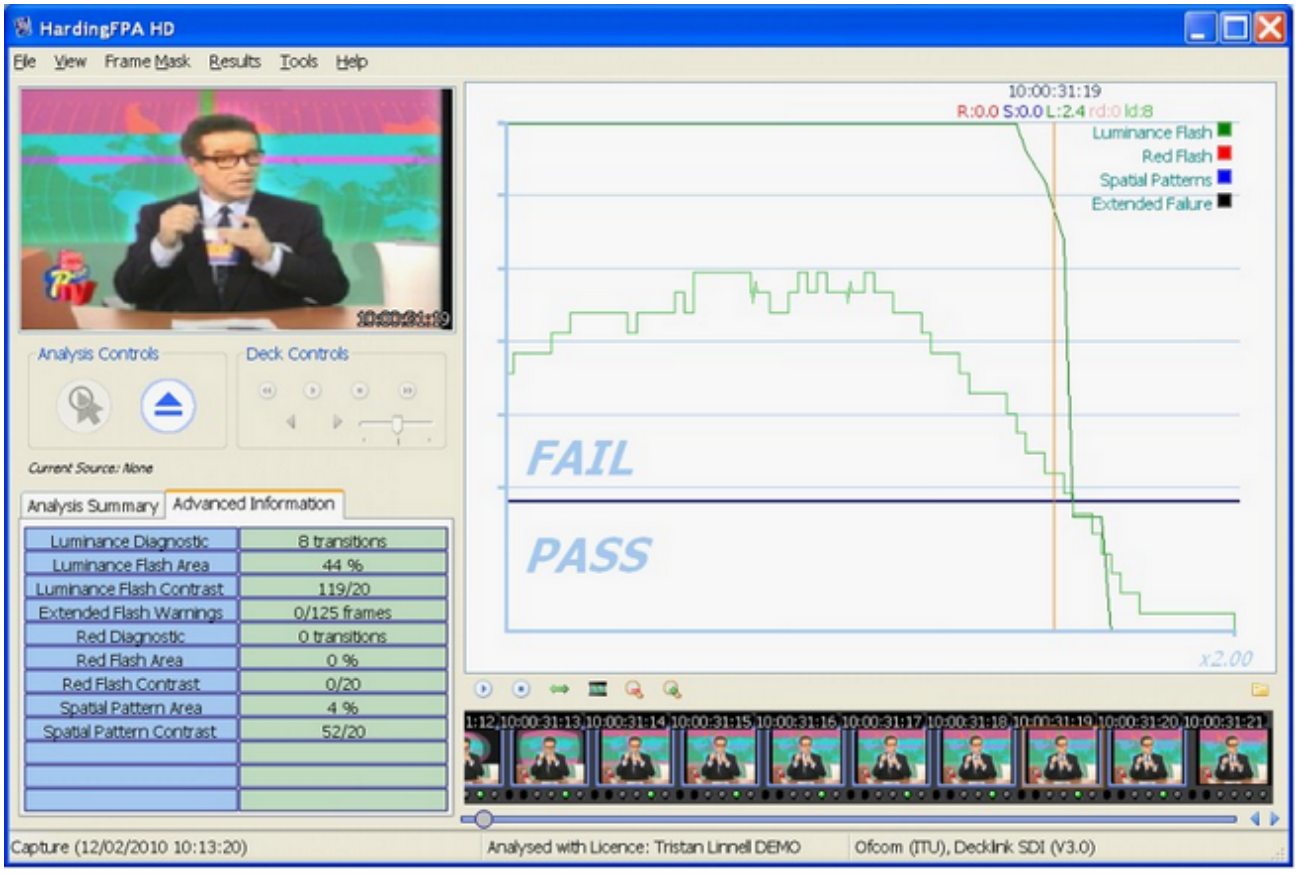
2) The flash risk trace (dark green line) appeared close to the pass-fail limit for a long sequence of images but didn't enter the fail zone – The system has detected flashing of above 3Hz and 20cd/m² in amplitude; but the flash area is less than 25% of the screen area. If the criteria for failure are not all met then the system will generate a line based on how close the material is to failure. If the line is hovering just below the failure line then it might only need a tiny change in size of the flashing area to push it into failure. Such a tiny change could be introduced when converting between formats, frame rates or codecs if this is not done carefully using professional grade codecs.



The example below shows that the flash risk has remained close to the failure line for long enough to generate an extended flash failure. This occurs whenever more than 80% of the frames in the last five seconds generated flash risk warnings of 0.3 or 0.4 (i.e. close to failure).

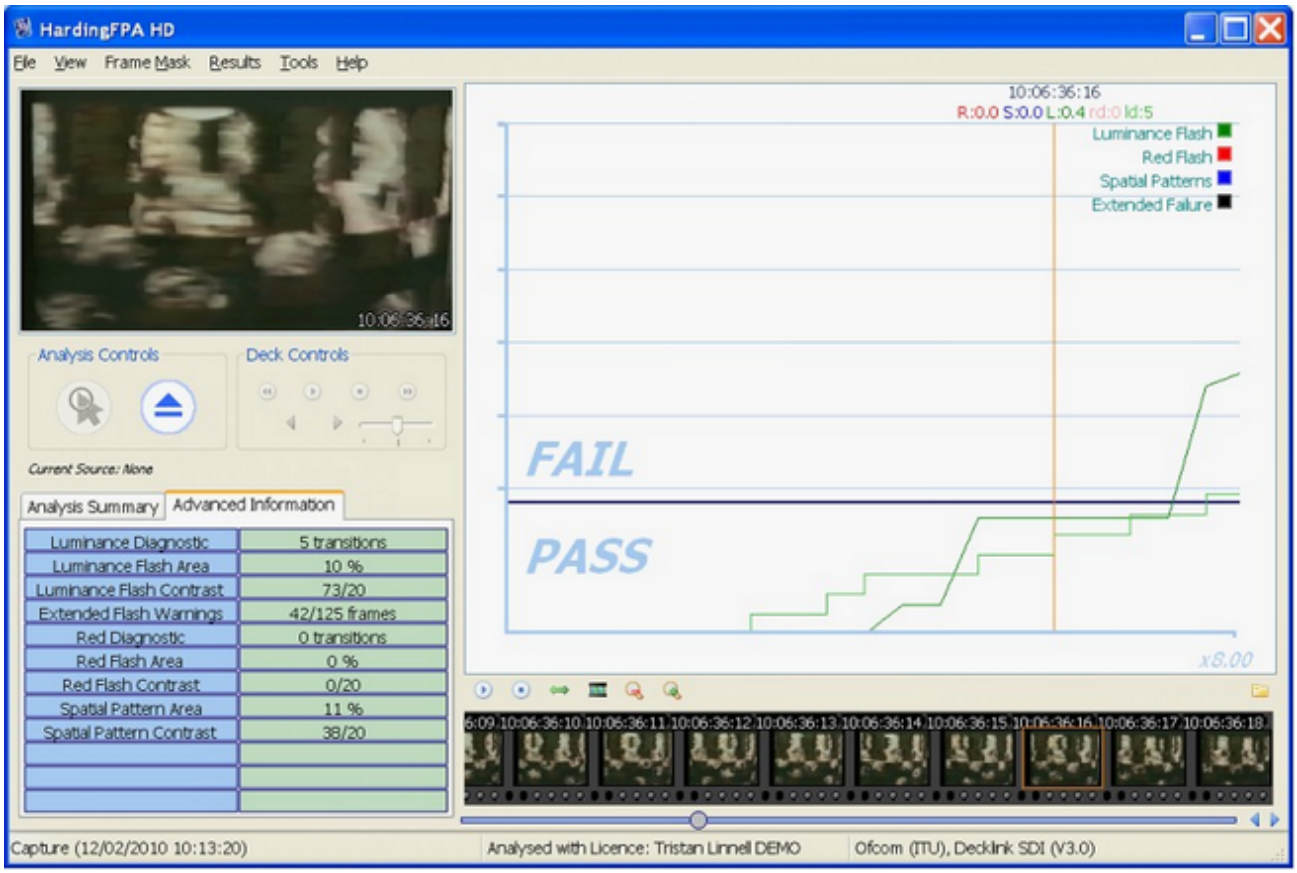
(2) Long sequence of flashing that eventually led to an Extended Flash Failure

3) The flash risk trace (dark green line) persists for several frames *after* a flash occurred – This is perfectly normal, and arises because of the way the system has to detect flashing frequencies over the most recent second. You do not need to worry about the persistence of the flash risk traces, you need to principally examine the second before the line moves into failure, or where the diagnostics trace shows that the transition count is still rising. Once you have corrected all the causes of the line first moving into failure then the material at that point will pass the test. Note, however that lots of flashing close together will generate a much longer compound failure: the best thing to do is deal with the flashes one at a time until the material passes the test.



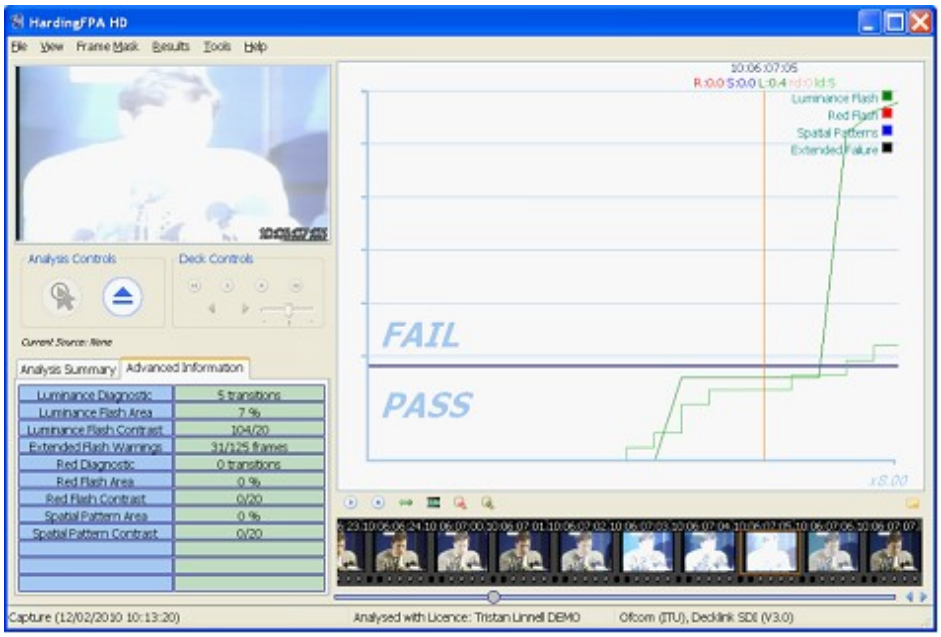
(3) Flash graph persisting after the flash.

4) The diagnostic transition count increased where no obvious flash had occurred – The diagnostic trace represents the number of transitions seen by the most active 25% of the screen over the most recent second. Therefore continuous image activity (e.g. localised flashing and rapid movement within the scene caused by camera pan or zoom etc) can steadily increase the number of transitions that individual pixels have seen, and when at least 25% of those have seen an extra transition will the diagnostic count increase. This can be quite tricky material to fix, and may only be possible by reducing the brightness of the image or cut down on the whole area.



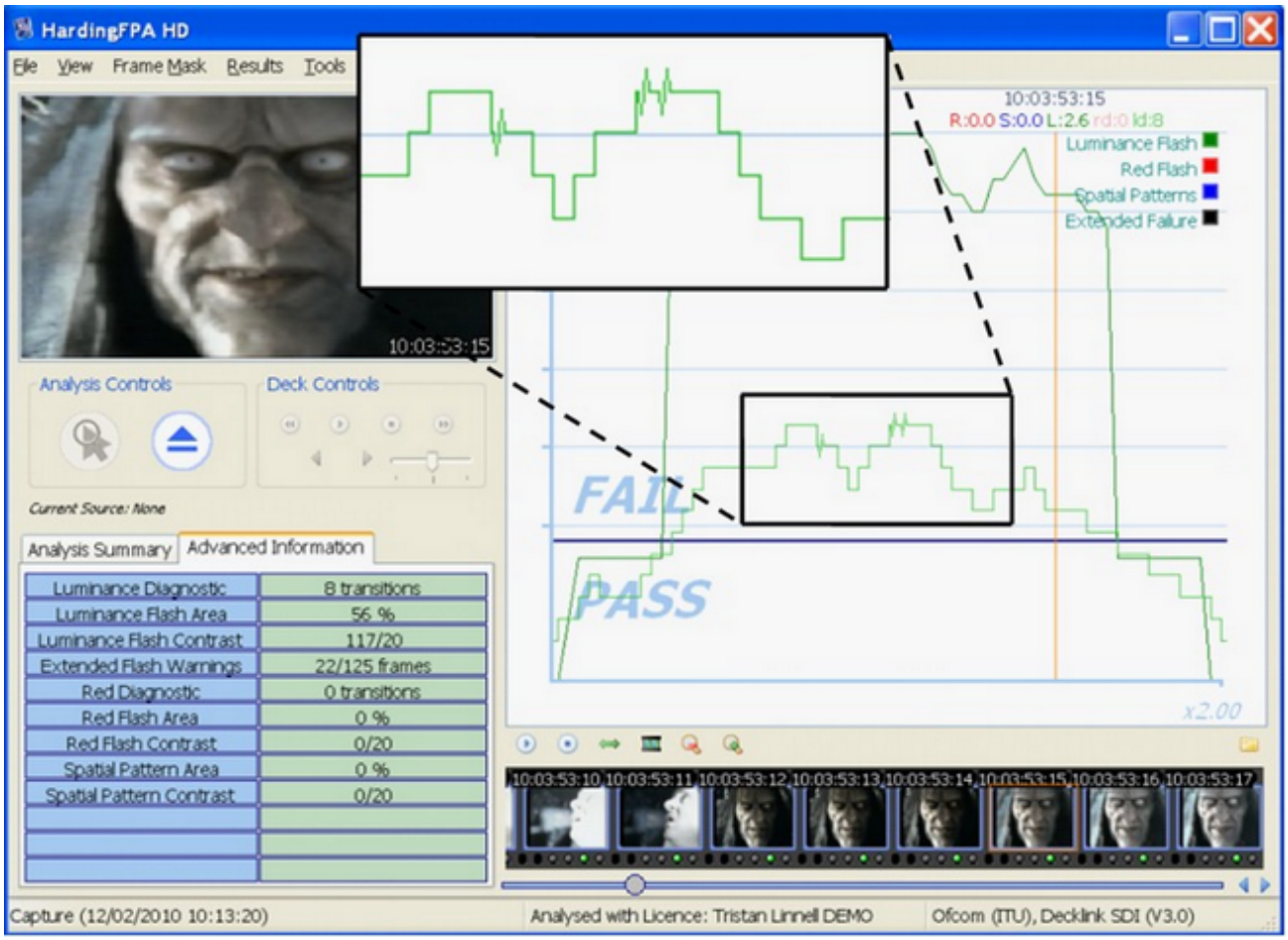
(4) Transition count (light green trace) increased without an obvious transition

5) A flash clearly occurred but the diagnostic trace didn't increase – The diagnostic trace shows the number of transitions seen in the last second of material, and transitions older than that will be discarded. This means that the diagnostic count may not always coincide with an obvious flash. For example, a visible transition in an image may not lead to a higher transition count if the pixels that see the transition are not part of the most active 25%.

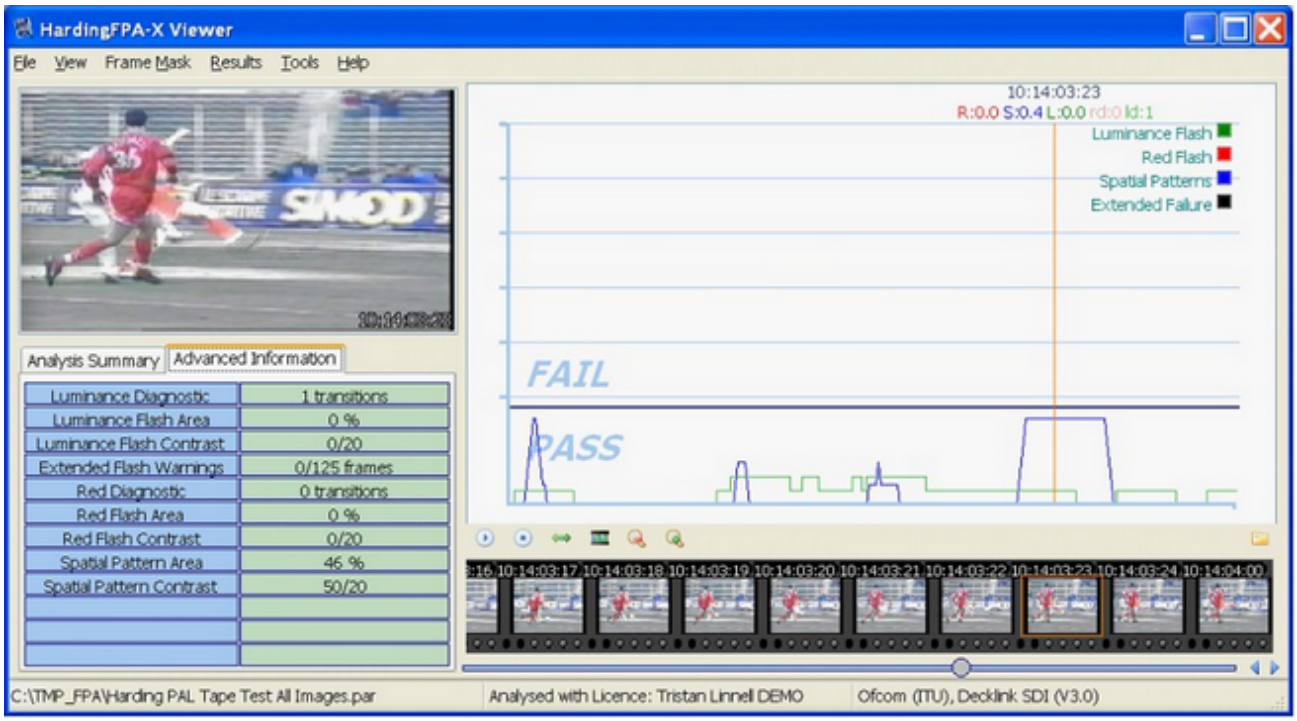


(5) A flash clearly occurred but the diagnostic trace hasn't increased.

Alternatively, an incoming transition may coincide with an outgoing transition from one exactly second earlier. When this occurs, the new version 3 analyser inserts a *squiggle* (see picture with inset) to indicate that the diagnostic trace has simultaneously gained and lost a transition over the most recent second between video frames.

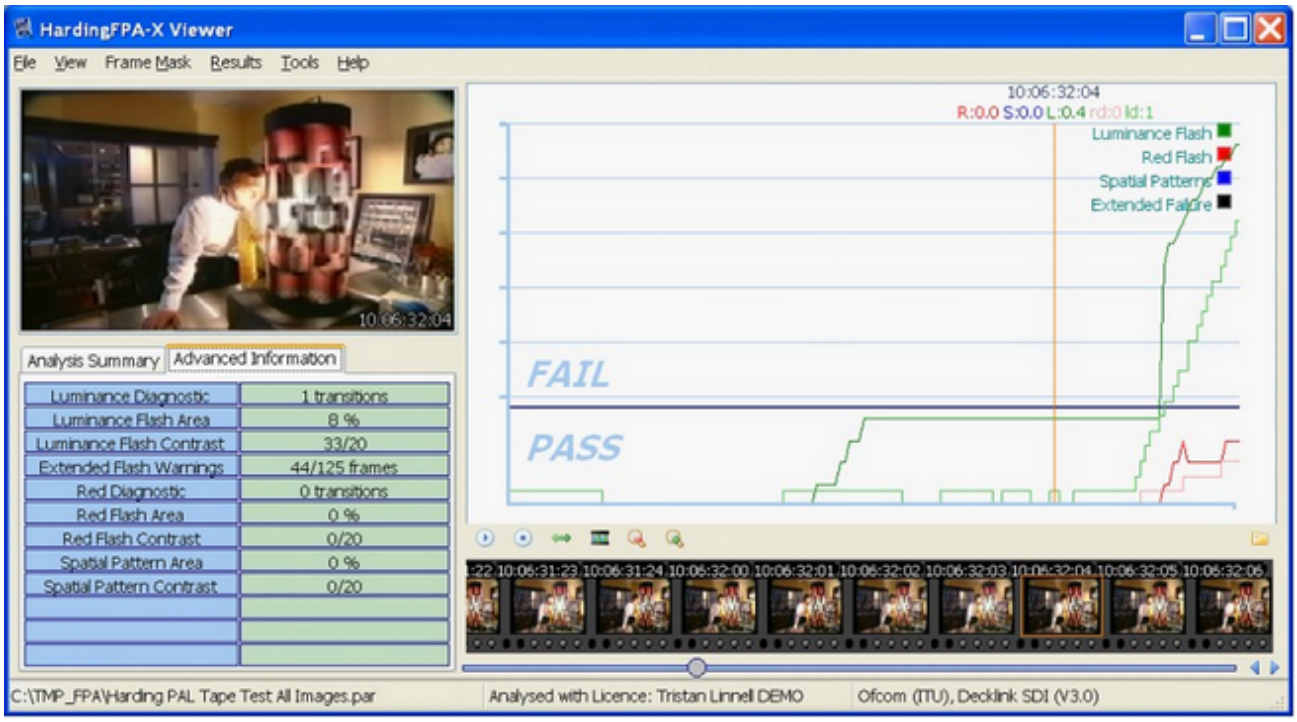


6) The spatial pattern trace remains in the pass zone even though the detected spatial pattern exceeds contrast and screen area limits – A number of limits have to be exceeded before a detected spatial pattern can generate a failure. The Advanced Information tab in the example below shows that a spatial pattern has been detected with 50 cd/m^2 contrast (limit 20 cd/m^2) and covers 46% screen area (limit 40%). However, in this example, the system has not generated a failure because motion, caused by the camera pan and zoom, makes the detected spatial pattern exempt from failure under Ofcom rules.



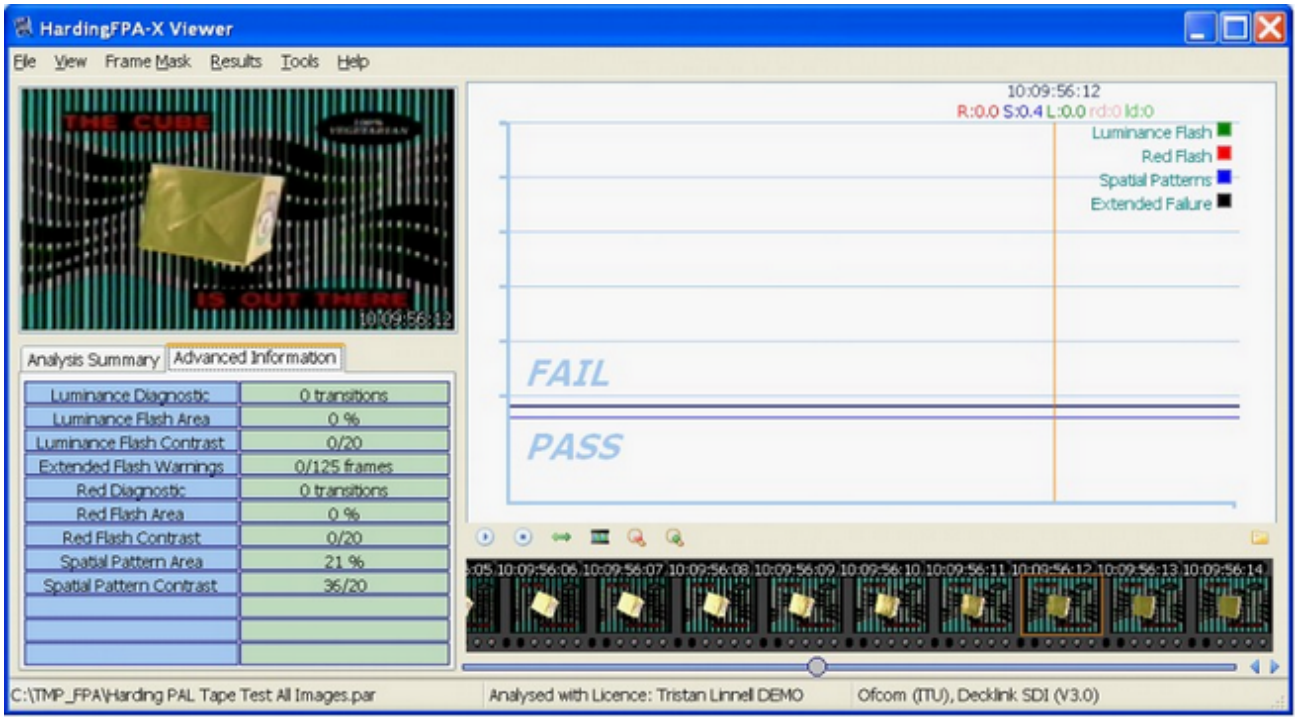
7) The diagnostic trace decreased within a few frames after it had increased. Shouldn't it have taken one second for the transition to flush out? -- Not necessarily. It is true that the diagnostic trace monitors transitions over the most recent second but the most active pixels that determine this diagnostic count are, in most cases, constantly changing. The diagnostic trace will only follow this one-second pattern if the most active pixels are changing together in phase.

The example below shows the diagnostic trace (light green) increasing from zero to one for a period of only two frames (around the vertical amber current frame line) before returning to zero.

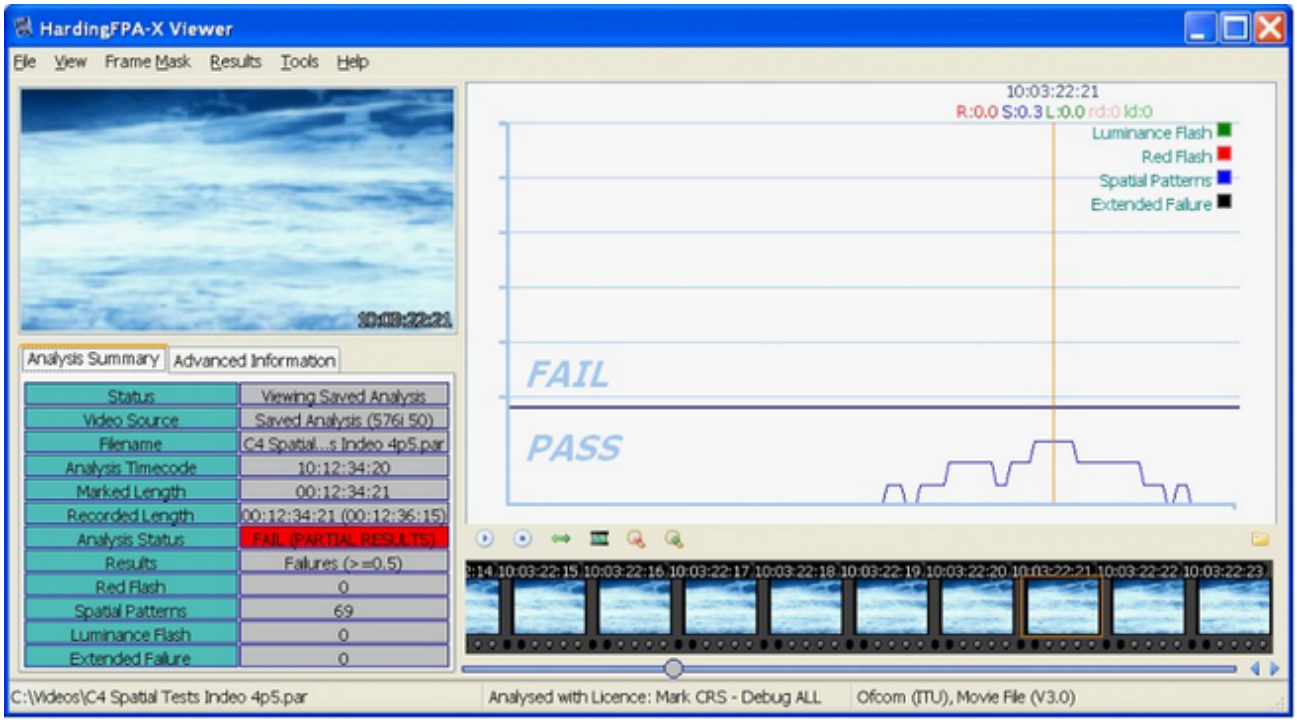


8) The system passes a stationary pattern that looks as though it should have failed – Some patterns that are clearly bar-like in one direction may also possess some local structure in the orthogonal direction. Alternatively, a pattern may not be sufficiently regular or may not have sufficient contrast throughout. Any such structure may cause the system to see fewer than 6 light-dark bars or may separate a provocative pattern into two or more regions. Either of these mechanisms can save a provocative pattern that would otherwise have failed.

The spatial pattern in the example below passes because of text and foreground objects which break up the bar-like pattern into smaller irregular regions.



9) The analyser generates spatial warnings but it's not obvious where the pattern is! – Occasionally the spatial trace may appear when there is no obvious spatial pattern present in the video stream. The example below shows a picture of the sea generating spatial warnings caused by waves in perspective creating faint, repeating structure. Other candidates for generating unexpected spatial responses are: landscape in perspective, net curtains and reams of paper. However, it is highly unlikely that any of these scenes would actually lead to a spatial pattern failure.



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Version 2.1, February 1999

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If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library

creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

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a) Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

c) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

e) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

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