VQTS-100

Video Quality Test System

VideoQ, Inc
3283 Kifer Road
Santa Clara, CA 95051
www.videoq.com

Key Features

- Complete self-contained unit combining hardware and software tools to measure the quality of analog or digital video
- Suitable for testing both simple single stage CVBS-to-CVBS links and complex multi-stage CVBS video links, which may include RF modems and/or digital codecs
- Comprised of:
  - Test Signal Generator Module
    - VQMA only option: Play-out of VQMA test pattern in a variety of formats
    - VQL Option: Play-out of full comprehensive library of VideoQ sophisticated test patterns and sequences
  - Video Capture Module
  - VQMA - fully automated Software Video Analyzer
- Ideal tool for video link facilities and video development labs, instantly revealing your video system performance

VQTS-100 Value Proposition

Competitor Solution

Pros:

- Standard off-the-shelf products from established supplier

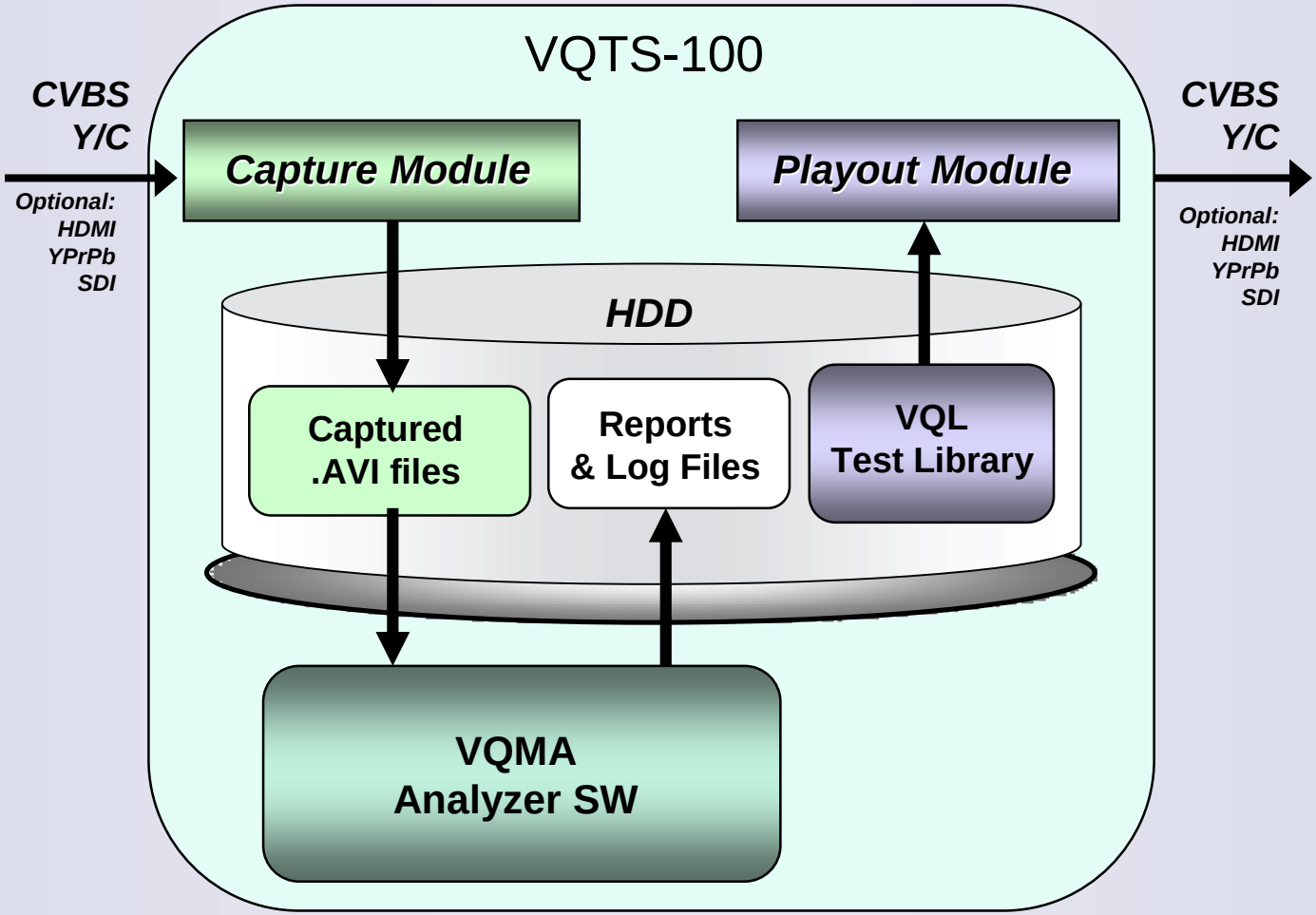
Cons:

- Extremely high cost of the already aged equipment ($50-100K per set)
- Bulky Solution: Two units (TSG and Analyzer) plus PC for automation
- Labor-intensive tests by highly skilled staff
- Control and integration in the system via old-style RS and/or GPI connections is not easy

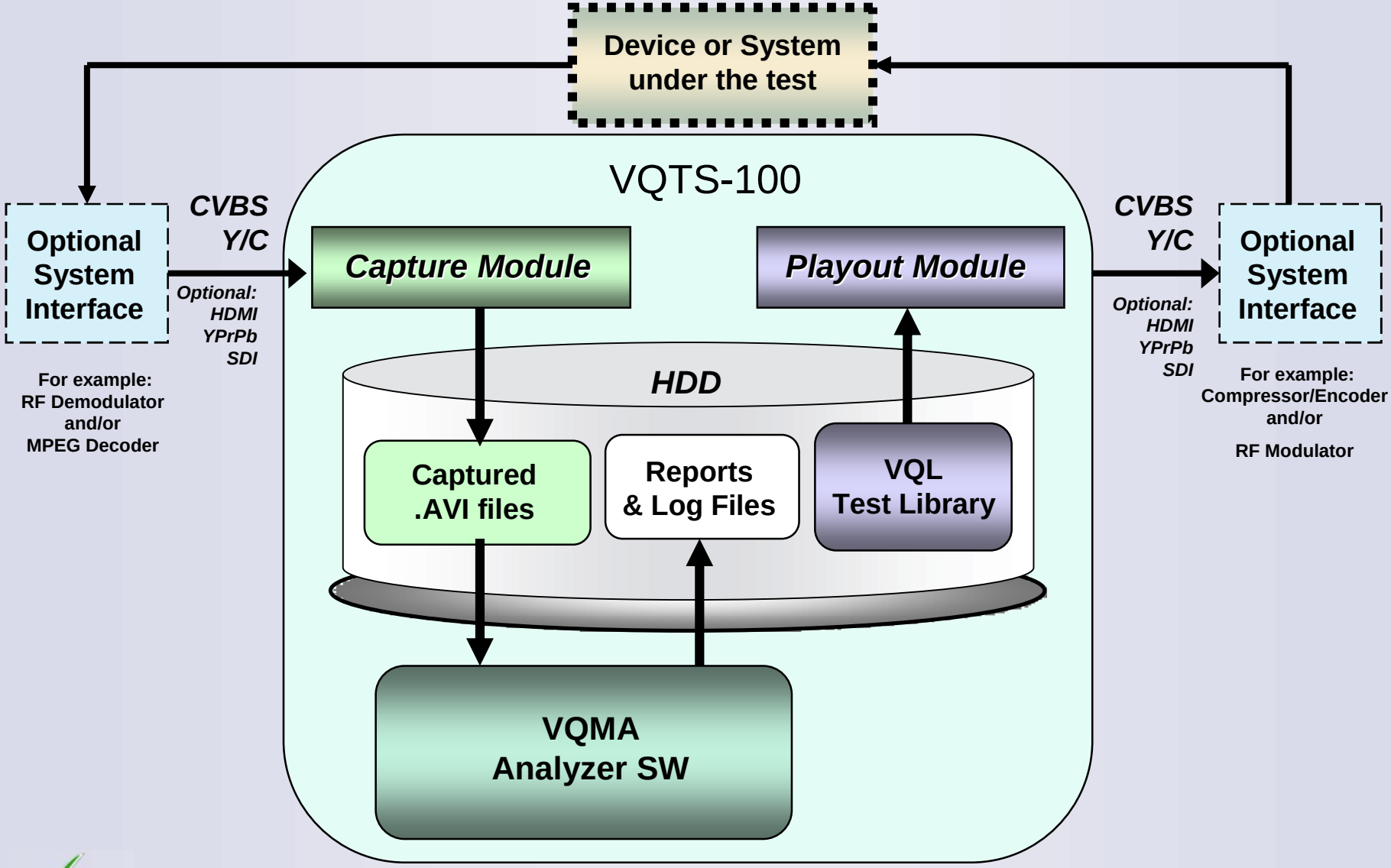
VQTS-100 from VideoQ

- Reasonably priced all-in-one PC-based compact system
- Accurate automated video measurement methodology: *full report in just few seconds, no video engineer required*
- Flexible, easy to customize Windows XP GUI and robotic ‘batch’ mode
- Build-in network connectivity
- Expandable Modular Solution with future upgrades into multi-format Test Generator/Analyzer

VQTS-100 Architecture



VQTS-100 Application Diagram



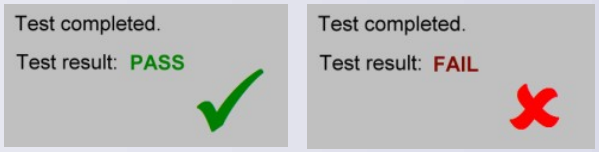
VQTS-100 Operation

There are three major modes of VQTS-100 system operation:

- Preview
- Automated Measurement
- Off-line Analysis

The VQTS-100 system modules can be launched at any moment in any one of these three modes; two or even all three modes can be used in parallel.

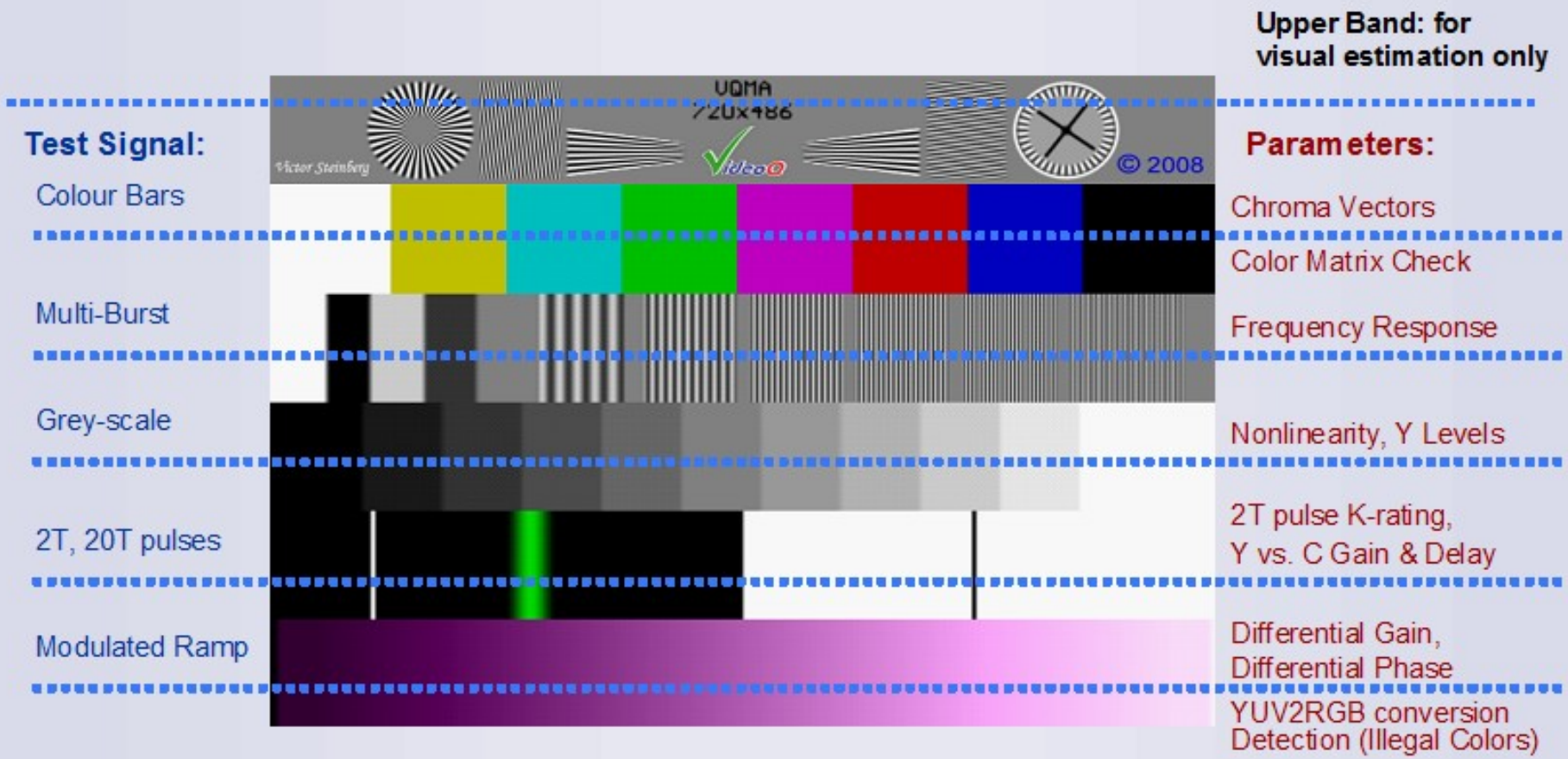
- Test Result in ‘Pass/Fail’ format appears in few seconds



- Machine-readable VQTS-Log.txt file can be opened at any time in any text viewer/editor
- Detailed report can be printed at any time, e.g. in PDF file format
- Test Generator Module starts automatically on a system power-up

VQMA - Auto-Matrix Test Pattern used by VQTS system

All-In-One: Single pattern allows automatically measure multiple video signal parameters



Noise & Interferences accurately measured on any static image by analysis of frame differences

Key Video Measurements

Parameter	Unit	*VQMA Test Matrix Component*
Black & White Levels	%	*Black & White Bars*
Nonlinearity, Y levels	%	*Gray-scale*
K-rating	%	*2T Pulse*
C vs. Y Gain & Delay	dB, ns	*20T Pulses*
Frequency Response	dB vs. MHz	*Multi-Burst*
Differential Phase & Gain	deg, %	*Modulated Ramp*
UV Vector Errors	%, deg	*Color Bars*
SNR & Noise Spectrum	dB, dB vs. MHz	*VQMA pattern (all bands)*

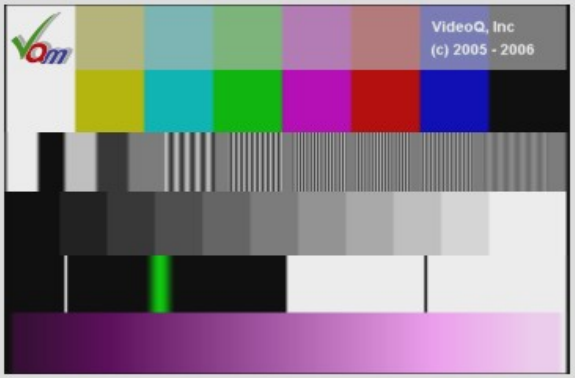
Summary Page Screenshot

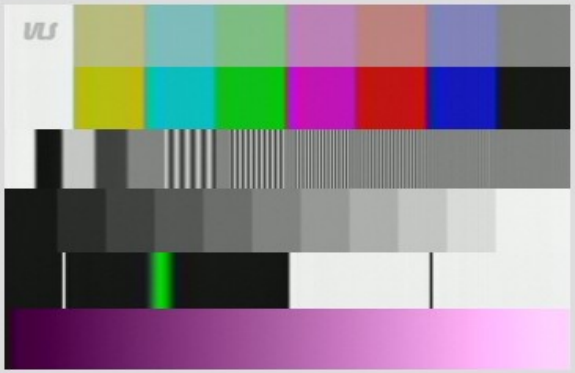
C:\vq\NTSC Tuner 1mV.avi - VQM

File BitStream View Aperture Help

VQM Test Failed Fri Mar 31 12:12:20 2006 ✗ **Video Quality Test Summary** *Averaged of 50 x 32 lines of 32 frames*

Parameter	Measurement	Unit	Target	Pass
Black Level	3.5 %, (23.6)	%, (8 bits)	-5.0 -- +5.0 %	✓
White Level	101.6 %, (238.5)	%, (8 bits)	95.0 -- 105.0 %	✓
Unfiltered Y SNR	35.79	dB	> 40 dB	✗
K Rating on 2T Pulse	1.47	%	< 3 %	✓
Chroma vs Luma Gain	1.58	dB	0.0 -- +0.0 dB	✗
Chroma vs Luma Delay	287	ns	-40 -- +40 ns	✗
Differential Gain	5.76	%	< 5 %	✗
Differential Phase	1.1	degree	< 5 degree	✓
Freq. Response @ 1.00 MHz	-0.04	dB	-1.0 -- +1.0 dB	✓
Freq. Response @ 2.00 MHz	-1.11	dB	-1.0 -- +1.0 dB	✗
Freq. Response @ 3.00 MHz	-3.06	dB	-3.0 -- +1.0 dB	✗
Freq. Response @ 3.58 MHz	-7.41	dB	-4.0 -- +1.0 dB	✗
Freq. Response @ 4.20 MHz	-26.16	dB	-6.0 -- +1.0 dB	✗
Freq. Response @ 5.80 MHz	-31.43	dB	-20.0 -- +1.0 dB	✗

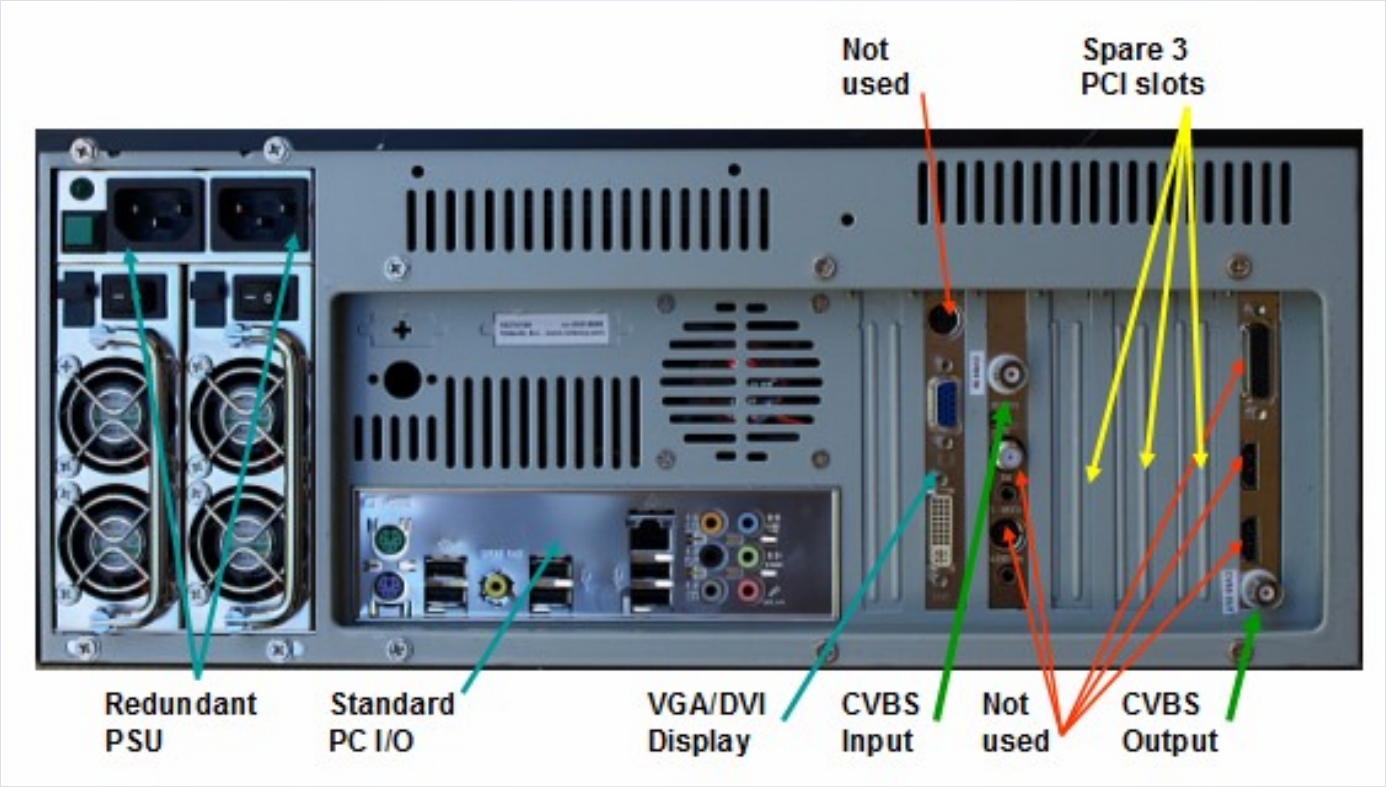




Reference *Test*

C:\vq\NTSC Tuner 1mV.avi

VQTS-100 Rear Panel



VQTS-100 Specifications

Copy Protection
USB Dongle

- Video output:
  - NTSC/PAL CVBS, 1Vpp on 75 Ohm, BNC x1
- Video input:
  - NTSC/PAL CVBS, 1Vpp on 75 Ohm, BNC x1

- 4U case, Pedestal or Rack-mounted:
  - Weight: 12 kg
  - Dimensions (D x W x H):
    522 mm x 430 mm x 176 mm
    (20.5“ x 16.9" x 6.9")
  - Detachable handles for easy carrying
  - Detachable rack mount ears
- Power Supply Unit:
  - Redundant x2, 400 Watt, 115-230 V, 50/60 Hz
- Easy swap 2 x 80 mm rear fans, 1 x 120 mm front fan
- PCI expansions slots x 3
- USB ports x 8
- Intel Pentium Dual Core 2.2 GHz
- 2 GB RAM
- 250 GB HDD
- DL +/-RW DVD Drive
- Windows XP Pro OS

VQMA Software Analyzer (also see next 11 slides)

- Software executable running under Windows
- Unique Matrix Test Pattern to check ALL parameters in one process
- Detailed and sophisticated analysis of video data using spatial and temporal filtering
- Highly accurate and consistent results due to sophisticated processing algorithms
- 0.1 dB accuracy of SNR and frequency response meters
- 0.1 dB and 0.1 degree accuracy of differential gain and differential phase
- Built-in spectrum analyzer with industry standard weighting filters
- NTSC and PAL standards supported
- User-friendly intuitive GUI for off-line analysis
- Unattended (‘robotic’) mode provides machine-readable log file

VQMA Modes of Operation

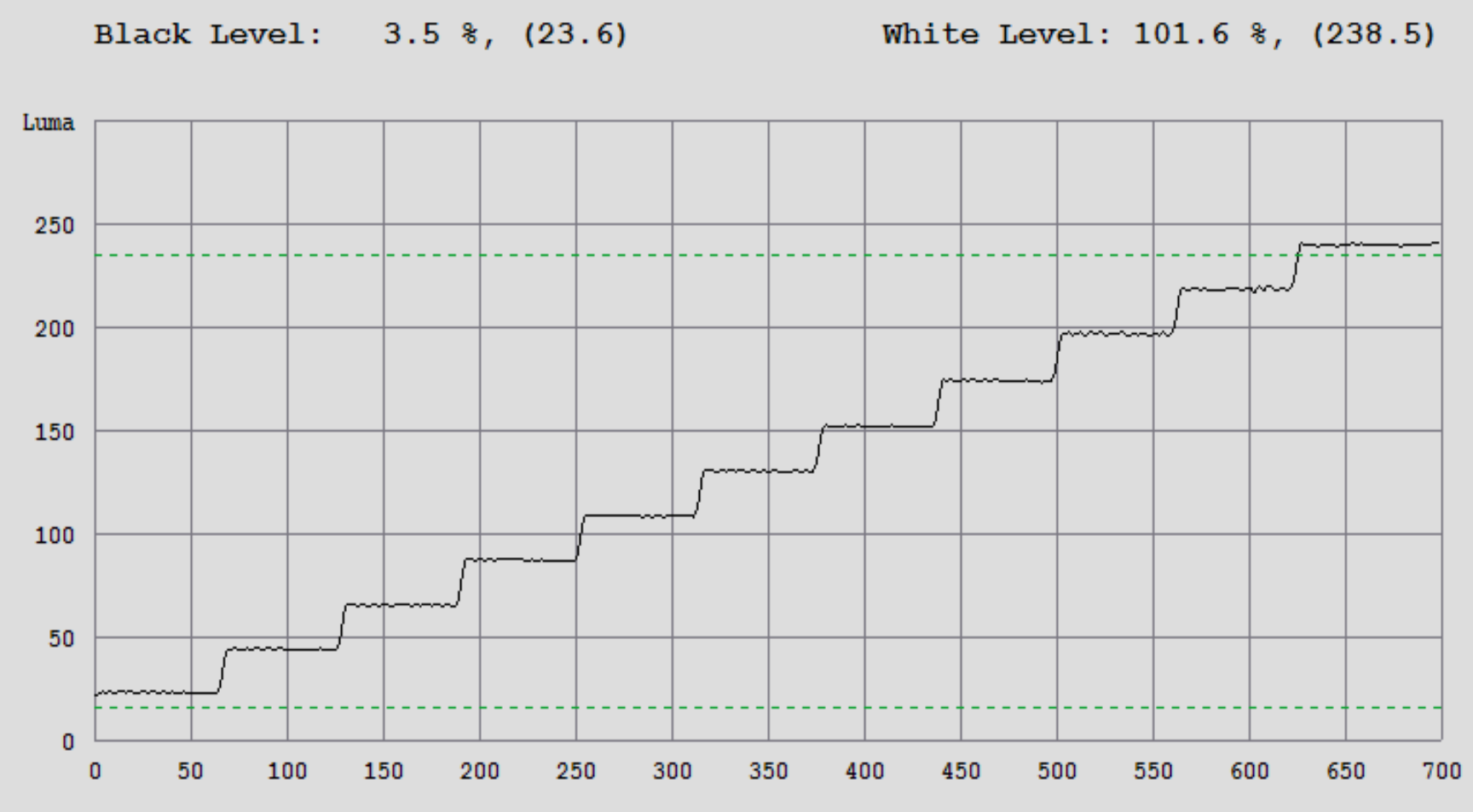
VQMA software can be launched in two ways:

- Windows GUI mode – aimed for a video design and verification environment. It provides a detailed multi-page printable report file with all test results in both numerical and graphic representation
- Unattended mode provides machine readable log file with numerical representation of test results for automated production environment or automated software drivers verification, e.g. for inclusion in higher level automated QA systems

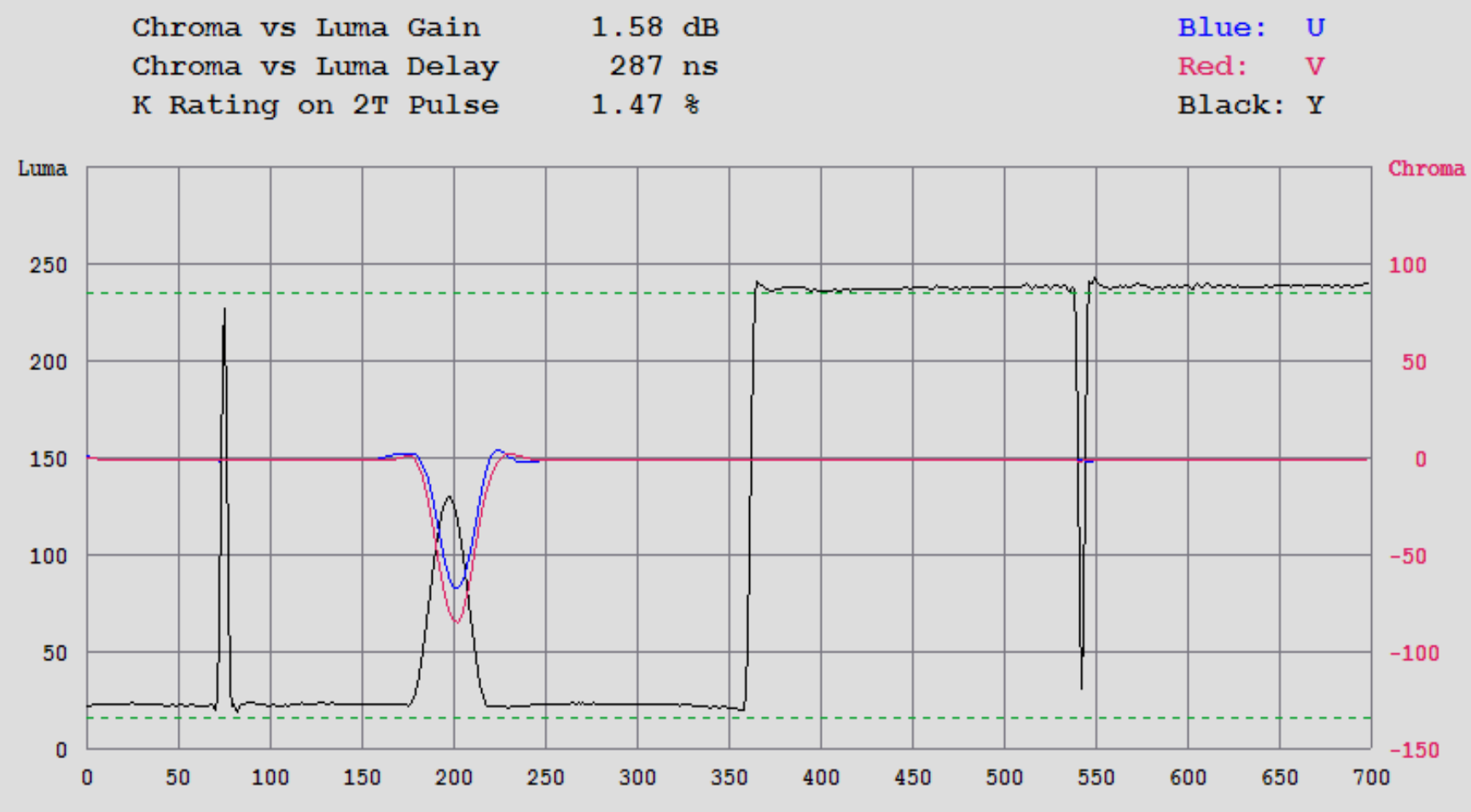
Either mode allows customization of the tolerance values by direct editing of the .INI files to match the performance of particular board types/models.

VQMA program checks the captured video data against the tolerance values contained within the customizable .INI file.

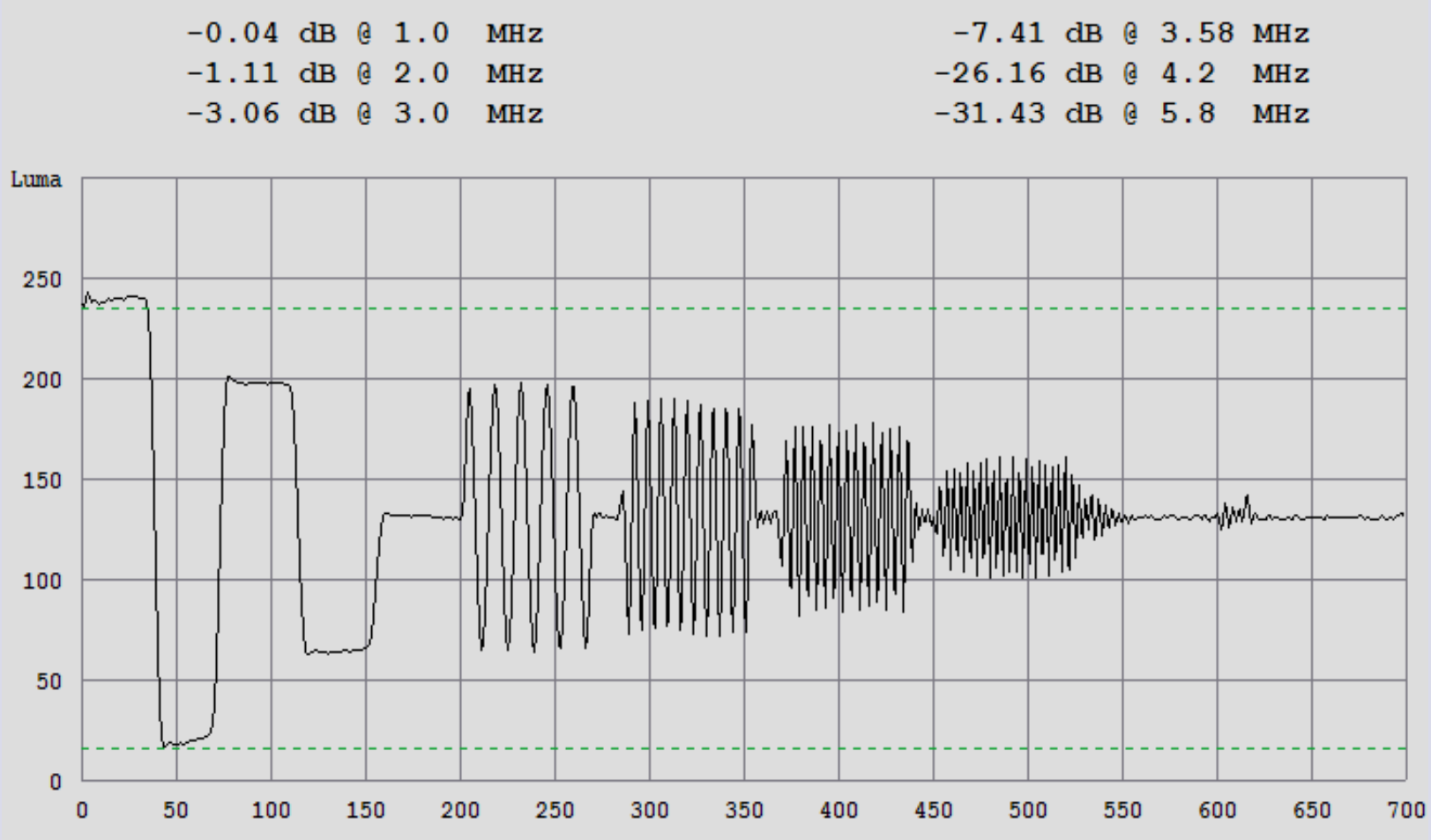
Screenshot Example - Staircase Display



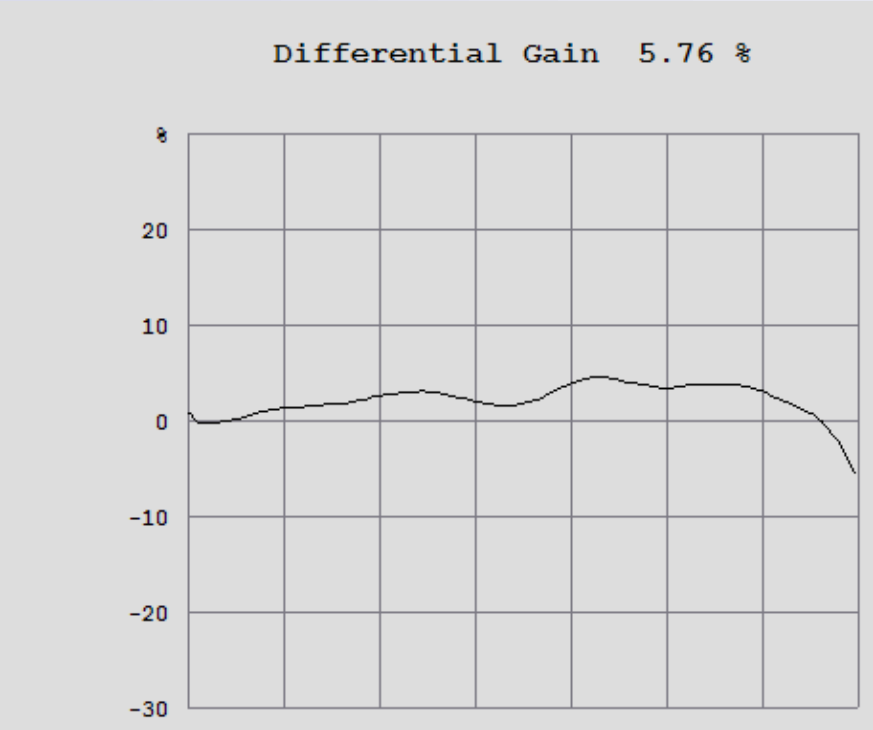
Screenshot Example - K-Rating & C vs. Y

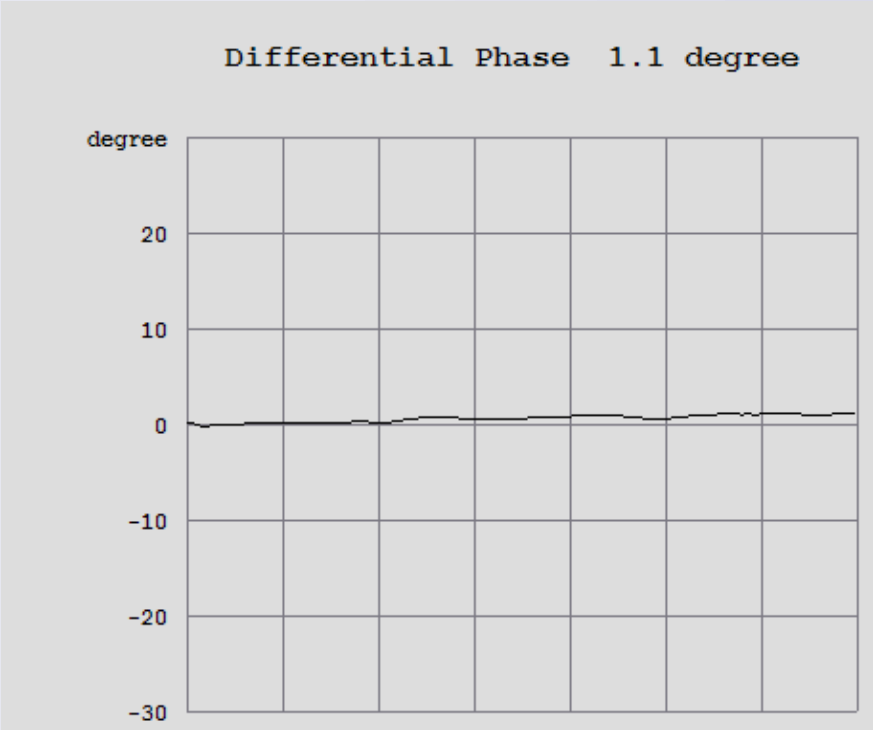


Screenshot Example - Frequency Response

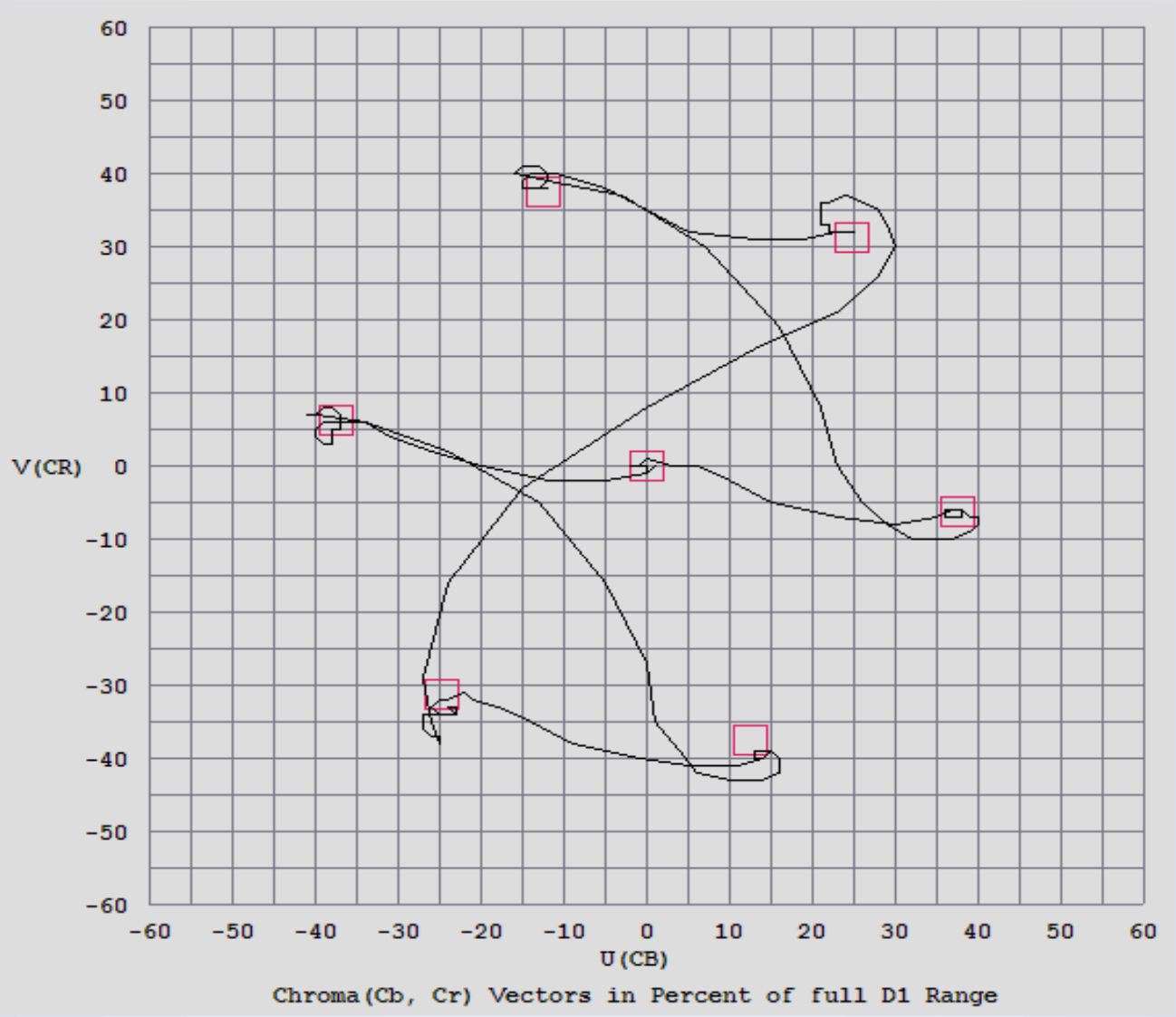


Screenshot Example - Differential Gain & Differential Phase



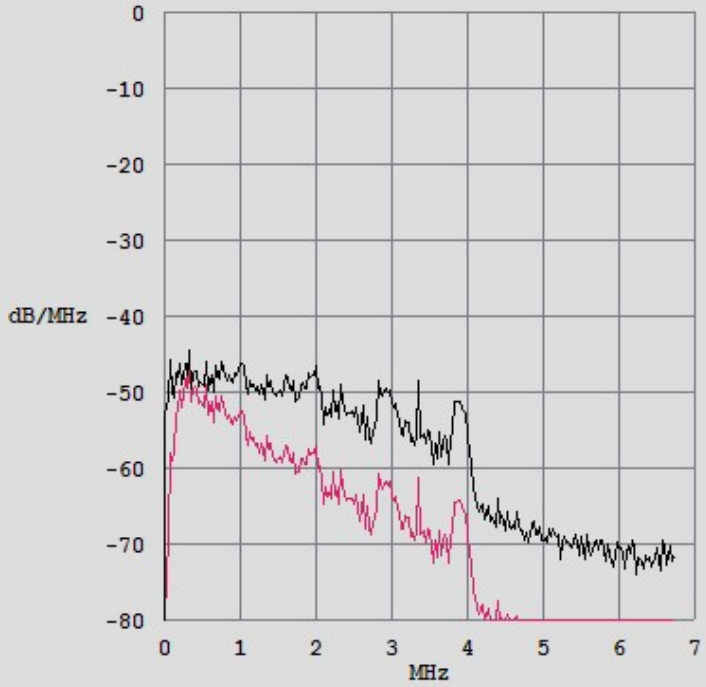


Screenshot Example - Chroma Vectors



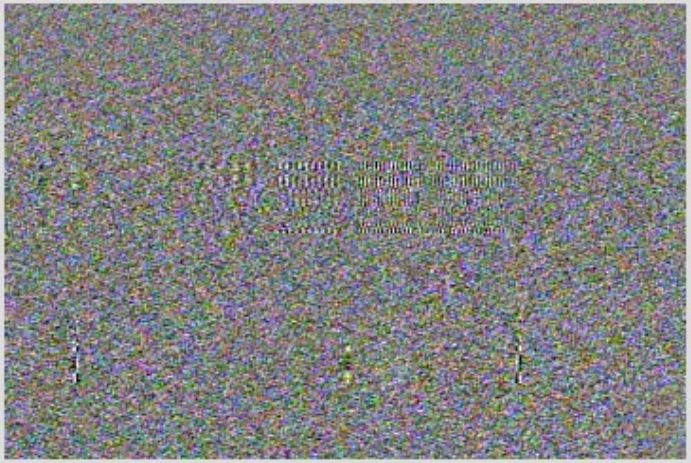
Screenshot Example - Noise Measurement Results

Y Noise Level RMS	3.56 (8 bit level)		
Y SNR unfiltered	35.79 dB	UV SNR 1.5 MHz	43.36 dB
Y SNR 4.2 MHz	36.13 dB	Y SNR 4.2 MHz weighted	42.08 dB
Y SNR 6.0 MHz	36.10 dB	Y SNR 6.0 MHz weighted	42.07 dB



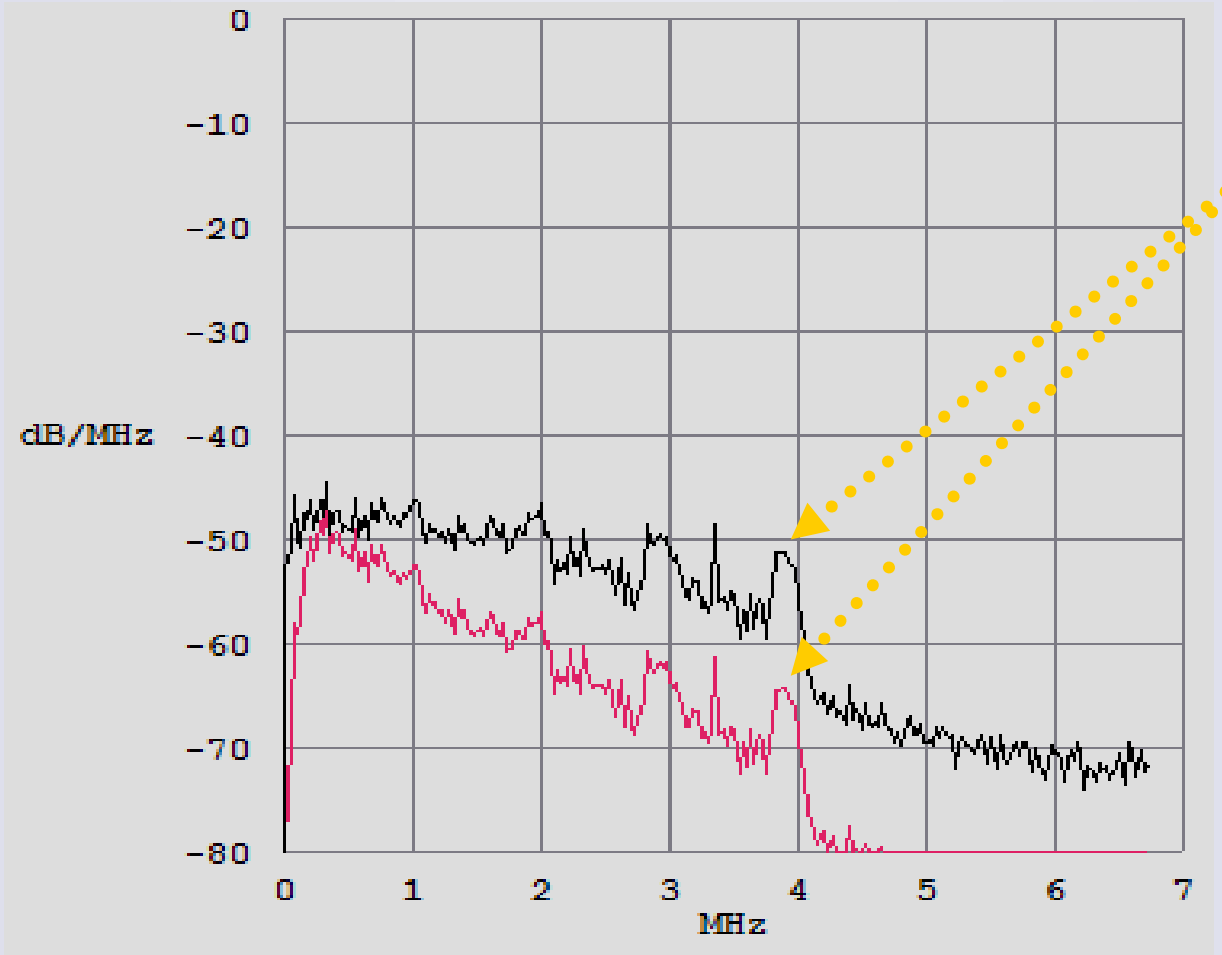
Noise Spectrum

Noise weighted in red



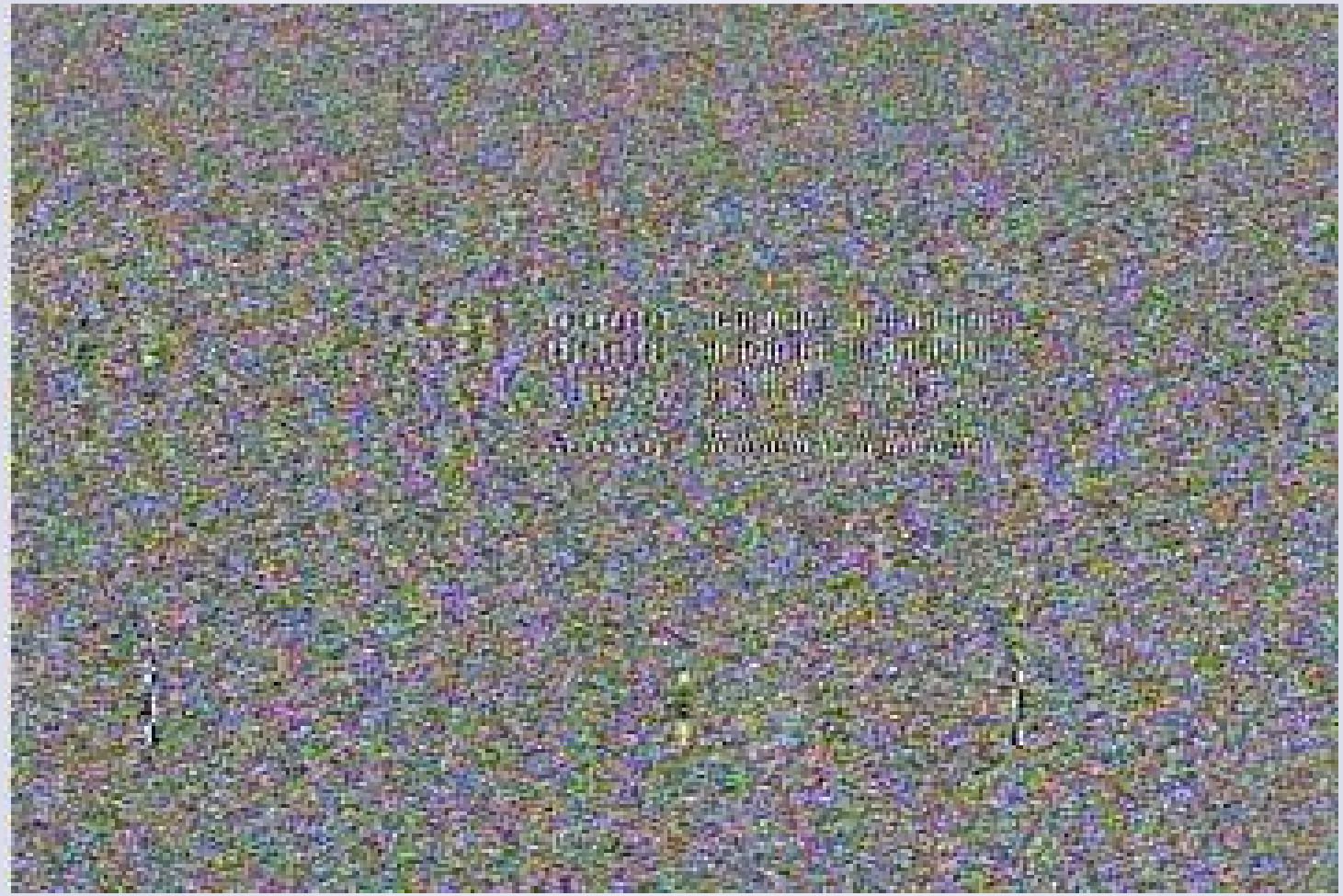
8 x Noise

Noise Spectrum Display – Interference Detection



Noise Pattern View – magnified

In this example: both additive noise & sync jitter are visible



Automated Mode – Fragment of Log File

VideoQ Inc. Copyright [c] 2005-2008

V2.4.1, 03/31/08 12:13:14 PM

BL, 10/19/05 2:13:14 PM, 10/19/05 2:13:14 PM, Success, 2.8, %, Success

WL, 10/19/05 2:13:14 PM, 10/19/05 2:13:14 PM, Success, 99.3, %, Success

SNR, 10/19/05 2:13:14 PM, 10/19/05 2:13:14 PM, Success, 52.23, dB, Success

KR, 10/19/05 2:13:14 PM, 10/19/05 2:13:14 PM, Success, 0.94, %, Success

CYG, 10/19/05 2:13:14 PM, 10/19/05 2:13:14 PM, Success, 1.51, dB, Failure

CYD, 10/19/05 2:13:14 PM, 10/19/05 2:13:14 PM, Success, 2, ns, Success

DG, 10/19/05 2:13:14 PM, 10/19/05 2:13:14 PM, Success, 1.21, %, Success

DP, 10/19/05 2:13:14 PM, 10/19/05 2:13:14 PM, Success, 0.8, degree, Success

FR1, 10/19/05 2:13:14 PM, 10/19/05 2:13:14 PM, Success, 0.12, dB, Success

FR2, 10/19/05 2:13:14 PM, 10/19/05 2:13:14 PM, Success, -0.77, dB, Success

FR3, 10/19/05 2:13:14 PM, 10/19/05 2:13:14 PM, Success, -1.35, dB, Failure

FR36, 10/19/05 2:13:14 PM, 10/19/05 2:13:14 PM, Success, -1.88, dB, Failure

FR42, 10/19/05 2:13:14 PM, 10/19/05 2:13:14 PM, Success, -3.05, dB, Failure

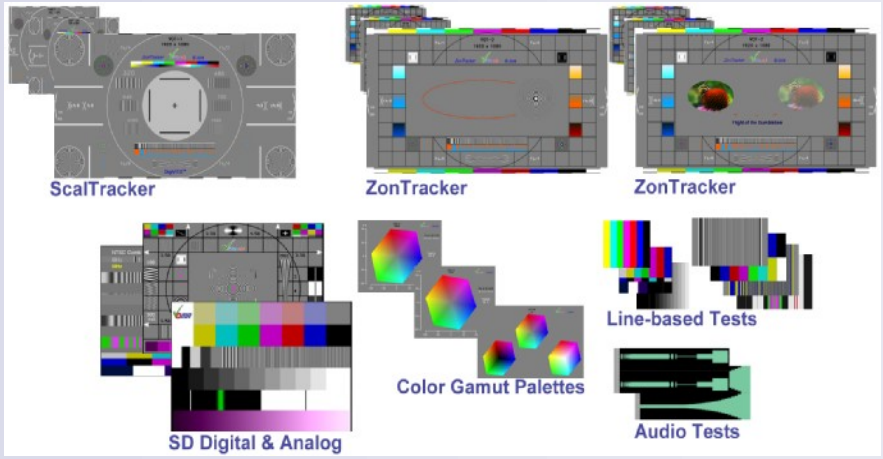
FR58, 10/19/05 2:13:14 PM, 10/19/05 2:13:14 PM, Success, -4.38, dB, Failure

Customizable Target Values – Fragment of .INI File

```
VQNTSC.ini - VideoQ inc. Copyright [c] 2005 - 2008
; [BL]
; BLUNIT=%
; BLMIN=-5.00
; BLMAX=5.00
; [WL]
; WLUNIT=%
; WLMIN=95.00
; WLMAX=105.00
……..
.....
; [SNR]
; SNRUNIT=dB
; SNRMIN=40.00
; [KR]
; KRUNIT=%
; KRMAX=3.00
; FR36MAX=1.00
; [FR42]
; FR42UNIT=dB
; FR42MIN=-1.00
; FR42MAX=1.00
; [FR58]
; FR58UNIT=dB
; FR58MIN=-1.00
; FR58MAX=1.00
```

Other VQTS-related VideoQ Products

VQL – Library of Test Files



Software Coders, Transcoders, Players, Analyzers

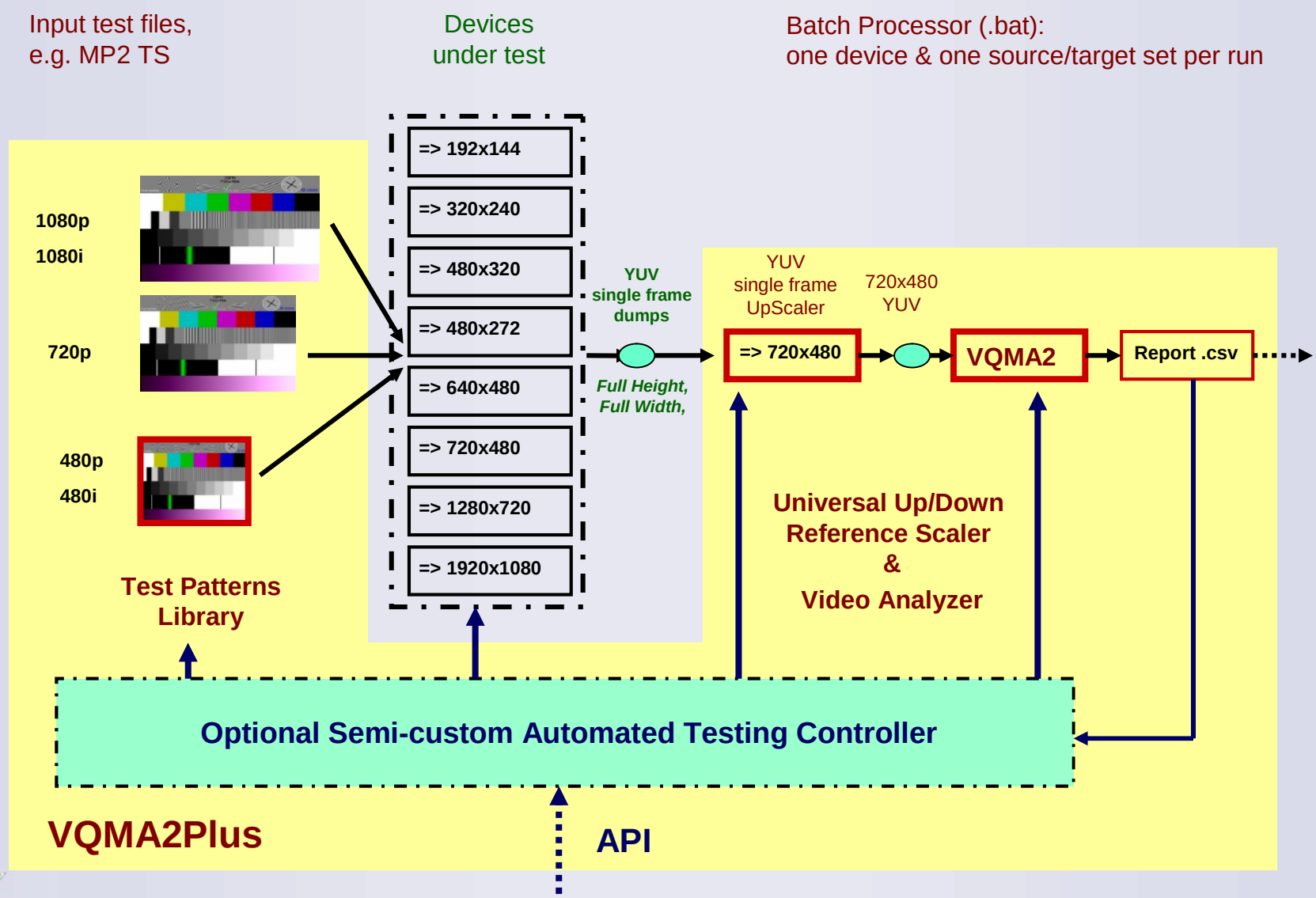
VQL Compatible Hardware Players/Generators

3Genie by NuMedia

VQTS by VideoQ

Other (3rd party) players

VQL/VQMA in Multi-Resolution Applications



VQB – Video Quality Benchmarking Tool

VQB is a sophisticated video benchmarking tool for multiple segments of IPTV, PC and CE industries. It is targeted at:

- Industry analysts
- Computers, video servers and related hardware manufacturers
- GPU and CPU suppliers
- Software developers
- System integrators
- PC-based home theatre installers and customers
- PC users interested in getting top video performance

VQB Methodology

All parameters critical for video quality of professional, semi-professional and consumer devices can be sub-divided into two classes:

1. **Classical** (deterministic) video processors parameters:
   - Picture Size, Aspect Ratio and Position, Black Bands (Letterbox/Pillar-box)
   - Y and UV Gain and Offset
   - Frequency Response, including its off-band part, i.e. Aliasing
   - Pulse Response (K-rating)
   - Inter-frame Random Noise and Periodic Interferences
   - Differential Phase and Differential Gain (affected by YUV=>RGB conversion)
2. **Digital Compression** (pseudo-random) artifacts:
   - Blockiness and Mosquito Noise (aka Digital Noise)
   - Video Frames Drop/Freeze and related AV sync problems