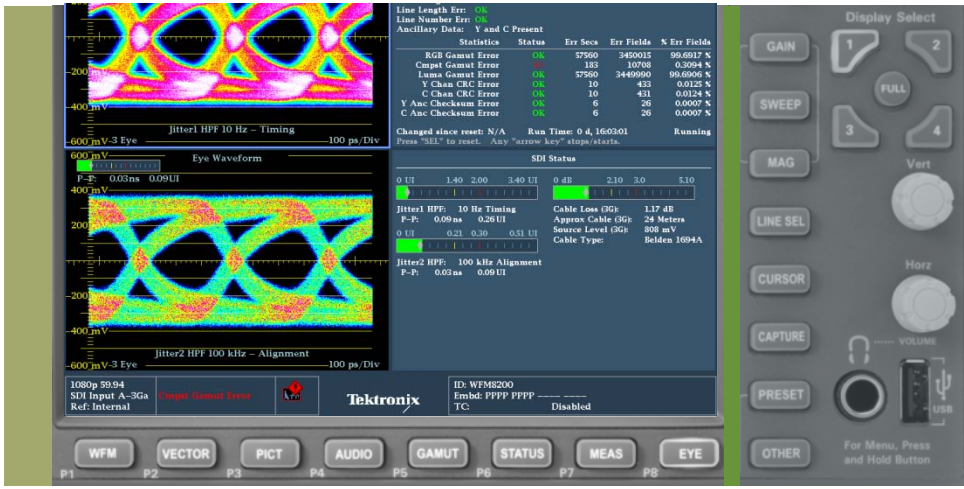
3G-SDI 與畫質評估的新技術



William Wu

Video Product Manager

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Agenda

- 3Gb/s SDI Standards and Measurement
- Physical Layer Eye and Jitter Measurements
- Why Picture Quality Analysis
- Picture quality case study

Hybrid Facility

Picture Formats	Sampling Structures	Physical Layer	Transmission Media
2048X1080	12-bit	3Gb/s SMPTE 424M	Blu-Ray
1920X1080	4:4:4:4	Dual Link SMPTE 372M	HD
1280X720	RGB(A)	1.5Gb/s SMPTE 292M	SD
720X480	RGB	270Mb/s	DVD
720X576	YCbCr	Physical Layer Cable Type Termination Inter-Connections	
	4:2:2		
	10-bit		

Dual Link Format SMPTE 372M

- Using existing HD-SDI infrastructure
- Requires two signal paths
  - Link A & Link B
- SMPTE 352M to identify links
- Mapping various formats into existing HD-SDI structure

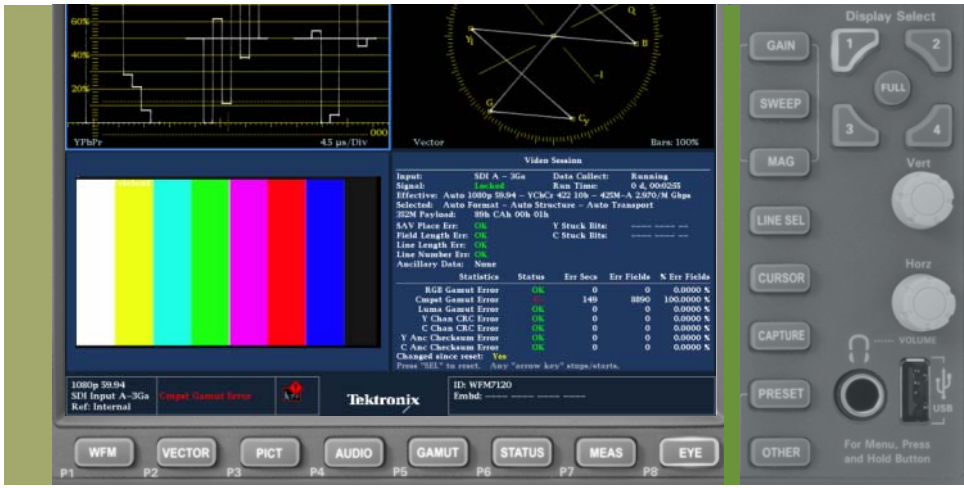
- Problems
- Interconnection issues
  - Swapped or Missing links
- Cable Path different for each Link

Signal Format Sampling Structure / Pixel Depth	Frame/ Field Rate
4:2:2 (Y'C'bC'r) / 10-bit	60, 60/1.001 & 50 P
4:4:4 (R'G'B') 4:4:4:4 (R'G'B' + A) / 10-bit	30. 30/1.001, 25, 24 & 24/1.001, P, PsF 60, 60/1.001 & 50 fields interlaced
4:4:4 (R'G'B') / 12-bit	
4:4:4 (Y'C'bC'r) 4:4:4:4 (Y'C'bC'r + A) / 10-bit	
4:4:4 (Y'C'bC'r) / 12-bit	
4:2:2 (Y'C'bC'r) / 12-bit	

Why 3Gb/s SDI and High Speed Data?

- Work at the highest resolution (Bit Depth and Colorspace) possible prior to rendering the product.
- In standard HD-SDI limited to 4:2:2 YCbCr only at 10-bit
- With Dual Link & 3Gb/s, users can:
  - Increase color range from 10 bits to 12 bits
  - Switch from 4:2:2 to 4:4:4 Sampling to the total chrominance Bandwidth
  - Work in the RGB domain for easier integration with Special Effects editors, and Telecine applications
- Digital cinema cameras now being adopted for feature films, television shows, and even commercials
  - Panavision Genesis™
    - Attack of the Clones, Revenge of the Sith, Apocalypto, …
  - Thomson Viper FilmStream™

3Gb/s SDI Standard



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SMPTE424M Signal/Data Serial Interface

- Defines the transport of bit-serial data structure for 3.0Gb/s
- Using a single coaxial cable interface
- Supports either 10 or 12 bits data words
- Mapped into two virtual interfaces
  - 10 bit parallel data streams (Data Stream One & Data Stream Two)

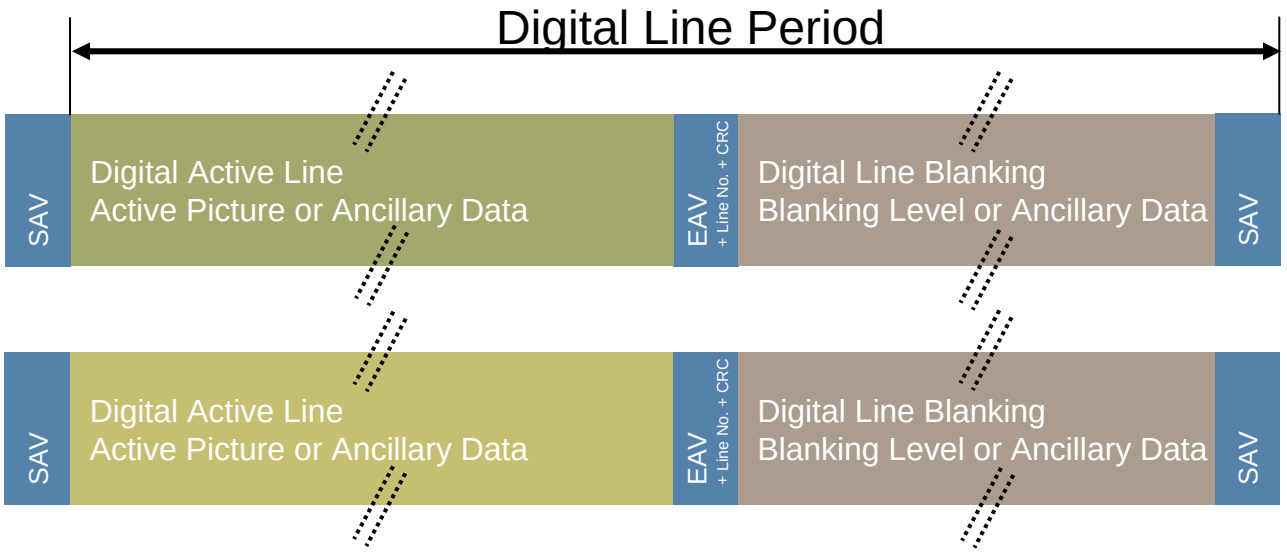


Image Structure

- Example of image mapping structure for 4:2:2 YCbCr 10 bits 60/59.94

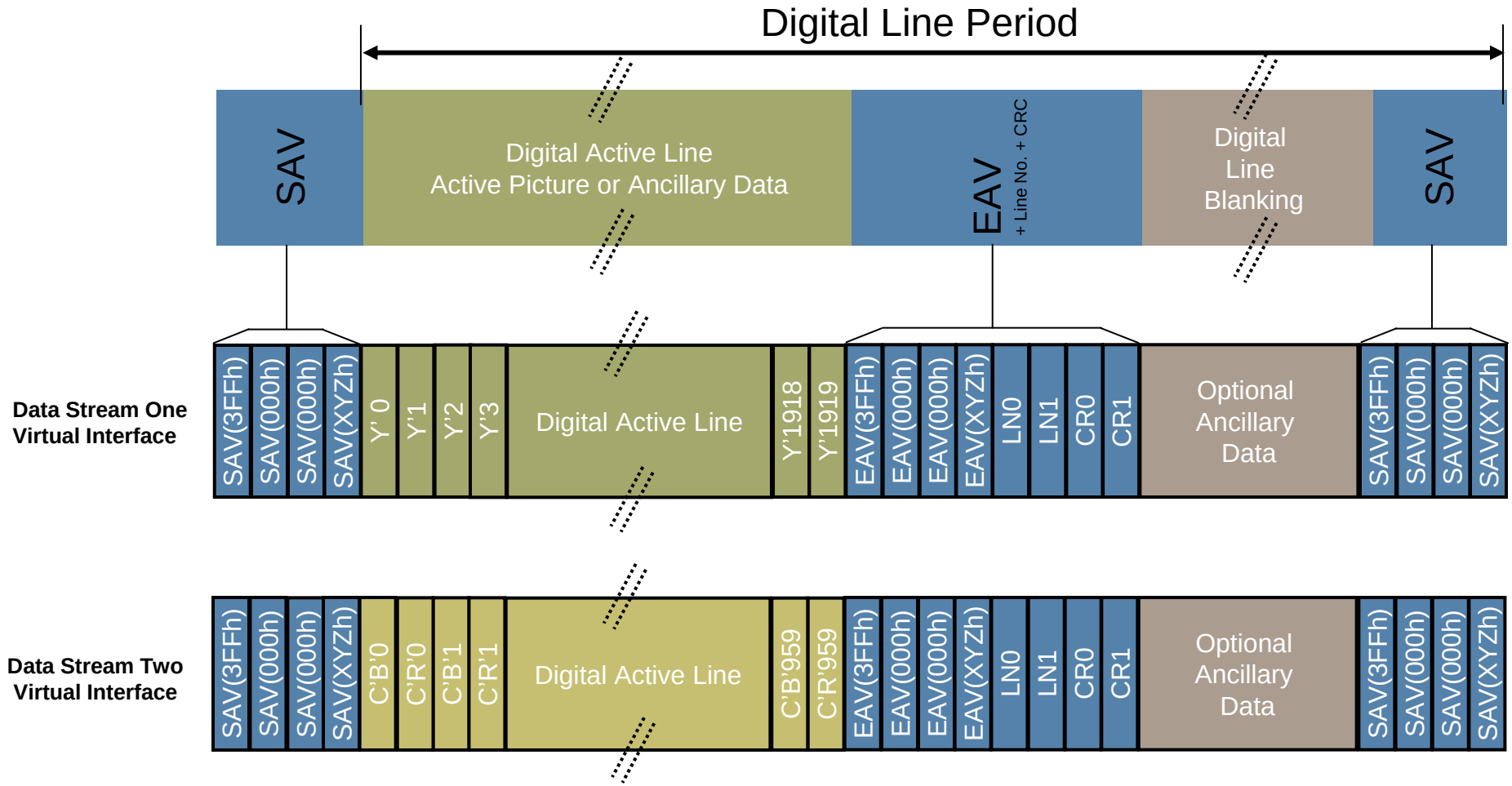


Image Structure Multiplexed

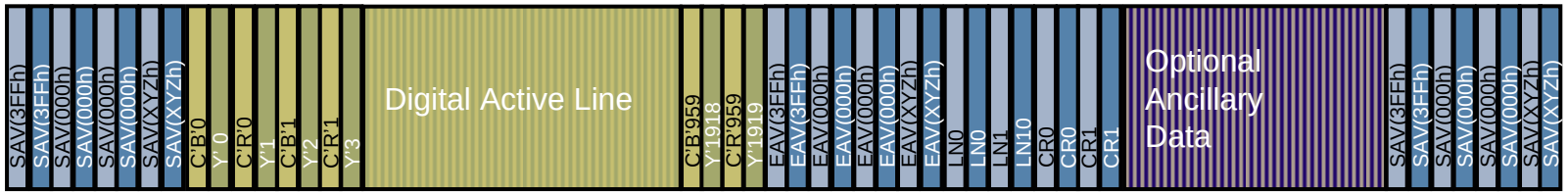
- Data Stream one and two of the virtual interfaced are multiplexed together producing twice the data rate
- Channel Coding uses NRZI

$$G_1(X) = X9 + X4 + 1.$$
$$G_2(X) = X + 1.$$

Data Stream One Virtual Interface

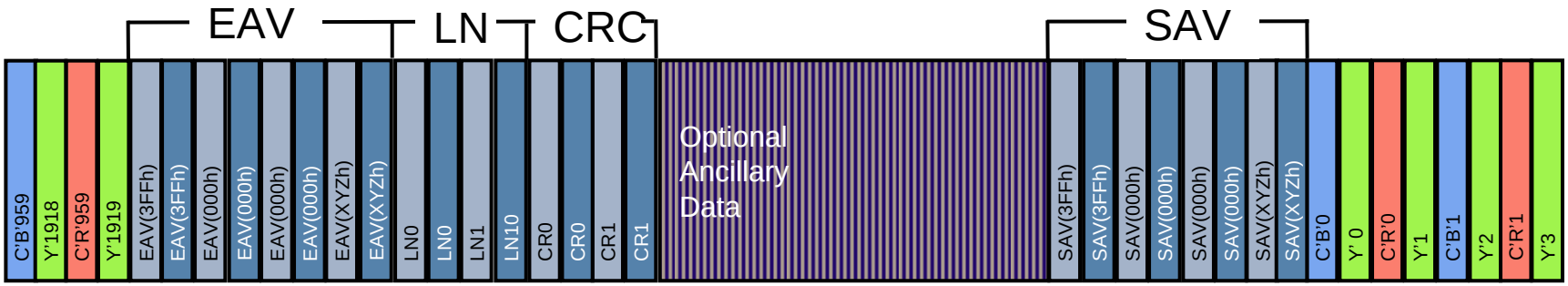
Data Stream Two Virtual Interface

Multiplexed 10-bit Parallel interface



Mapping 2x SMPTE 292 HD-SDI Level B

- Mapping of two parallel 10 bit interfaces with same line and frame structure in conformance with SMPTE292.



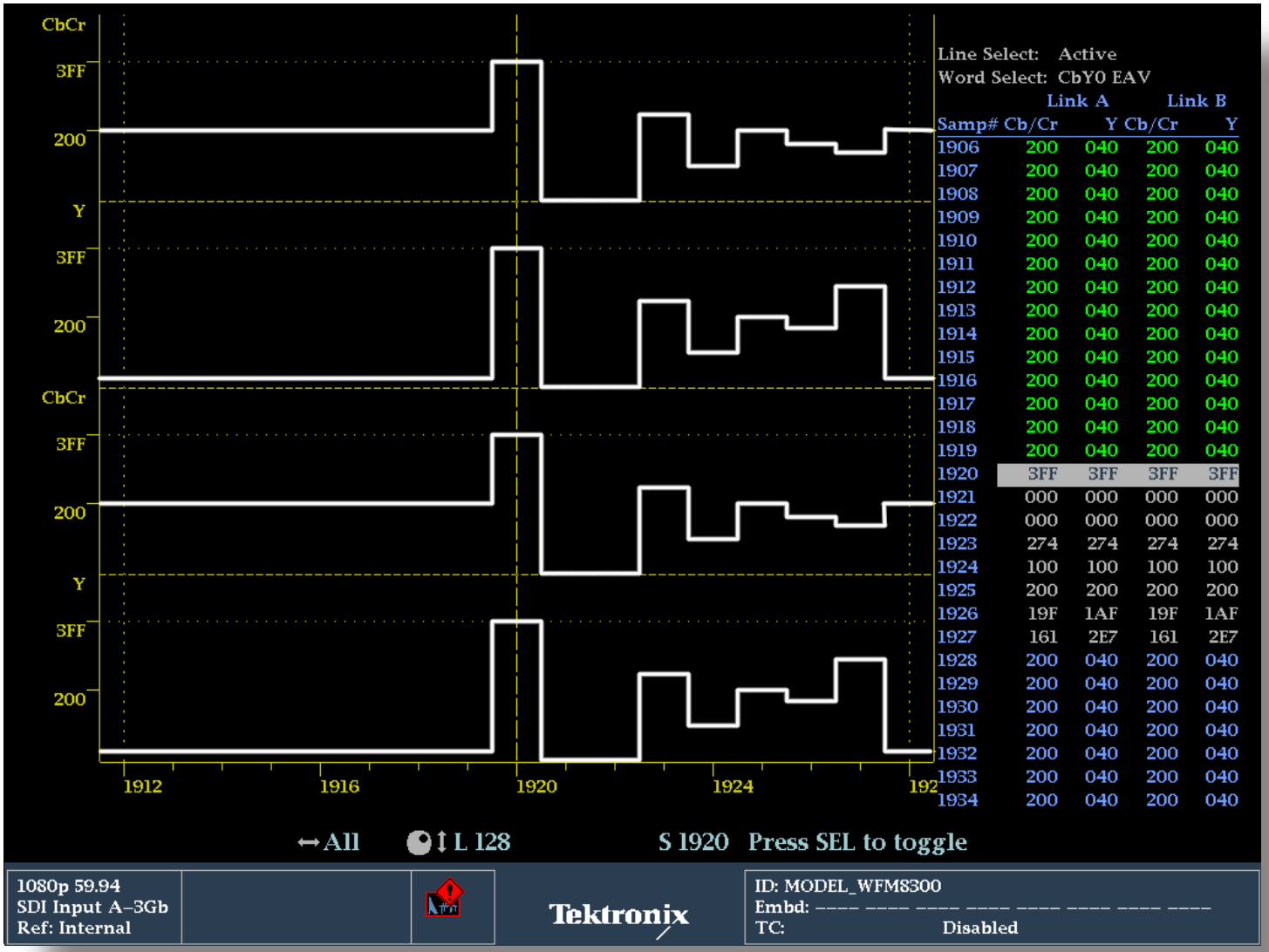
10-bit multiplex in accordance with SMPTE 292M

Interface clock frequency 148.5MHz or 148.5MHz/1.001 MHz

- Payload Identifier

Mapping Nomenclature	Byte 1 Video payload and digital interface
SMPTE 372M Dual link payload on a 3 Gb/s serial digital interface	8Ah
2 x720-line video payload on a 3 Gb/s serial digital interface	8Bh
2 x1080-line video payload on a 3 Gb/s serial digital interface	8Ch
2 x483/576-line video payload on a 3 Gb/s serial digital interface	8Dh

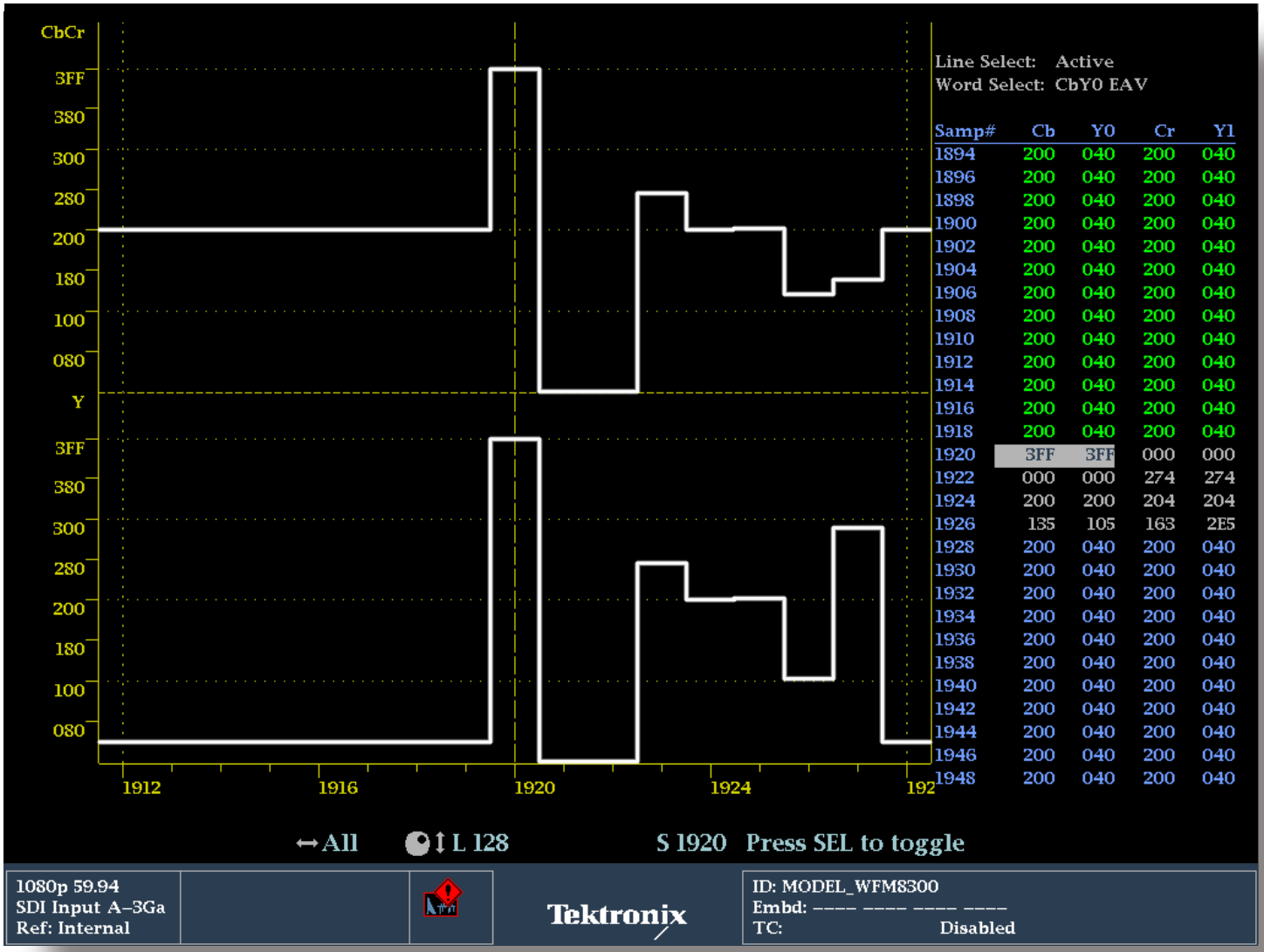
3Gb/s Level B Mapping of SMPTE 372M Dual Link



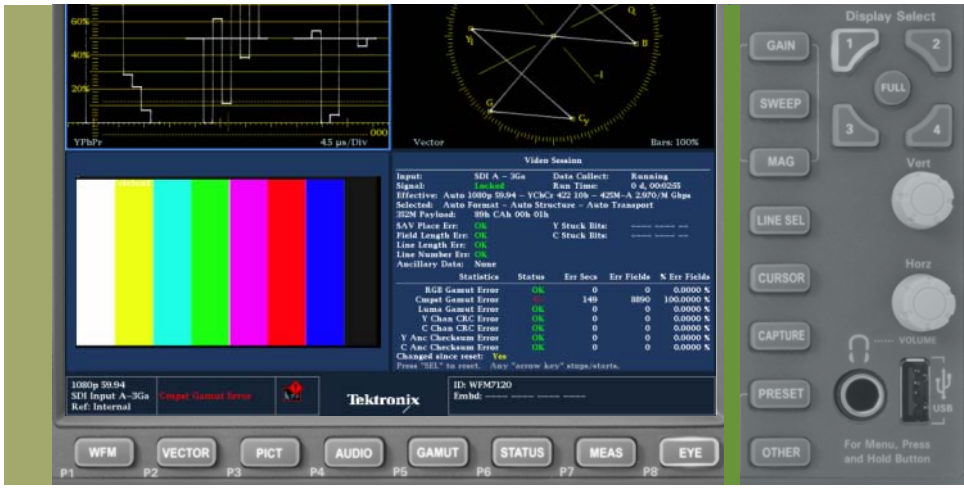
SMPTE425M Signal/Data Serial Interface Source Image Format (Level A)

Mapping structure	Reference SMPTE Standard	Picture Format	Signal Format sampling structure/pixel Depth	Frame/Field Rates
1	274M	1920 × 1080	4:2:2 (Y'C'$_B$C'$_R$)/10-bit	60, 60/1.001 and 50 Frames Progressive
2	296M	1280 x 720	4:4:4 (R'G'B'), 4:4:4:4 (R'G'B' +A)/10-bit	60, 60/1.001 and 50 Frames Progressive 30, 30/1.001, 25, 24 and 24/1.001 Frames Progressive
			4:4:4 (Y'C'$_B$C'$_R$), 4:4:4:4 (Y'C'$_B$C'$_R$+A)/10-bit	
	274M	1920 x 1080	4:4:4 (R'G'B'), 4:4:4:4 (R'G'B' +A)/10-bit	60, 60/1.001 and 50 Fields Interlaced 30, 30/1.001, 25, 24 and 24/1.001 Frames Progressive
			4:4:4 (Y'C'$_B$C'$_R$), 4:4:4:4 (Y'C'$_B$C'$_R$+A)/10-bit	
3	274M	1920 x 1080	4:4:4 (R'G'B')/12-bit	60, 60/1.001 and 50 Fields Interlaced 30, 30/1.001, 25, 24 and 24/1.001 Frames Progressive
			4:4:4 (Y'C'$_B$C'$_R$)/12-bit	
	428	2048 × 1080	4:4:4 (X'Y'Z')/12-bit	24 Frames Progressive, PsF
4	274M	1920 x 1080	4:2:2 (Y'C'$_B$C'$_R$)/12-bit	30, 30/1.001, 25, 24 and 24/1.001 Frames Progressive 60, 60/1.001 and 50 Fields Interlaced

3Gb/s Level A Mapping Structure 1
YPbPr 4:2:2 1080P 50, 59.94, 60



3Gb/s Physical Layer Measurements



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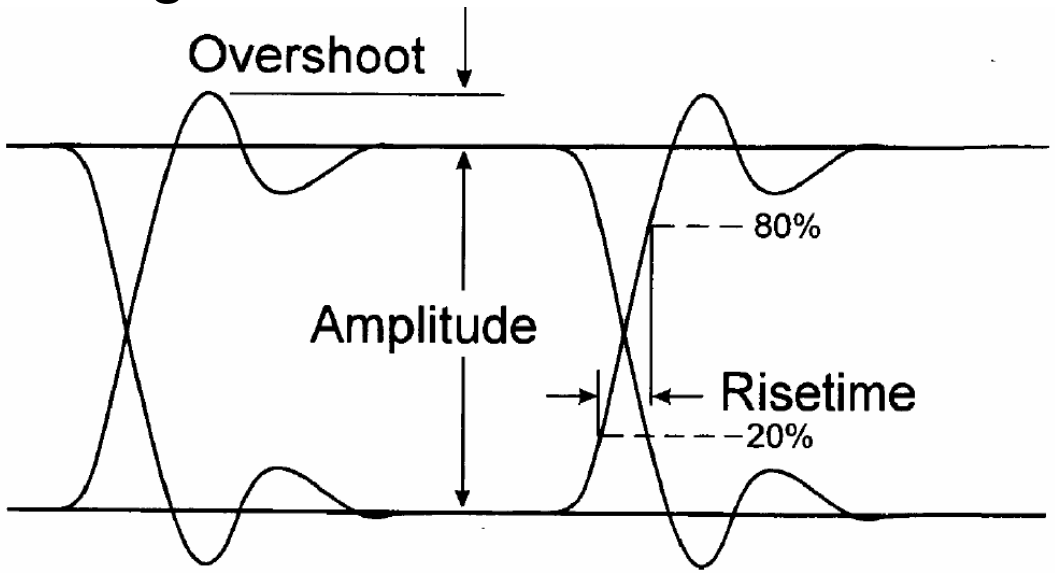
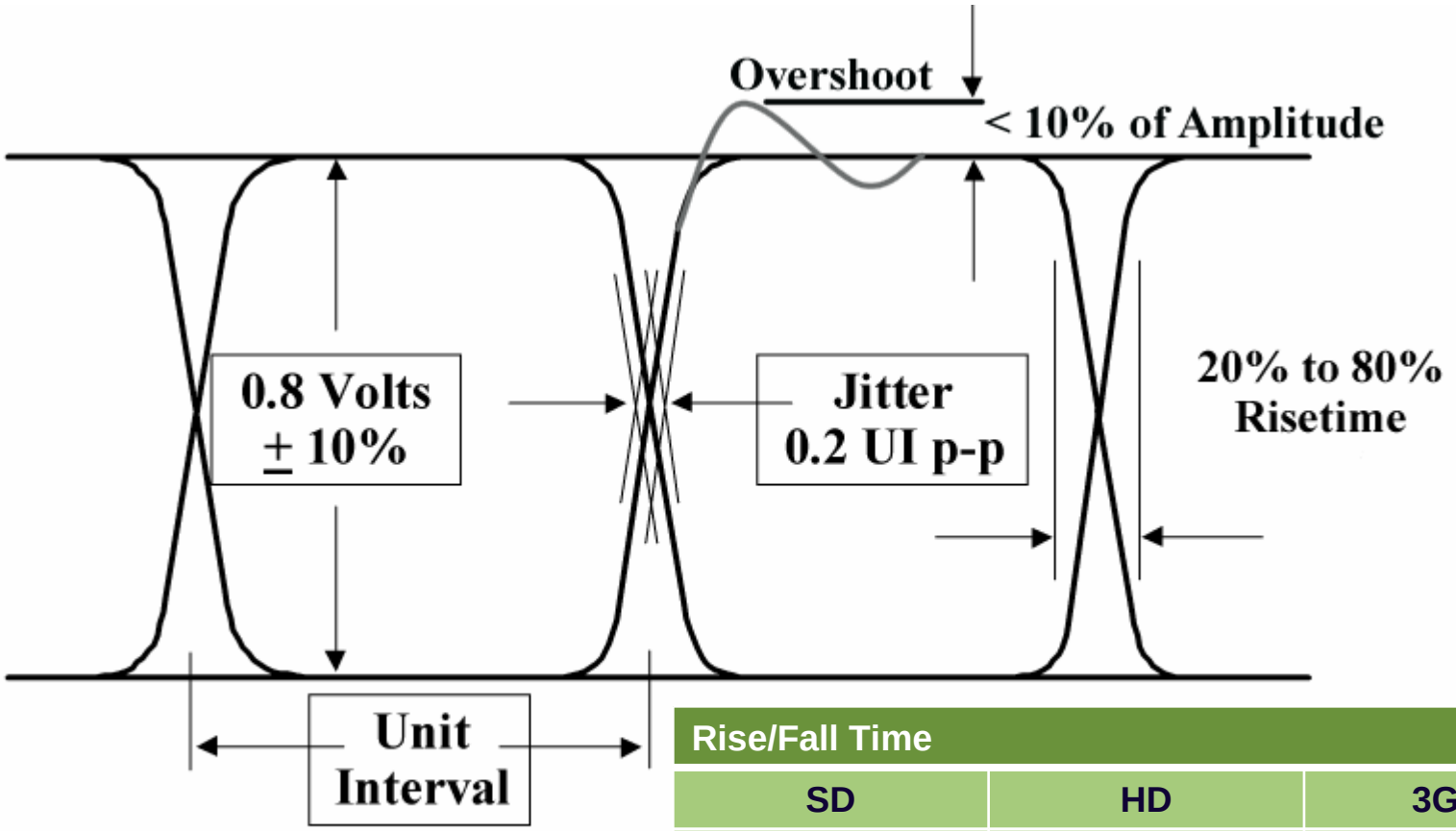
3Gb/s Serial Digital Interface



- Pk-to-Pk Amplitude 800mV +/- 10%
- DC Offset 0.0V +/- 0.5V
- Rise/Fall Time between 20% & 80% no greater than 135ps and not differ by more than 50ps
- Overshoot rise/fall not to exceed 10% of amplitude
- Timing Jitter <= 2UI above 10Hz
- Alignment Jitter <= 0.3UI above 100kHz

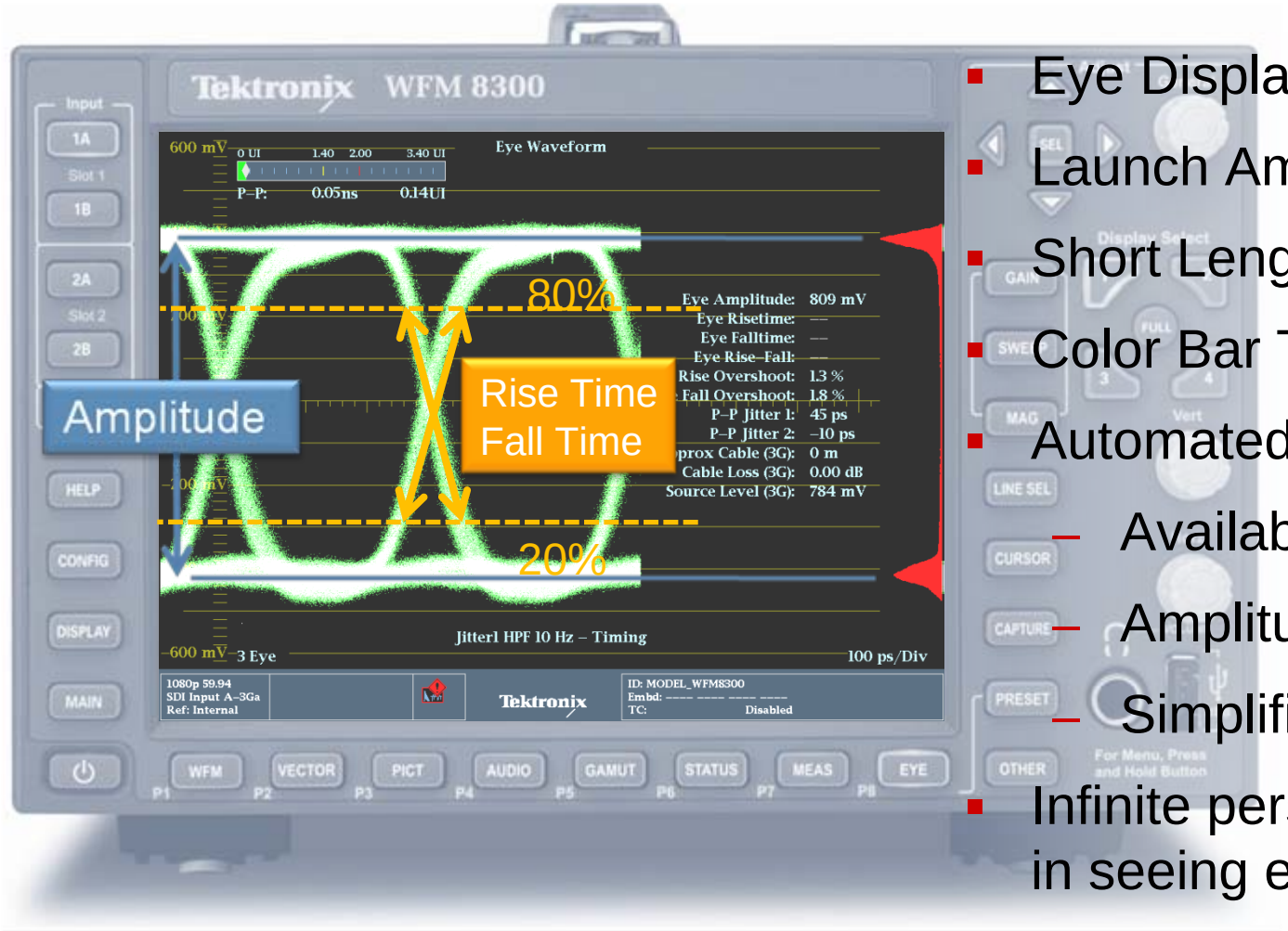
Eye Specifications per SMPTE Standards



Unit Interval		
SD (259M)	HD (292M)	3Gb/s (424M)
3.7ns	673.4ps	336.7ps

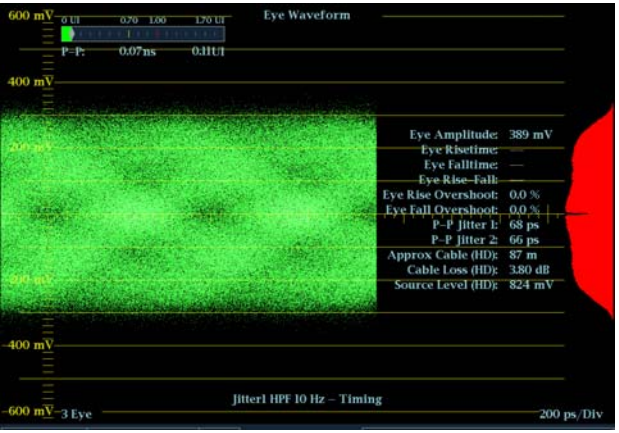
Rise/Fall Time		
SD	HD	3Gb/s
Shall be no less than 0.4ns, no greater than 1.50ns, and shall not differ by more than 0.5ns	Shall be no greater than 270ps and shall not differ by more than 100ps	Shall be no greater than 135ps and shall not differ by more than 50ps

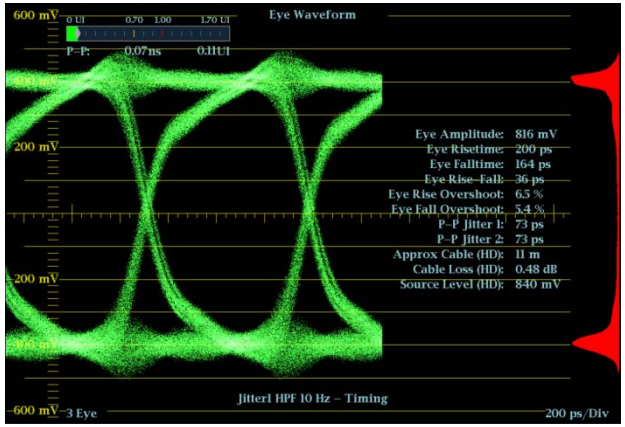
How to Make Eye Measurement

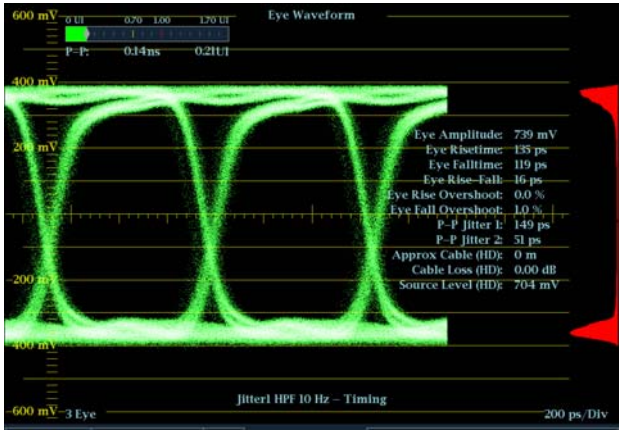


- Eye Display
- Launch Amplitude
- Short Length of Cable
- Color Bar Test Signal
- Automated Measurements
  - Available on WM8300
  - Amplitude Histogram
  - Simplifies The Task
- Infinite persistence can aid in seeing eye opening

Eye Pattern Distortions







Long cable

- Decrease in amplitude
- Decrease in Frequency response
- Eye opening narrows
- Rise/Fall time increases

Termination

- Incorrect termination causes overshoot and undershoot

Shift in Eye Crossing

- Shifts 50% point of eye opening
- Caused by unequal rise or fall time

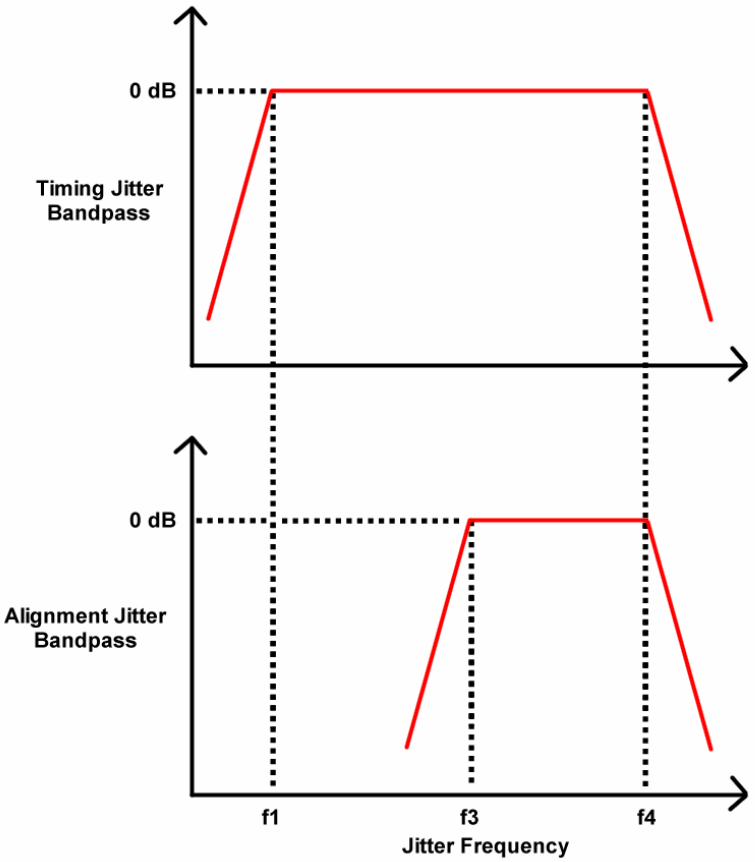
Jitter Measurements

- Timing Jitter

Timing Jitter (10Hz)		
SD	**HD**	**3Gb/s**
0.2UI (740ps)	1.0UI (673.4ps @ 1.485Gb/s) (674ps @ 1.4835Gb/s)	2.0UI (673.4ps @ 2.97Gb/s) (674ps @ 2.967Gb/s)

- Alignment Jitter

Alignment Jitter		
SD	HD	3Gb/s
0.2UI (740ps) @ 1kHz	0.2UI (135ps) @ 100kHz	0.3UI (101ps) @ 100kHz Maximum Preferred 0.2UI (67.3ps) @ 100kHz



How to Make Jitter Measurements

- Jitter Meter shows direct readout
- Ability to measure Timing and Alignment jitter simultaneously
- Jitter waveform show variation of signal related to line and field rate of video signal

WFM8300

- **Video Monitoring Standards and Formats**
  - 3 Gb/s SDI (Level A and Level B) – Option 3G
  - Dual Link SMPTE372M– Standard
  - High Definition SDI – Standard
  - Standard Definition SDI – Standard
  - Composite Analog Video – Option CPS
- **Color Gamut Monitoring**
  - Arrowhead Display – Standard
  - Diamond and Split Diamond Displays – Standard
  - Spearhead Display – Option PROD
  - Luma Qualified Vector (LQV™) – Option PROD
- **Audio Monitoring Standards and Formats**
  - Analog, Digital AES/EBU, Digital Embedded – Option AD
  - Analog & Dolby Digital and Dolby E – Option DDE
- **Measurement and Analysis**
  - Eye Pattern & *Jitter Waveform Measurements* – Option PHY
  - *Color Bar & Pathological Signal Generation – Option PHY*
  - *Digital Data Analysis – Standard*
  - *ANC Data Inspector – Standard*
  - *Simultaneous Input Monitoring – Standard*
  - *Audio / Video Delay Measurement – Standard*

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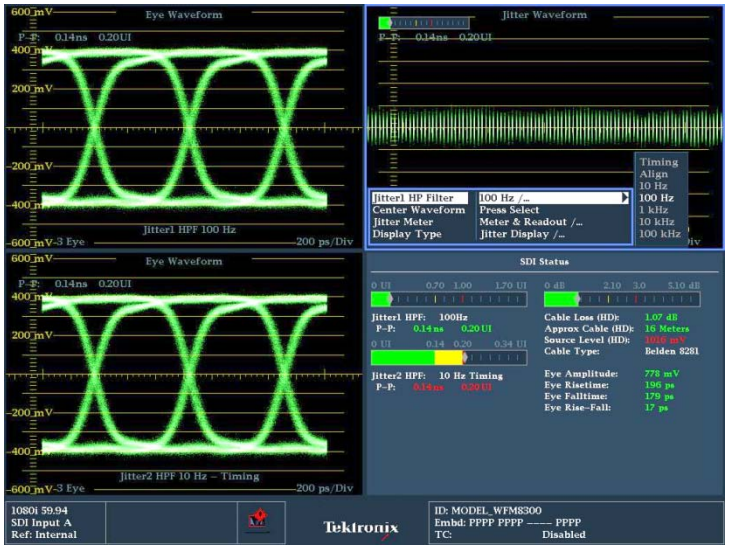
Physical Layer Measurements

- **Reliable measurements prevent digital transmission problems**
  - Tektronix provides top performance for physical layer measurements
  - Advanced jitter analysis includes jitter waveform display and automatic measurement of eye parameters
  - Jitter filters facilitate the tracing of signal interference sources
  - Simultaneous view Timing and Alignment Jitter within the signal
  - Available on WFM8200 & WFM8300
    - Eye Display
    - Jitter (Timing / Alignment)
    - Cable length measurements
    - SDI Status Display
  - Available only on WFM8300
    - Eye Amplitude
    - Amplitude Histogram
    - Rise/Fall Time
    - Overshoot / Undershoot
    - Jitter Waveform Display



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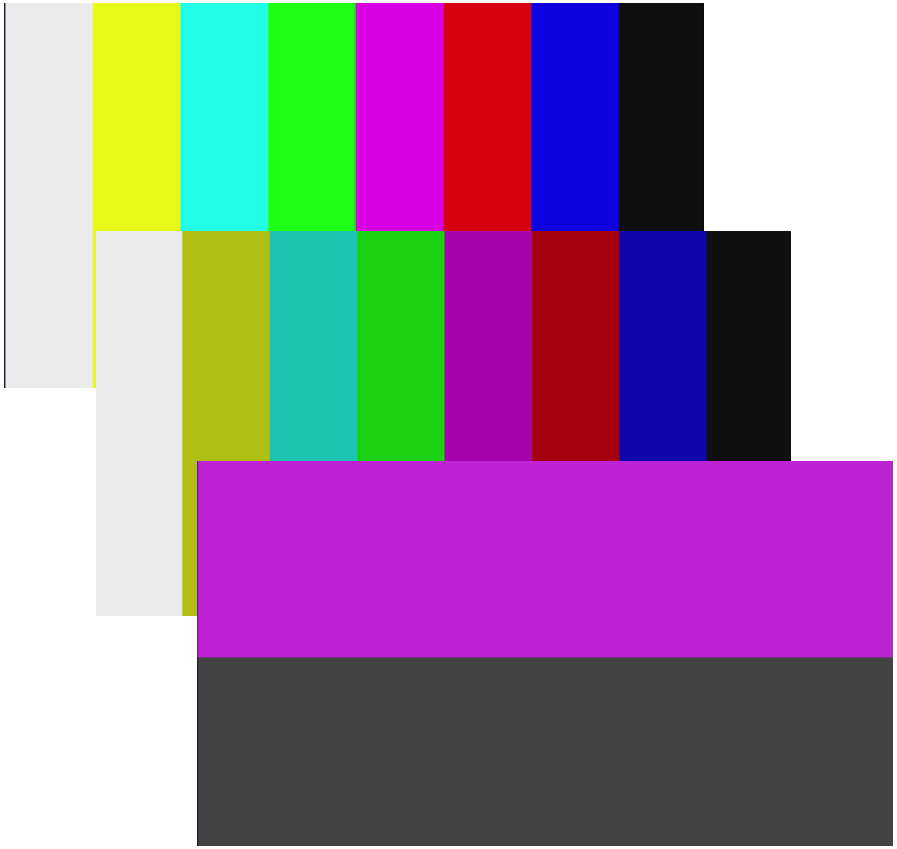
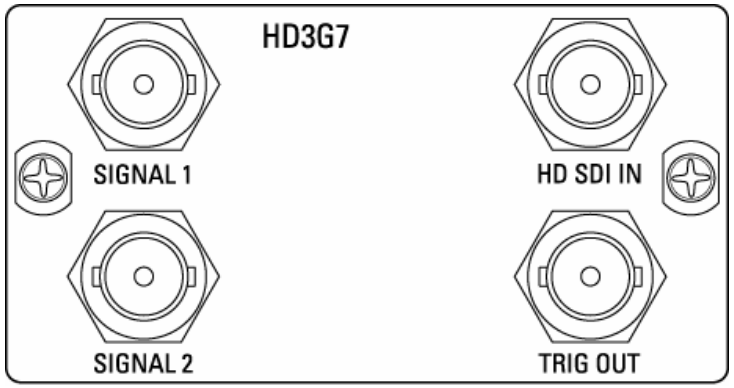
Built in Simple Test Signal Generator

- Included with Option PHY
  - SD/HD-SDI (3G-SDI with Opt 3G)
    - Color Bars 75/100%
    - Pathological Test Signal
    - Level A & B
    - Stand alone generator
      Does not require the generator to be looped-back as did 7000 series
    - Signals Now available for both SD & HD
    - Option 3G & PHY provides Test Signal generation for 3 Gb/s level A & B.



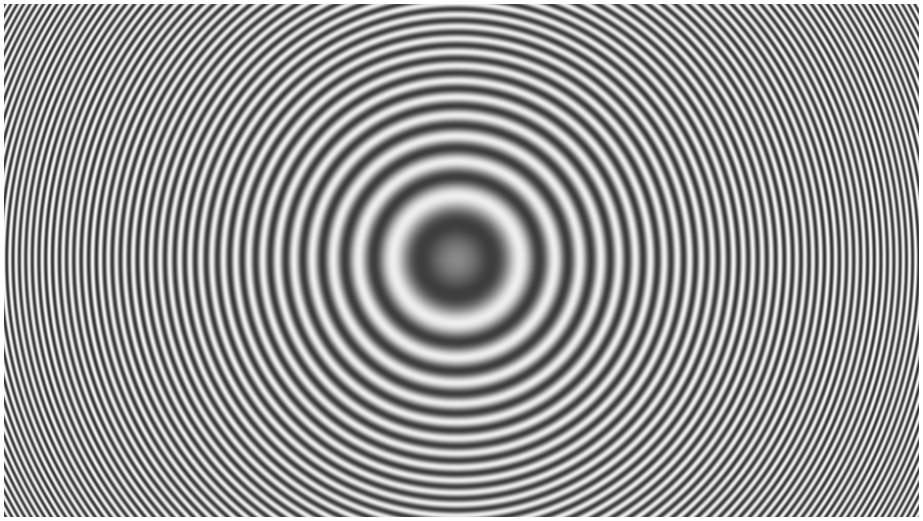
HD3G7 3 Gb/s SDI Generator/Converter Module for the TG700

- All 1080-line formats of SMPTE 425 now supported
  - YPbPr 4:2:2/4:4:4 10/12-bit
  - RGB 4:4:4 10/12-bit
  - XYZ 4:4:4 12-bit
  - Complete coverage of both Level A and Level B mappings
- Wide variety of standard test signals
- Two signal outputs
- HD-SDI input for up-converter function
- Trigger output (frame pulse or 148.5 MHz clock) for external oscilloscope synchronization



HD3G7 3 Gb/s SDI Generator/Converter Module for the TG700

- Real-time parametric zone plate generator
- Embedded audio generator
- Up to 32 channels (for Level B)
- A/V Delay mode for WFM measurements
- Ancillary data generation
- SMPTE 352M Payload ID
- Timecode
- User-defined packets (e.g. AFD)



Good but really bad (quality)

- ‘Good’ video i.e. fully
  - legal (video and audio constraints)
  - syntactically correct
  - and compliant to broadcaster’s system parameters
- …but just poor quality video

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Why Picture Quality Analysis?

- In compressed video systems, picture quality varies dynamically with data rate and picture complexity, thus measurements on moving video are required.

- Video is transmitted in a wide array of formats and standards. There is a need to ensure the quality of the images throughout the various transmission formats from HD to SD to CIF.

- Objective, repeatable, and reliable picture quality measurements are an attractive alternative to expensive and time consuming subjective assessments using viewer audiences.

- There is a need to quantify impairments introduced by different encoding algorithms, hardware, and software for different types of content.

Applying Human Vision to Picture Quality Analysis

or

JND, PQR and DMOS, Oh My!

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Human Vision Standards

- ITU T J.144 - Objective perceptual video quality measurement techniques for digital cable television in the presence of a full reference
- ITU-R BT.500 - Methodology for the subjective assessment of the quality of television pictures

The Old Way of Evaluating Video Quality

- Two Common Methods for Human Evaluation:

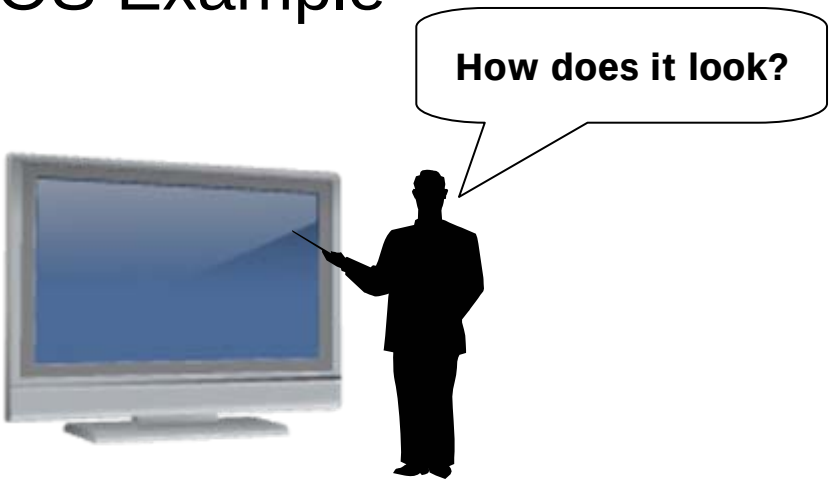
  - **Mean Opinion Score (MOS)**
    - Asking the viewer "How does it look?"
    - Mean average of individual viewers' opinion scores
    - Scale of 1 – 5
      - 1 = Very annoying (as bad as worst-case training video)
      - 2 = Annoying
      - 3 = Slightly annoying
      - 4 = Perceptible
      - 5 = Imperceptible (indistinguishable from best-case training video)
    - ***Results are only meaningful and comparable within the context of the worst-case training video***

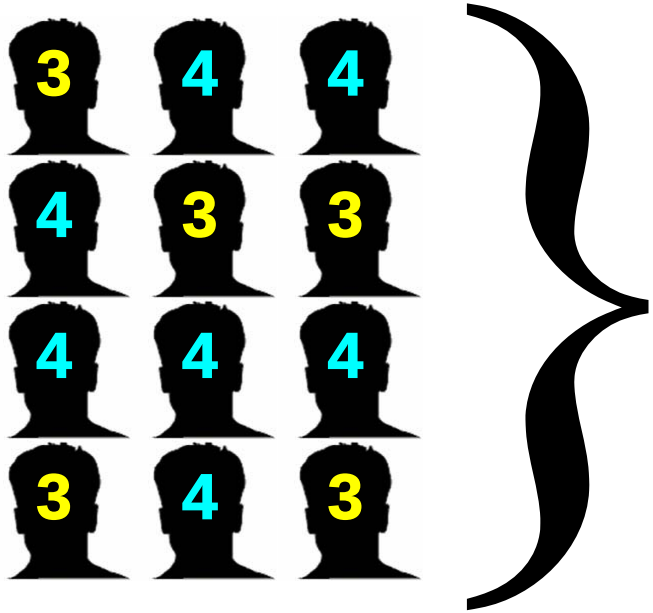
  - **Just Noticeable Difference (JND)**
    - Only asking the viewer "Which one looks better?"
    - 1 JND = Point when 1/2 of viewers can see a difference
    - No training videos required
    - Results are always comparable ***but not always meaningful***

Mean Opinion Score (MOS) Method

- **Step 1 -** Show the test audience the best-case training clip
  - This is generally the original unimpaired video clip
- **Step 2 -** Show the test audience the worst-case training clip
  - This is generally the most heavily-impaired version of the reference clip that you will ever ask this test audience to evaluate
- **Step 3 -** Show the test audience any number of video clips and ask them to evaluate each on a scale of 1 to 5
  - These video clips are often, but not always, the same content as the best and worst case but with varying degrees of impairment
  - MOS of 1 = As bad as the worst-case training clip
  - MOS of 5 = As good as the best-case training clip
- **Step 4 -** Calculate the mean average of all viewers' scores for each test clip to produce a final MOS score

MOS Example





$$\frac{5 \times 3\text{'s} + 7 \times 4\text{'s}}{12} = 3.58$$

This is your final MOS score

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Measuring Subjective Picture Quality

Double Stimulus Continuous Quality Scale Method (DSCQS)

Defined in ITU-R BT.500

Step 1 - Show the test audience training sequences

- Contain images other than those used in the test
- Comparable sensitivity, i.e. best case and worst case

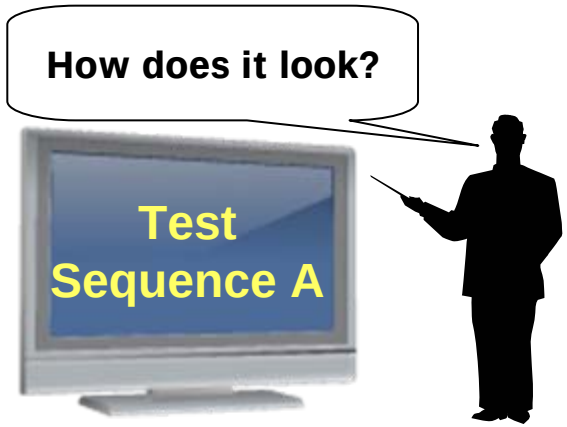
Step 2 – Show the test audience pairs of test sequences

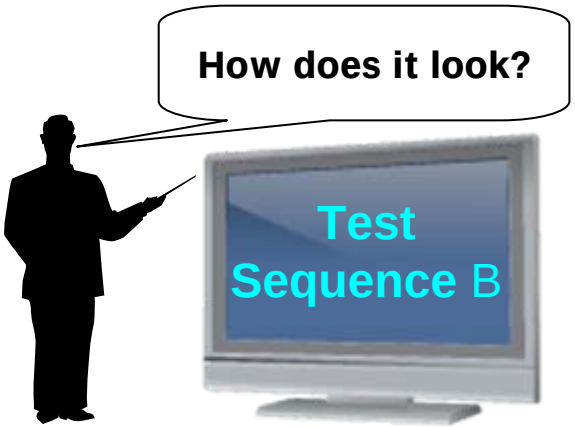
- One member of the pair contains an unimpaired image
- The other member may be impaired or may not be impaired

Step 3 – The test audience votes on each member of the pair

- Compute mean of the opinion scores over the entire test audience for each test sequence (MOS).
- Compute the difference between the MOS scores for the pair. This is called a Differential Mean Opinion Score (DMOS).

DMOS Example





MOS = 4.5

DMOS = 41 – 4.5
= 36.5

MOS = 41

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PSNR

- **Peak Signal to Noise Ratio (PSNR)**
  - Absolute difference between images
  - Not subjective
  - Poor correlation to human testing
  - Units of mean absolute LSB's or dB

- **PSNR (dB) = $20*\log_{10}(^{\text{MAX SIGNAL}}/_{\text{ERROR}})$**

  - MAX SIGNAL = 255 (sometimes 239)

  - ERROR = [reference pixel value] - [impaired pixel value]

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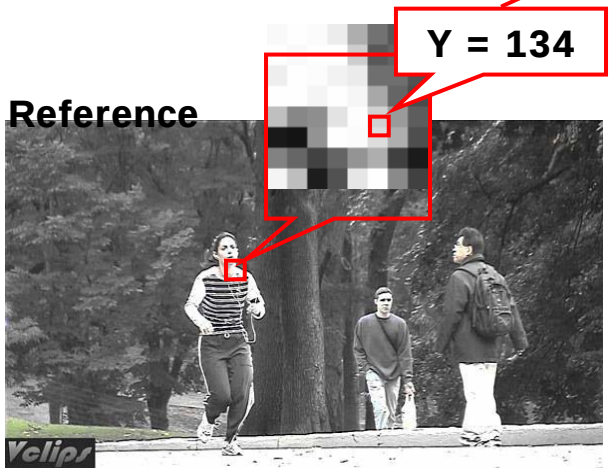
PSNR Example

$$\text{PSNR (dB)} = 20 * \log_{10}\left(\frac{255}{(134 - 139)}\right) = -34.15 \text{ dB}$$



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Extending the PQA200/300's Leadership with the PQA500

- The PQA200/300
  - Algorithm listed by ITU J-144 Appendix
  - The choice of industry leaders
  - Objective test results recognized and trusted throughout the video industry
  - Test capability that can be easily replicated and deployed around geographically dispersed organizations
  - An integrated solution for picture quality measurement

- The PQA500 is a new generation in picture quality analysis based on this Emmy award winning legacy

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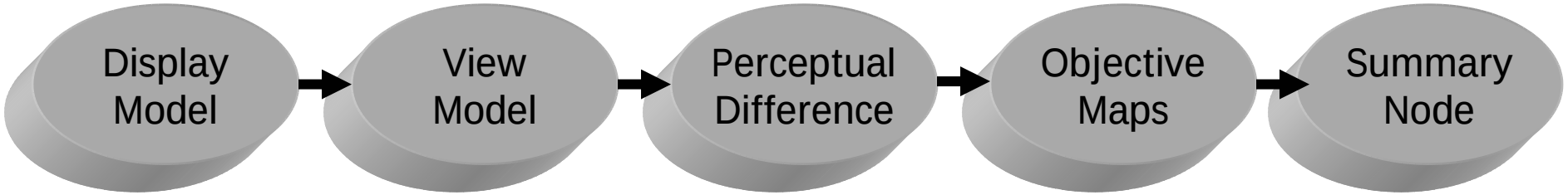
Simulation System Diagram



- Display Model
  - Types of display CRT, LCD, DLP
  - Types of Monitor Broadcast, Consumer, Computer, Custom
- View Model
  - Viewing Distance
  - Ambient Luminance
  - Spatial Alignment
- Perceptual Difference
  - Typical, Expert, Custom
- Objective Maps
  - Attention Model - Motion, Center, People Foreground, Contrast, Color, Shape, Size
- Summary Node
  - Measurement Results.

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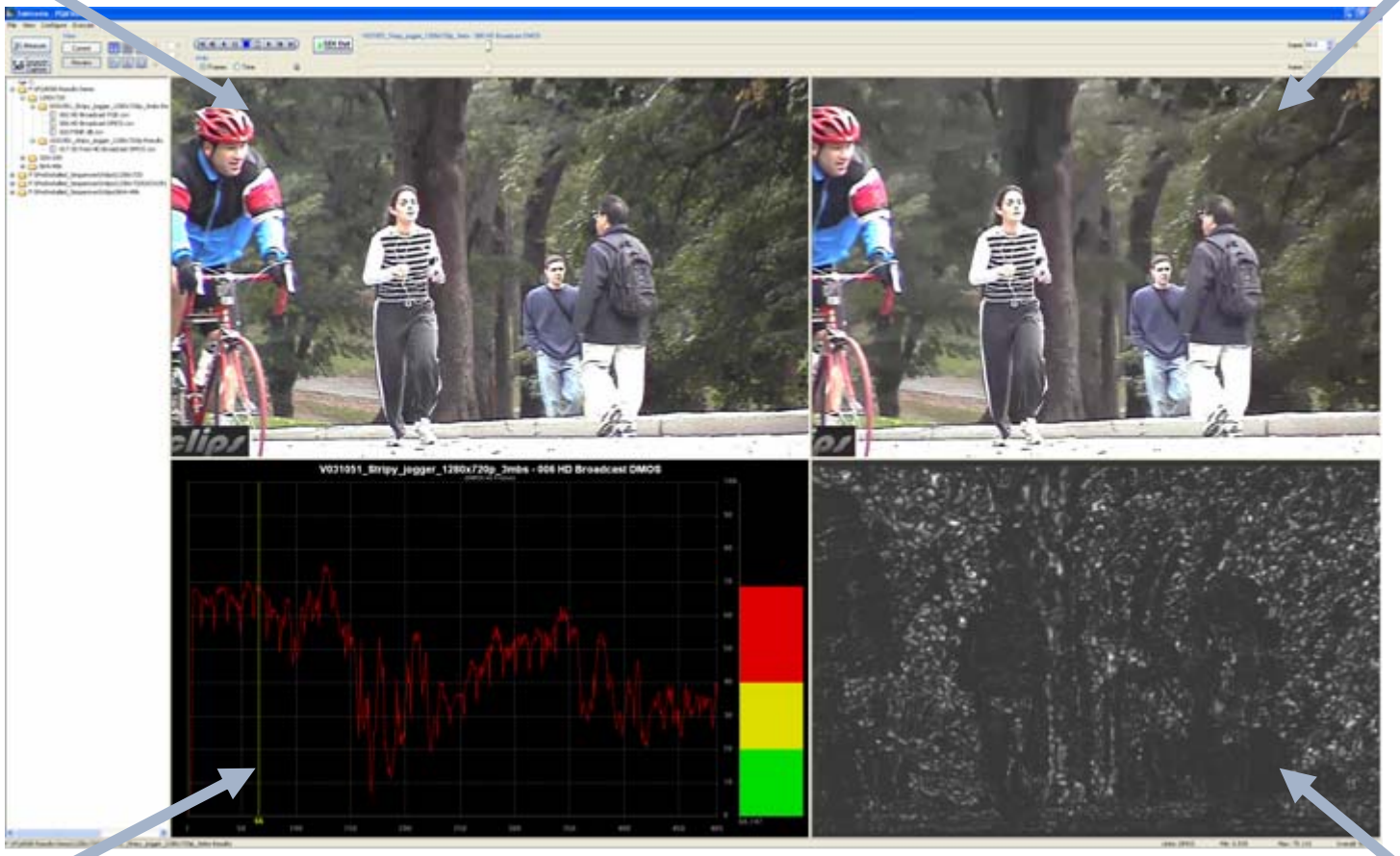
PQA500 Picture Quality Analysis System

Full-Reference Picture Quality Measurements

Reference

Test



Graphs

Maps

Tektronix®

Difference vs. Perceptual Contrast Difference

Reference

Test

Difference Map

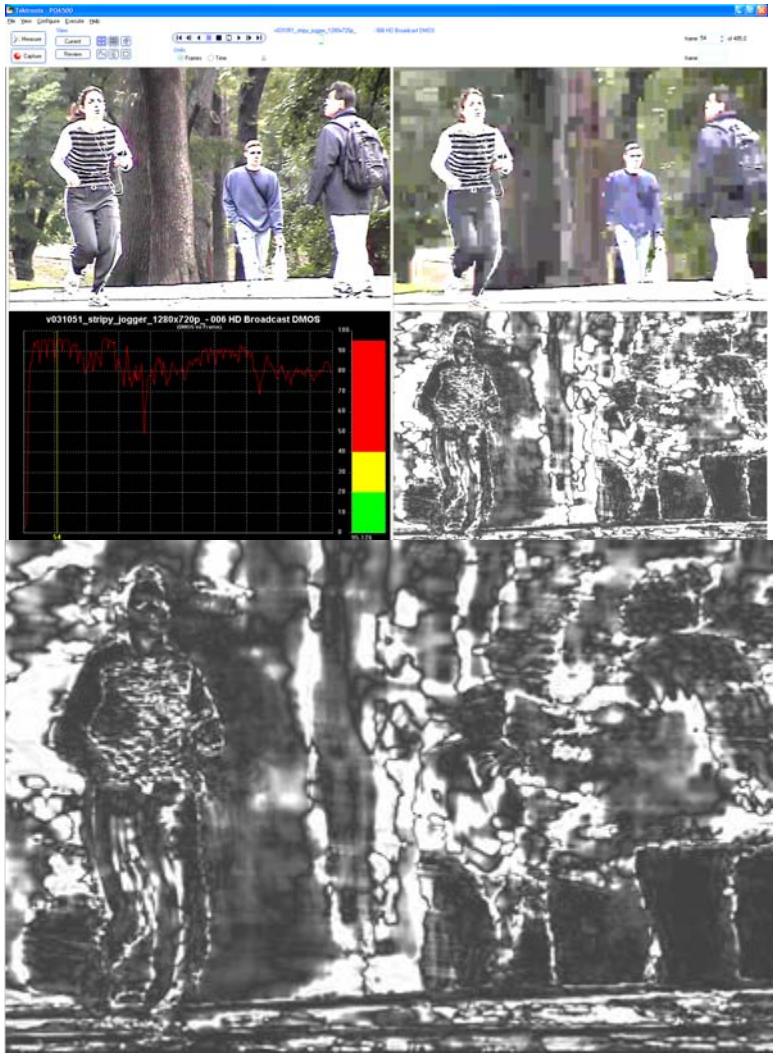
Perceptual Contrast Difference Map

- The difference map shows the numeric difference between pixels in the reference and test images.
- The PSNR measurement is based on these noise values.
- Viewers may or may not perceive these differences.

- The perceptual contrast difference map shows how the viewer perceives the differences between the images.
- Perceptual contrast differences form the basis of measurements correlated to subjective picture quality assessments.

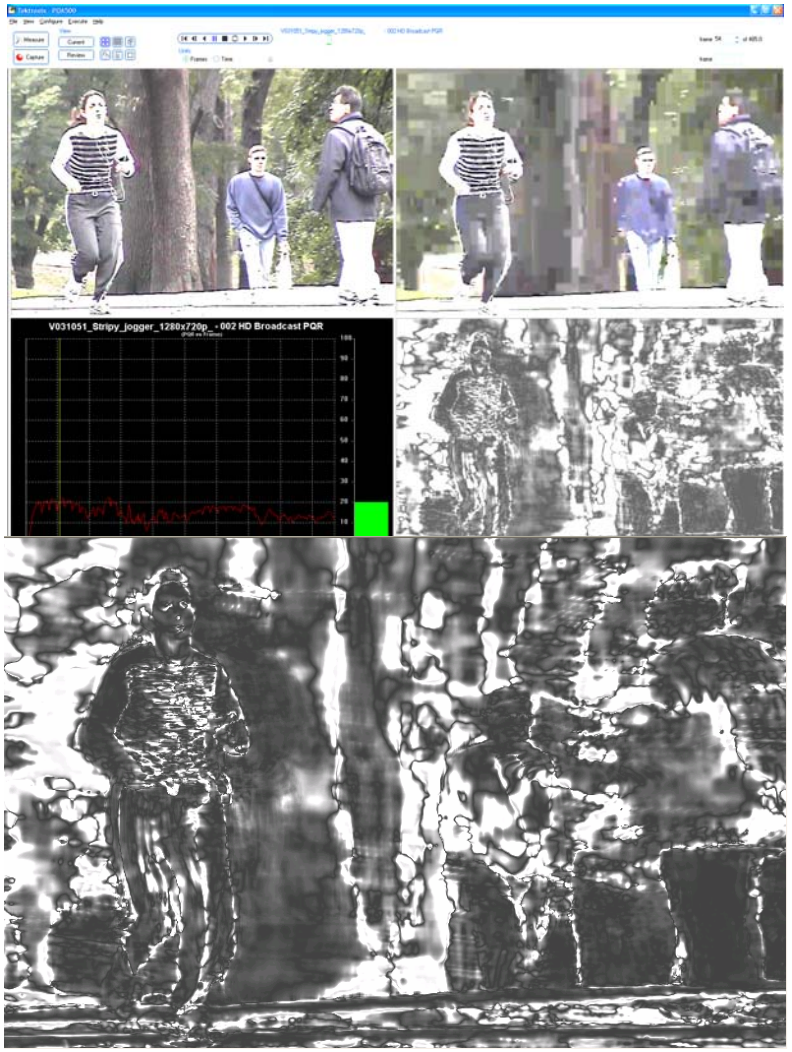
Picture Quality Measurements - DMOS

- DMOS - Difference Mean Opinion Score
- Measurement described by ITU-R BT.500
- Scale:
  - No difference between Ref & Test = 0
  - Good Quality = Lower number
  - Poor Quality = Higher number
- Relative measurement: Measurement results depend on worst case training sequence response used to configure measurement
- Use for assessing picture quality:
  - Over a wide range of quality levels close to or far from the visibility threshold
  - Relative to a baseline “worst case” picture quality specific to an application or situation



Picture Quality Measurements - PQR

- PQR – Picture Quality Rating
- Developed for the PQA200/300
- Based on Just Noticeable Difference (JND) concept
- 1 PQR = 1 JND
  - 75% of viewers will notice a difference
  - Difference is just barely noticeable
- Scale:
  - No difference between Ref & Test = 0
  - Good Quality = Low Number
  - Poor Quality = High Number
- Absolute measurement: Measurement results do not depend on any training video sequence
- Use to determine how much viewers will notice differences between the reference and test videos
- Most meaningful for differences near the visibility threshold



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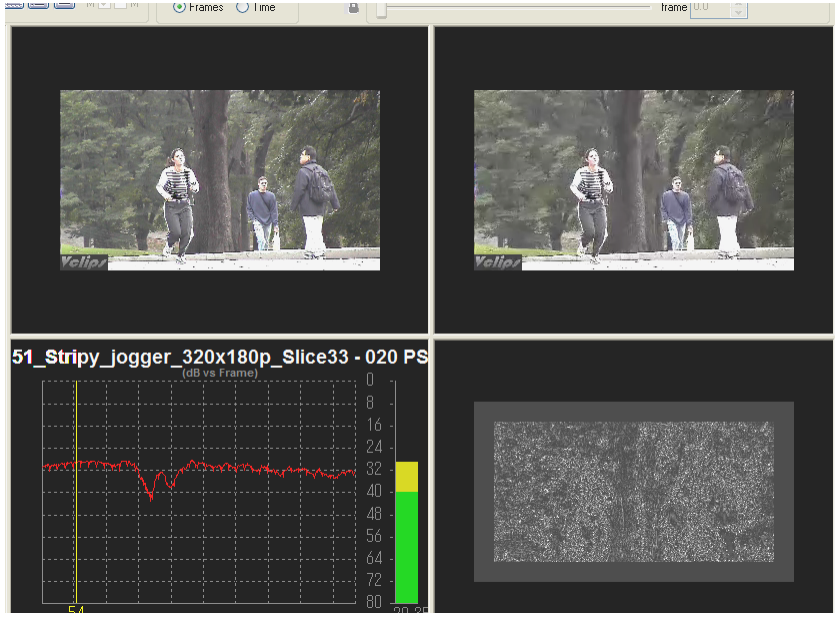
Picture Quality Measurements - PSNR

- PSNR – Peak Signal to Noise Ratio
- PSNR shows the ratio between the peak signal amplitude and the RMS noise between the reference and test video
- Scale (expressed in dB):
  - No difference between Ref & Test = Infinite
  - Good Quality = Higher dB value
  - Poor Quality = Lower dB value
- Use for:
  - Detecting and diagnosing problems in video processing hardware, software and algorithms
  - Quick checks to detect possible picture quality problems
- PSNR is not a direct prediction of what human viewers will perceive



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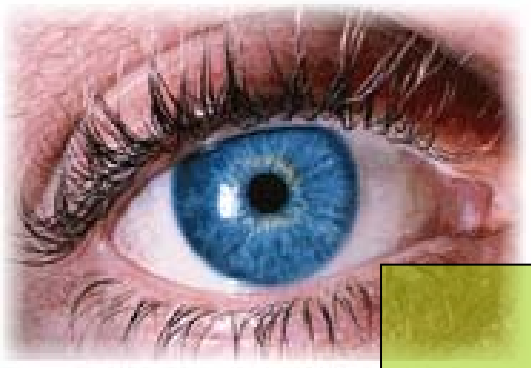
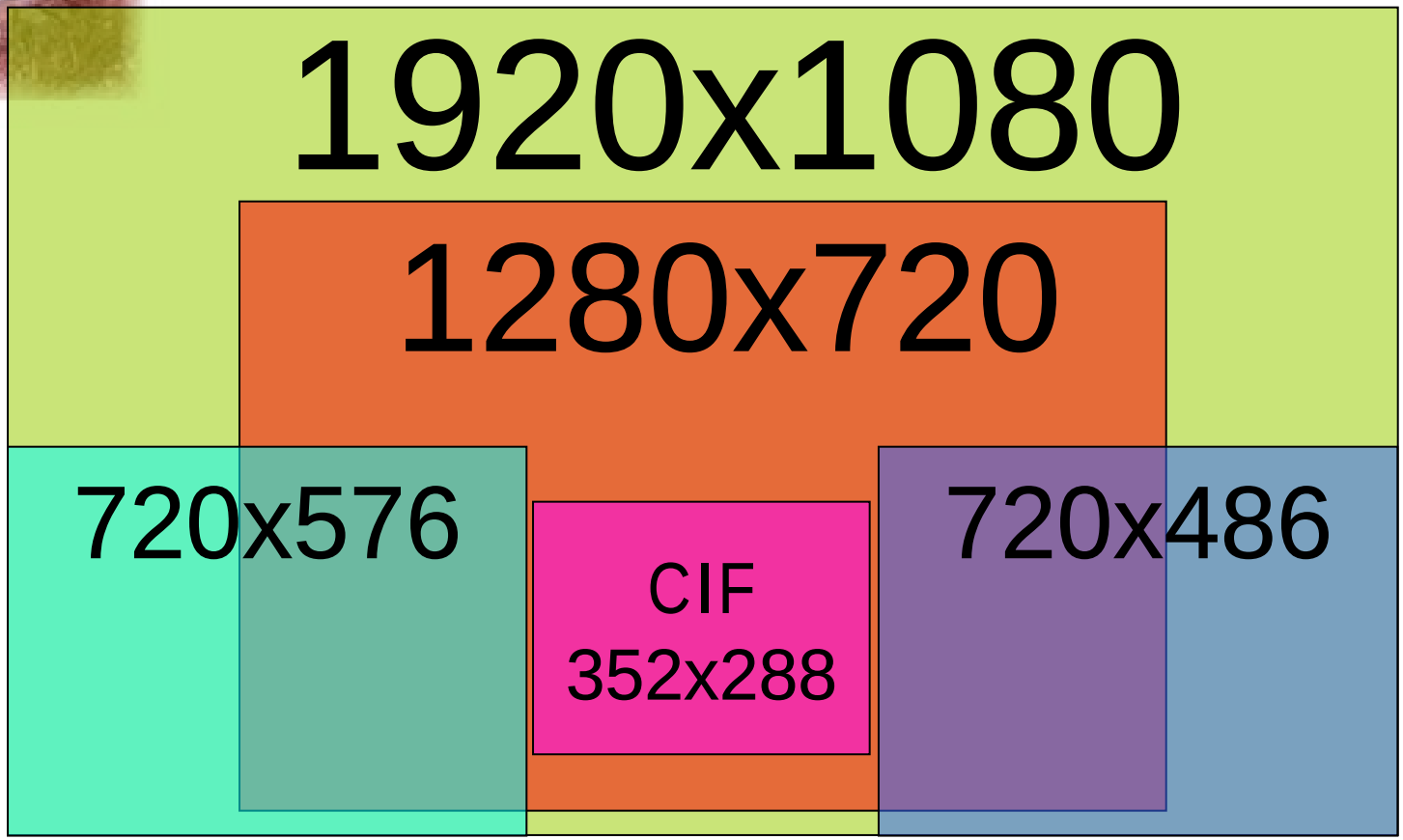
The Real World – Various Resolutions

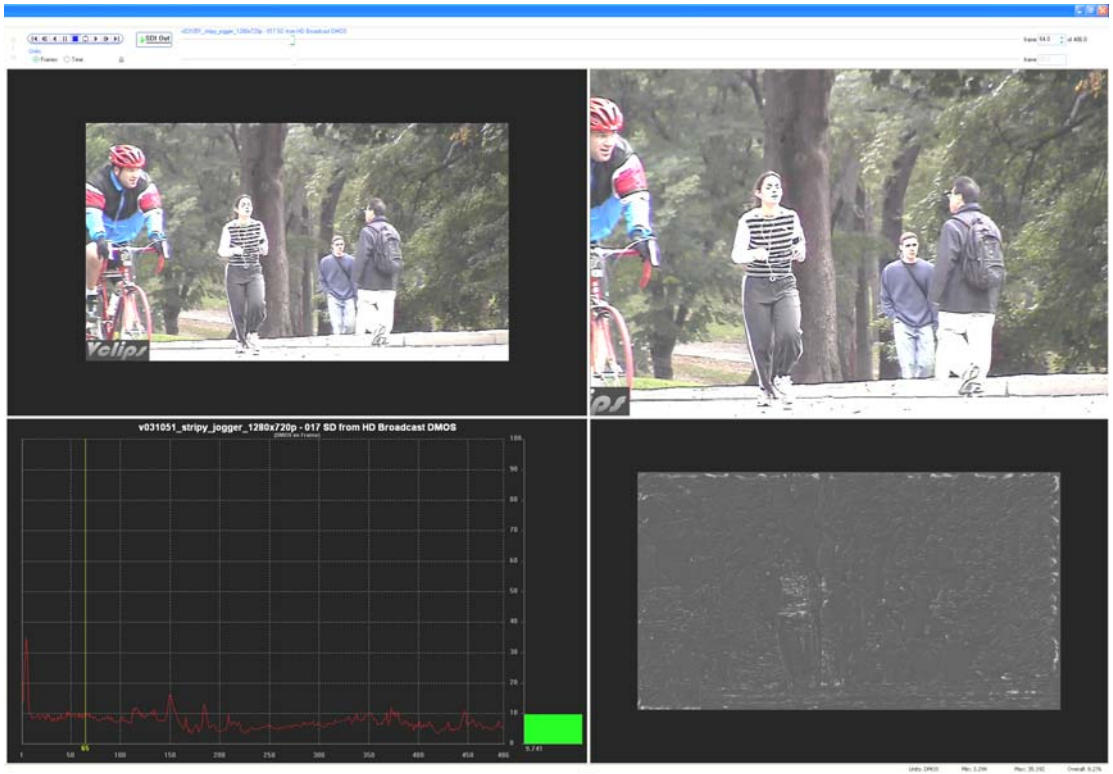


- Various Video Formats & Frame Rates
- Conversion between Resolutions



PQA500 Picture Quality Analysis System

Predicted DMOS between Different Resolutions



- PQA500 supports picture quality measurements at multiple resolutions and frame rates, e.g. HD vs SD.
- Useful in evaluating up-conversion and down-conversion processes.

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The Real World – Different Viewing Conditions

CRT

Handheld Phone

LCD

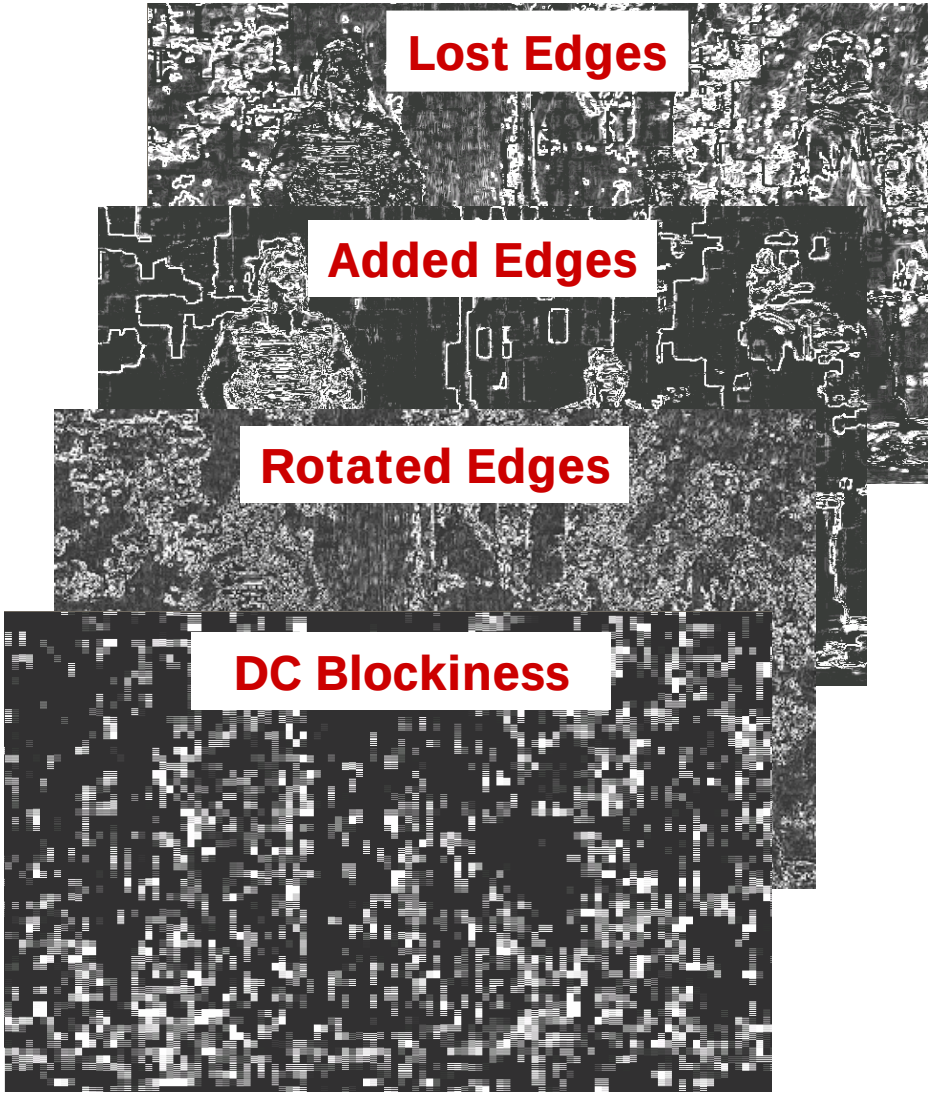
DLP

Home Theater

Tektronix

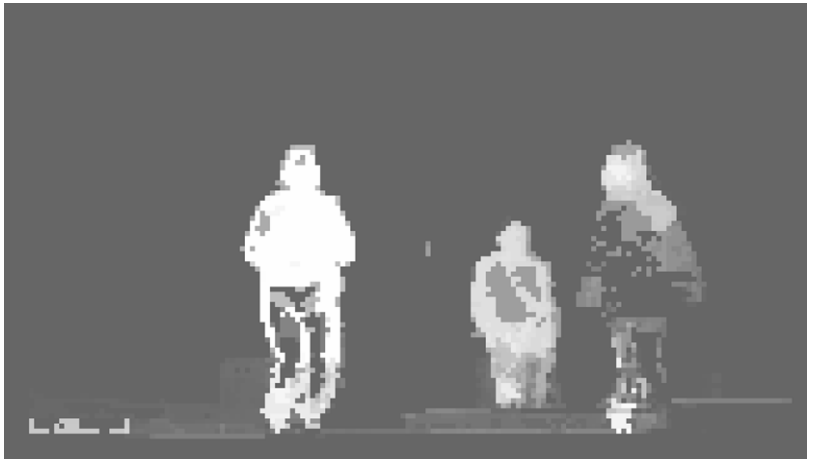
Artifact Detection and Weighting

- Artifact Detection
  - Lost Edges (Blurring)
  - Added Edges (Ringing, Mosquito Noise)
  - Rotated Edges (Jagginess)
  - DC Blockiness
- Apply as weighting factors on any picture quality measurement
- Use to:
  - Detect, diagnose, and correct picture quality problems
  - Optimize video processing algorithm performance and make critical performance tradeoffs



Attention Model and Attention Weighting

Reference



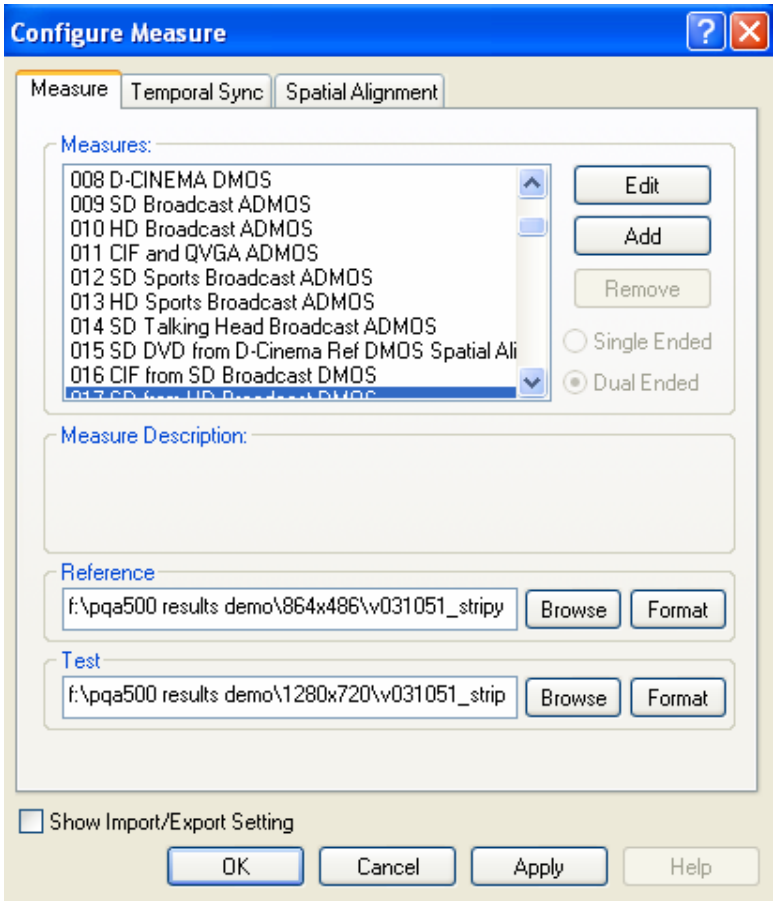
Attention Map

- The Attention Model predicts the viewer's focus of attention within the image.
- Highlighted regions show the viewer's focus of attention.
  - More focus on the jogger
  - Less attention paid to the two other walkers
- This model can be used in conjunction with other measurements and provides a weighting to PSNR or Predicted DMOS.
- For example, can be used to optimize specialized encoding for sports programming.

Pre-configured Measurements

- 34 pre-configured measurements
  - PQR with SD, HD, CIF/QVGA, D-Cinema
  - DMOS with SD, HD, CIF/QVGA, D-Cinema
  - Attention DMOS for SD, HD, CIF/QVGA
  - DMOS with different display and viewing condition between reference and test sequences
  - PSNR
  - Artifact / Attention weighted DMOS
  - No reference DC Blockiness

- Use as starting points and templates for developing picture quality measurements that address specific conditions, applications and requirements



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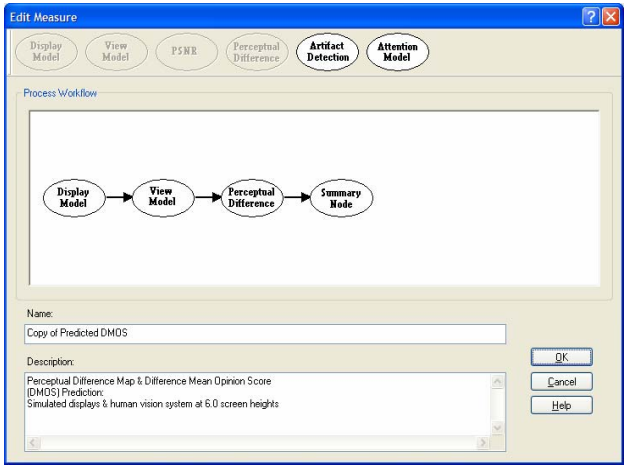
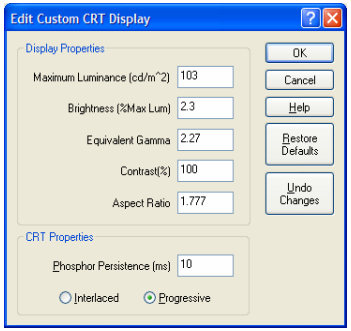
Configurable Measurements

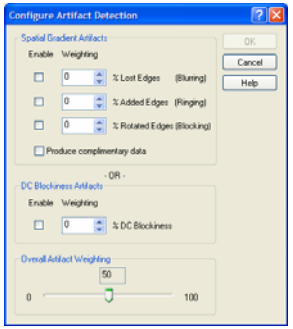
- Edit the pre-configured measurements
- Configurable parameters
  - Custom Display for CRT, LCD and DMD
  - Viewing environment
  - Viewer characteristics
  - Artifact / Attention weighting
  - Worst case training parameter for DMOS





CRT

Viewer



Artifact

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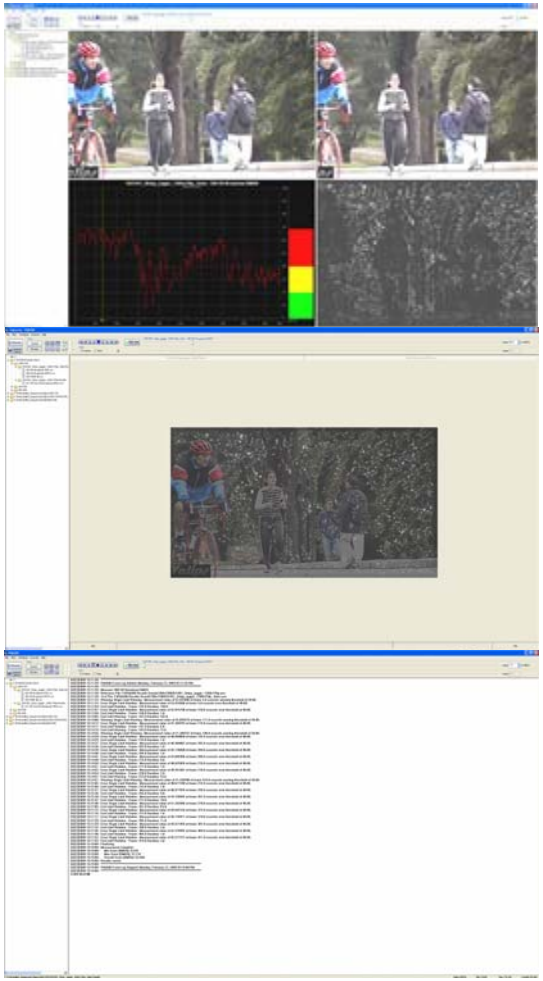
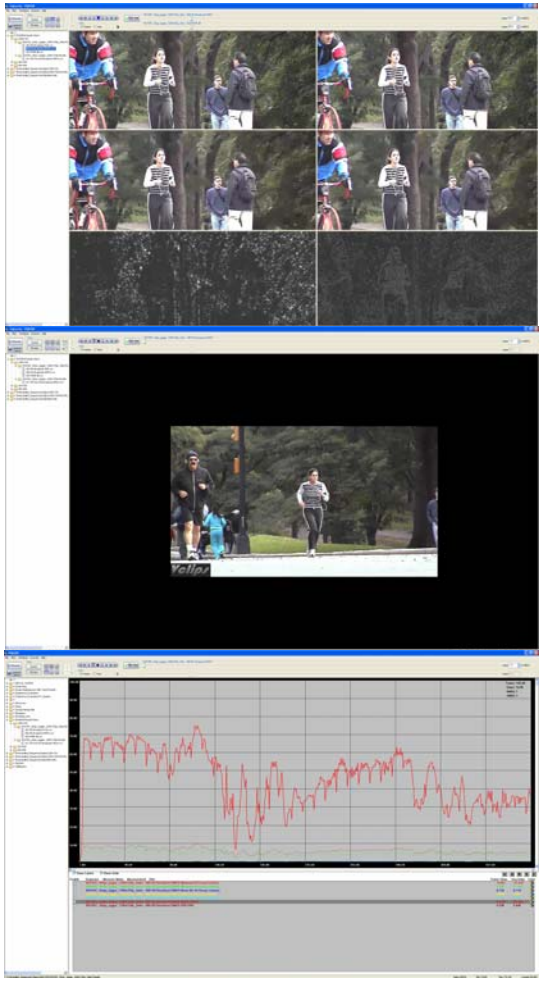
PQA500 Picture Quality Analysis System

Variety of Display Options

- Flex view
- Tile view
- Overlay view
- Full display
- Event log
- Graph





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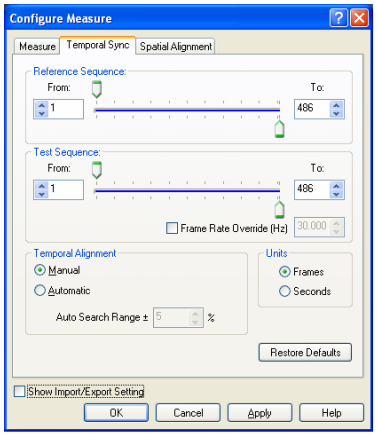
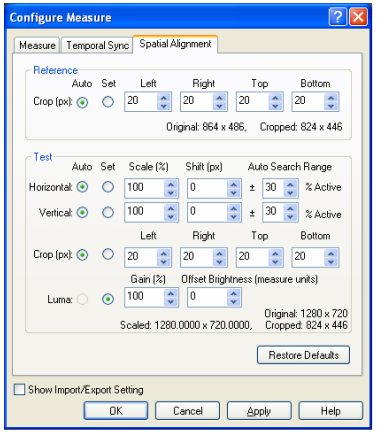
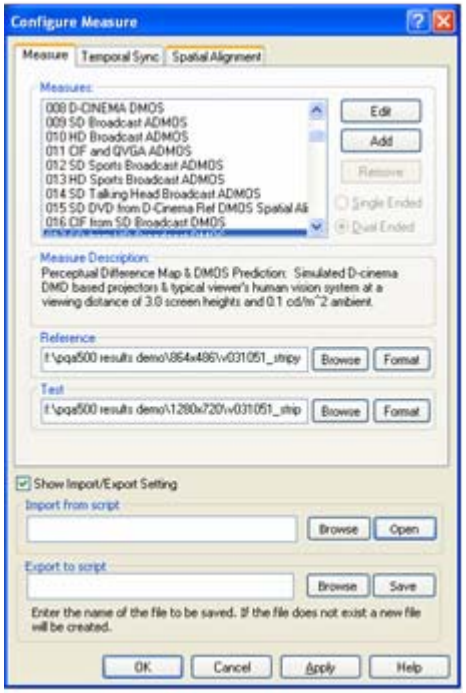
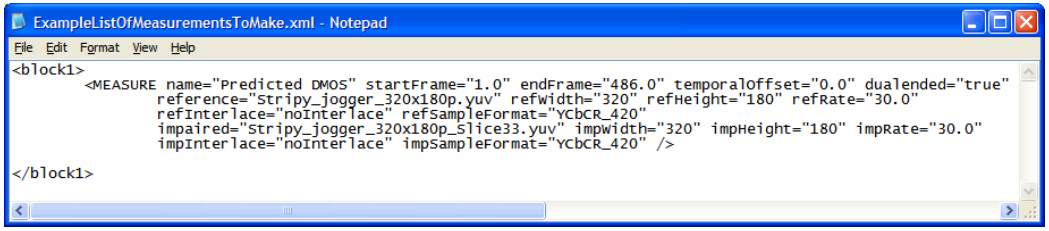
For More Efficient Measurement

- **Automatic Temporal / Spatial Alignment**
  - No need for embedded trigger pattern
  - Easy to use without tedious configuration before starting the measurement
- **Automatic Measurement with XML Scripting**
  - Execute multiple measurements with multiple sequences
  - Releases the engineer from instrument operation during regression testing
  - Create scripts by exporting measurements to script files.
- **"Infinite" Video Clip Length**
  - Easy to use your original video sequences
  - Limited only by available space on hard disk drive and processing time









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PQA500 Picture Quality Analysis System

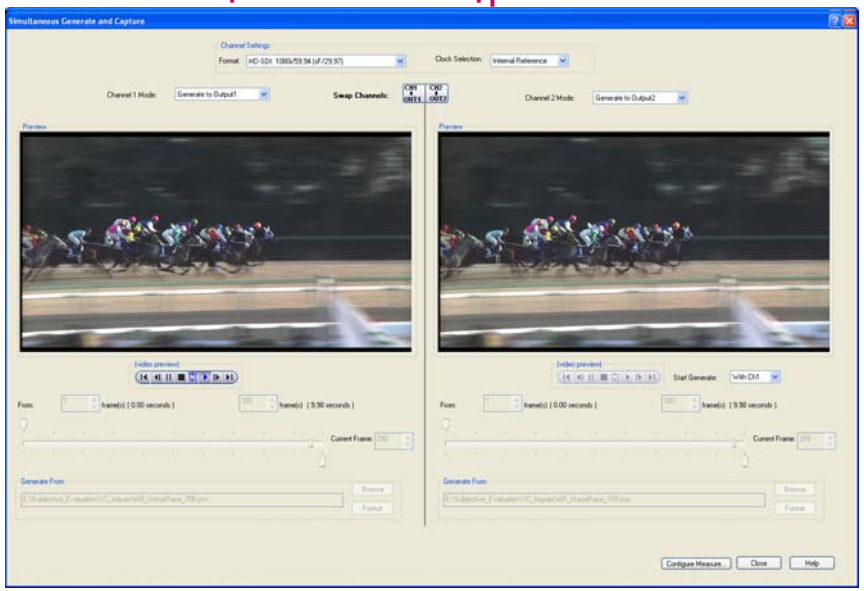
Simultaneous SDI Signal Generation and Capture

Signal Generation

- Generate 1 or 2 SDI outputs
- Instantaneously swap output for subjective evaluation
- User can determine playback start position and duration
- VCR-like playback controls

Large preview screens

Generate and Capture Mode



Signal Capture

- Capture 1 or 2 SDI inputs
- User can determine the capture file length
- Delayed capture capability
- Display of available image storage space

Formats and Frame Rates

525i 59.94 Hz	1080PsF 23.98 Hz	1080p 23.98 Hz
625i 50 Hz	1080PsF 24 Hz	1080p 24 Hz
720p 50 Hz	1080PsF 25 Hz	1080p 25 Hz
720p 59.94 Hz	1080PsF 29.97 Hz	1080p 29.97 Hz
720p 60 Hz	1080PsF 30 Hz	1080p 30 Hz
1080i 50 Hz		
1080i 59.94 Hz		
1080i 60 Hz		

File Formats

.yuv*, yuv10*, .v210*	UYVY*, YUY2*, YUV4:2:0 planar, YUV4:4:4
.rgb*	BGR 24-bit*, GBR 24-bit*
.avi*	UYVY*, YUY2*, BGR 24-bit*, GBR 24-bit*
.vcap,* .vcap10*	

Supported capture formats:	All formats listed
Supported generation formats:	Formats with *

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PQA Measurement Application – Codec Design

Reference
.YUV file

PQA500 analyses reference and test video to measure perceptible differences

Test
.vcap file

PQA500

PQA500 generates reference video sequence

PQA500 captures test video sequence

SDI Input

MPEG Encoder

MPEG Transport Stream

MPEG Decoder

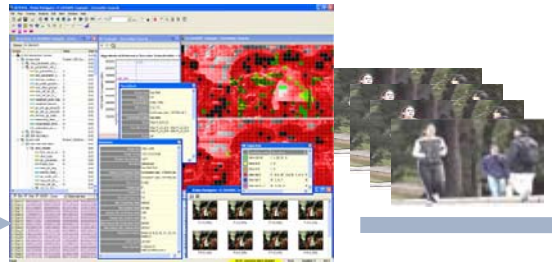
SDI Output

Tektronix

PQA Measurement Application – STB Testing

Reference
YUV File
(Vclips)

MTS4CC
Software
(Extract MPEG Video
To YUV file)



LCD Monitor

MPEG
Encoded
File

Reference
Video

PQA500

RF
O/P

(Set-Top-Box)
D.U.T

I/O
Interface
Conversion
To SDI

Test
Capture
SDI Video

MTX100B (MPEG Player)
RTX130B (ATSC/QAM)
RTX100B (ISDB)

Adaptor
HDMI -> SDI
Analog CVBS/YPbPr -> SDI

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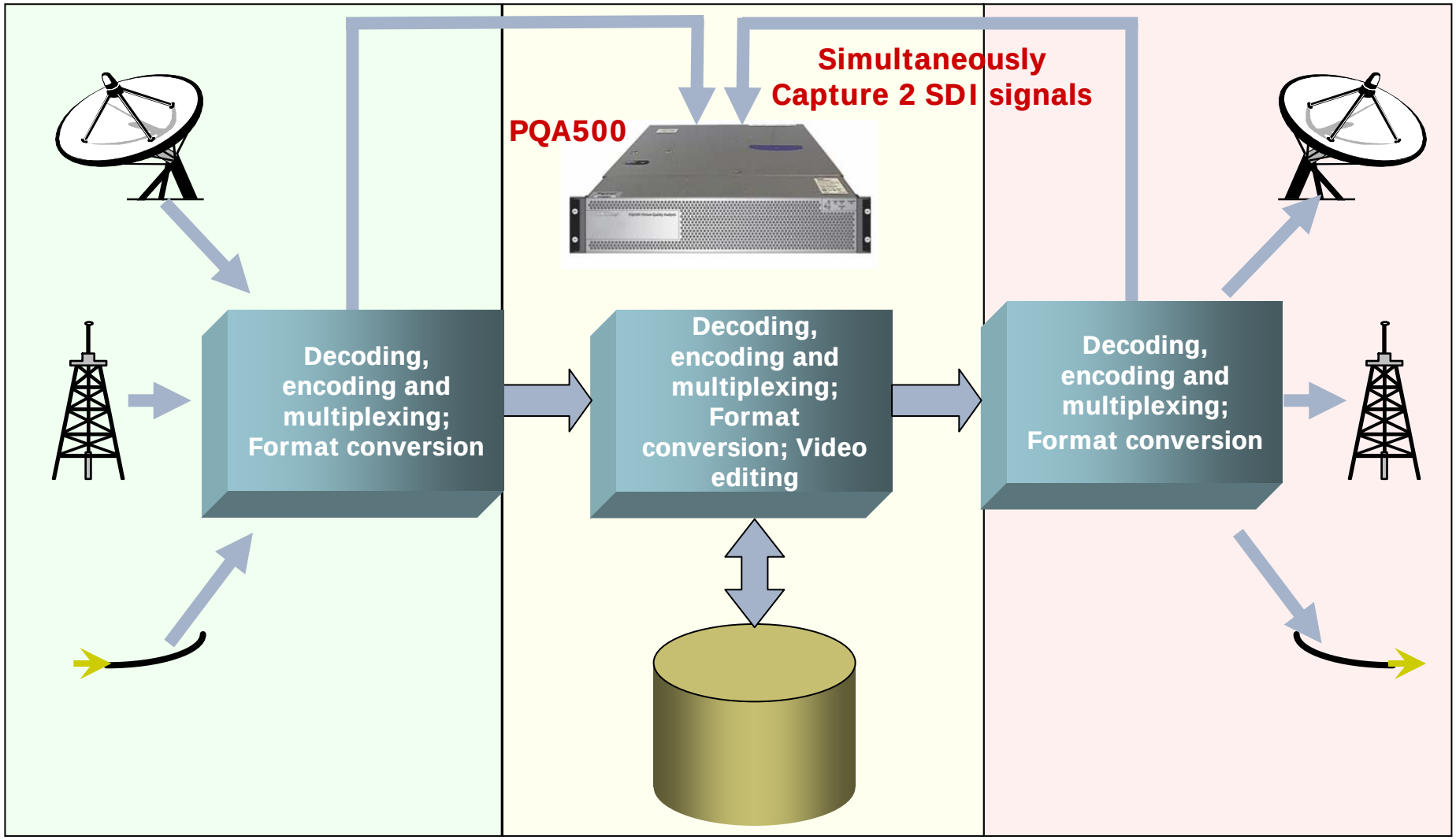
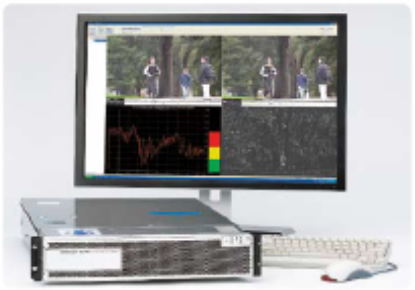
PQA Measurement Application – System Monitoring



Tektronix

Les tests du Laboratoire

Pour vivre la plus belle expérience de la haute définition, tournez-vous vers le Blu-ray, c'est le support idéal de la HD, qui offre à la fois une image parfaite et un son multicanal de qualité studio. Dans le même temps, les lecteurs offrent la possibilité d'améliorer la résolution standard d'un DVD en « upscalant » le signal de sortie, pour en faire un pseudo signal HD. Mais que valent réellement ces systèmes ? Le Laboratoire d'essais de la Fnac s'est équipé d'un matériel de mesure unique pour juger scientifiquement ces différences.



Nouveau PQA 500 pour la mesure Blu-ray et Upscale

Le test de lecture Blu-ray

→ Pour la première fois, nous pouvons mesurer la dégradation de lecture d'un Blu-ray en dynamique, c'est-à-dire sur des séquences vidéo complexes et en Haute Définition. Ce test unique et parfaitement répétitif, ne se contente pas d'effectuer des calculs mathématiques, mais analyse les différences selon les critères physiologiques de la vision humaine.

La mesure

Le principe de cette mesure est de comparer des fichiers originaux en Haute Définition non compressés, enregistrés dans un ordinateur PQA500 de Tektronix avec un contenu identique compressé en MPEG4 et gravé sur un Blu-ray. Nous générons 4 séquences complexes (mouvements rapides et détaillés) de 10 secondes chacune, ce qui représente plus de 2 milliards d'informations (2 millions de points/image x 24 images x 40 secondes). Le lecteur est relié en HDMI, nous mesurons l'écart entre l'original et la lecture, et analysons le résultat point par point. La dégradation de l'image est quantifiée de façon automatique et traduite en PQR (Picture Quality Rating) et en PSNR (Peak Signal-to-Noise Ratio).

Le test d'Upscale DVD

Afin d'améliorer la qualité de lecture des DVD, les constructeurs proposent maintenant des circuits d'amélioration de l'image appelés Upscale. Ces dispositifs de remise à l'échelle vont extraire le signal en définition standard des DVD (720 points x 576 lignes) et essayer de le transformer en un pseudo signal HD (1920 points x 1080 lignes).

La mesure

Le principe de la mesure est identique à celui du Blu-ray, le signal est prélevé sur la prise HDMI en sortie et comparé au signal idéal HD du PQA500. La qualité d'image n'est pas comparable à un vrai signal haute définition, néanmoins certains lecteurs réalisent des prouesses et permettent réellement d'améliorer la lecture de vos DVD, fonction appréciable si vous possédez un grand écran plat. Cette mesure est réalisée sur les lecteurs Blu-ray ainsi que sur les lecteurs DVD équipés d'une sortie HDMI et d'un circuit d'Upscale, les résultats sont donc comparables, sur ce critère, entre les deux types de lecteurs.

Le test de lecture DVD

Même si le principe reste identique aux tests précédents, ici, les signaux sont standards et la liaison YUV (composante) ou RVB sur un signal standard en 720 pixels x 576 lignes.

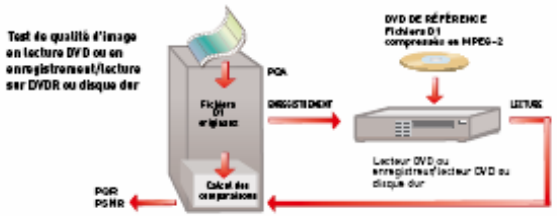
La mesure

Le principe de mesure est identique, l'appareil utilisé est un PQA200, et nous comparons 7 séquences complexes de 2 secondes gravées en MPEG2 sur un DVD avec les mêmes 7 séquences non compressées sur le disque dur de l'ordinateur. La dégradation de l'image est quantifiée de façon automatique et traduite en PQR (Picture Quality Rating) et en PSNR (Peak Signal-to-Noise Ratio).

Pour les enregistreurs, la procédure est la même, sinon que le DVD utilisé est préalablement enregistré par l'appareil à tester, aux différents taux de compression disponibles, soit les différentes durées d'enregistrement. Pour assurer les meilleurs résultats possibles, nous utilisons en priorité l'entrée la plus performante, le RVB, via la prise Péritel. S'il n'existe pas, l'enregistrement s'effectuera par l'entrée Y/C (S-Vidéo), et au pire la médiocre prise composite (CVBS) par défaut.

Qualité CD Audio

Connecté à l'amplificateur en numérique, l'information du disque DVD est intégralement transmise : aucune dégradation du signal, donc rien à tester.. Par contre, le signal est modifié par le lecteur si l'on utilise la sortie analogique stéréo. C'est donc en stéréophonie que nous mesurons les performances des appareils, avec les mêmes procédures que celles utilisées pour la CD Audio.



Les lecteurs Blu-ray haute définition

PHILIPS BDP3000

Lejugement de la Fnac : Philips, leader en lecteur Vidéo de salon arrive cette année avec une gamme Blu-ray plus étoffée. Ce premier lecteur, petit prix, vous ouvre les portes de la Haute Définition. Imprégnez-vous de chaque détail, appréciez la fluidité des mouvements ainsi que l'éclat des couleurs. Il vous permet également de revisiter toute votre DVDthèque avec un bon niveau de lecture (extrapolation en 1080p).

E

Temps d'accès de lecture :
DVD : 25 secondes
Blu-ray : 33 secondes

Note technique Blu-ray :
Note technique upscale :

LG BD370

Lejugement de la Fnac : Lecteur Blu-ray évolutif, compatible BD Live 2.0, c'est-à-dire connecté à internet via la prise Ethernet pour profiter de toutes les possibilités offertes par le format Blu-ray (téléchargements de bonus, jeux, scènes supplémentaires,...) ainsi qu'un accès direct à YouTube pour partager sur grand écran les dernières vidéos dont on parle. Côté son, il intègre un décodeur audio pour un rendu HD des flux audio (DTS-HD, Dolby True HD).

F

Temps d'accès de lecture :
DVD : 23 secondes
Blu-ray : 26 secondes

Note technique Blu-ray :
Note technique upscale :

SAMSUNG BD-P1600

Lejugement de la Fnac : dernier né de la gamme Samsung, ce lecteur BD Live Ready est bien spécifié pour retrouver à la maison toute la magie du cinéma. En associant ce lecteur à un TV Samsung dernière génération (LCD/Plasmas série 650 et + et LED série 7000 et +), la qualité de l'image se trouvera encore un peu plus améliorée (vivacité des couleurs, fluidité) grâce à la technologie BDWise. 2 prises USB : une pour connecter un adaptateur Wifi et profiter du BD Live sans fil, une seconde destinée à une clé USB ou un disque dur pour partager ses contenus multimédia.

F

Temps d'accès de lecture :
DVD : 24 secondes
Blu-ray : 35 secondes

Note technique Blu-ray :
Note technique upscale :

SONY BDP-S350

Lejugement de la Fnac : Lecteur Blu-ray évolutif, compatible BD Live 2.0 via une mise à jour sur internet et l'ajout d'une mémoire de 1 Go (clé USB non fournie) pour profiter de tous les atouts du format Blu-ray et partager des infos avec d'autres utilisateurs de Blu-ray. Un traitement vidéo poussé pour un meilleur rendu des couleurs et une plus grande fluidité d'images, un décodeur audio gérant les flux audio Haute définition (Dolby Digital Plus/ Dolby True HD) ont fait de ce lecteur une des meilleures ventes 2009.

F

Temps d'accès de lecture :
DVD : 48 secondes
Blu-ray : 51 secondes

Note technique Blu-ray :
Note technique upscale :

Document non contractuel

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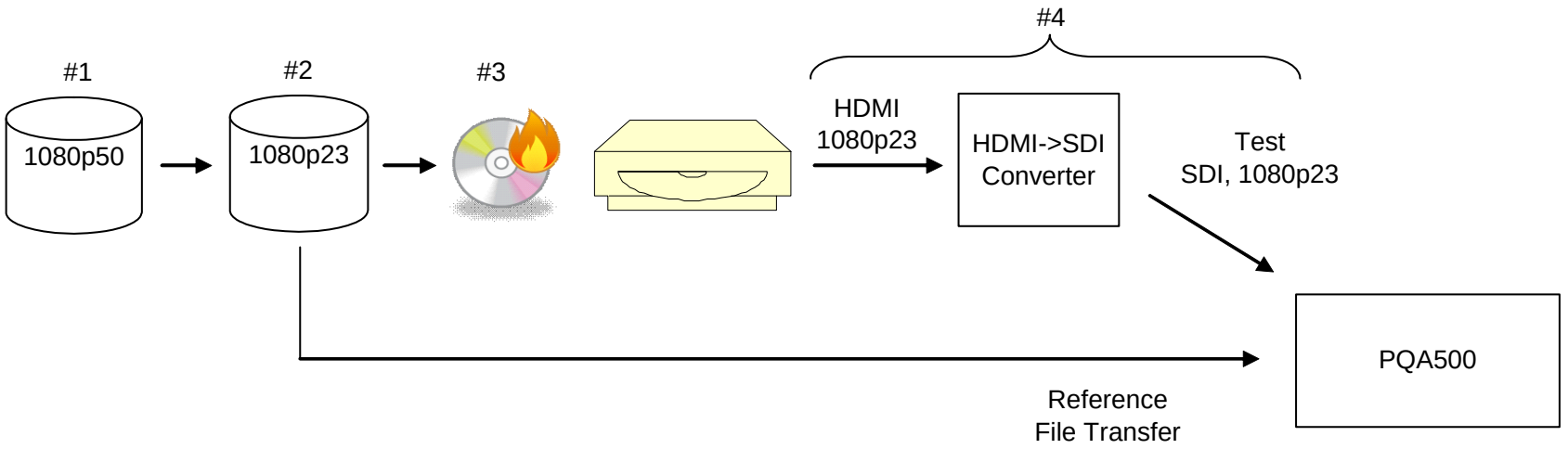
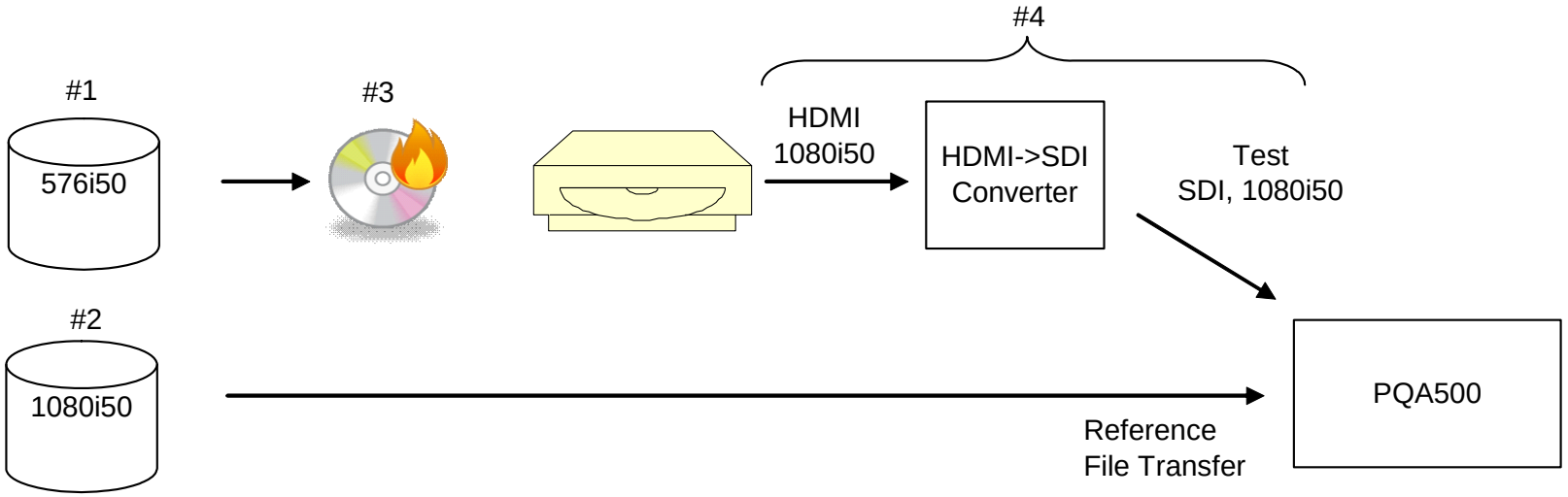
Picture Quality Measurement for Blu-ray / DVD player





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Blue-ray Player upconverter testing from SD to HD format

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Baseband Portfolio Overview

Performance Waveform Monitors
WFM8300/WFM8200
WFM7120/WFM7020
WFM6120

Audio Monitor
AMM768

Performance Rasterizers
WVR7120
WVR7020
WVR6020

Compact Waveform Monitors
and Rasterizers
WFM4000/5000
WVR4000/5000

Test Signal Generator/
Sync Pulse Generator
TG700

Sync Pulse Generators
SPG600/300

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MPEG Generators, Analyzers, Monitors & Software Tools

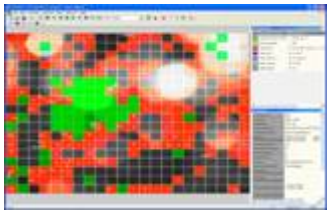
MPEG Portfolio Overview

Solving today's digital video delivery and quality challenges

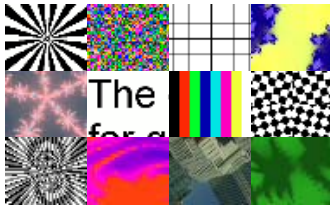
MPEG Test Systems & Software
MTS430/400P/4SA

MPEG Generators
MTX100B/RTX100B/RTX130B

MPEG Monitors
MTM400A



Next Generation Compressed
Video ES Analysis
MTS4EA/MTS4CC



Test Streams
Vclips

File-Based
Video Content Analysis
Cerify™
CYSW

Analysis

Generation

Operational

Tektronix®

Thank You !!!

Any Questions?

Tektronix®