



Video Analyzer and Scope

Training Presentation

August 2018

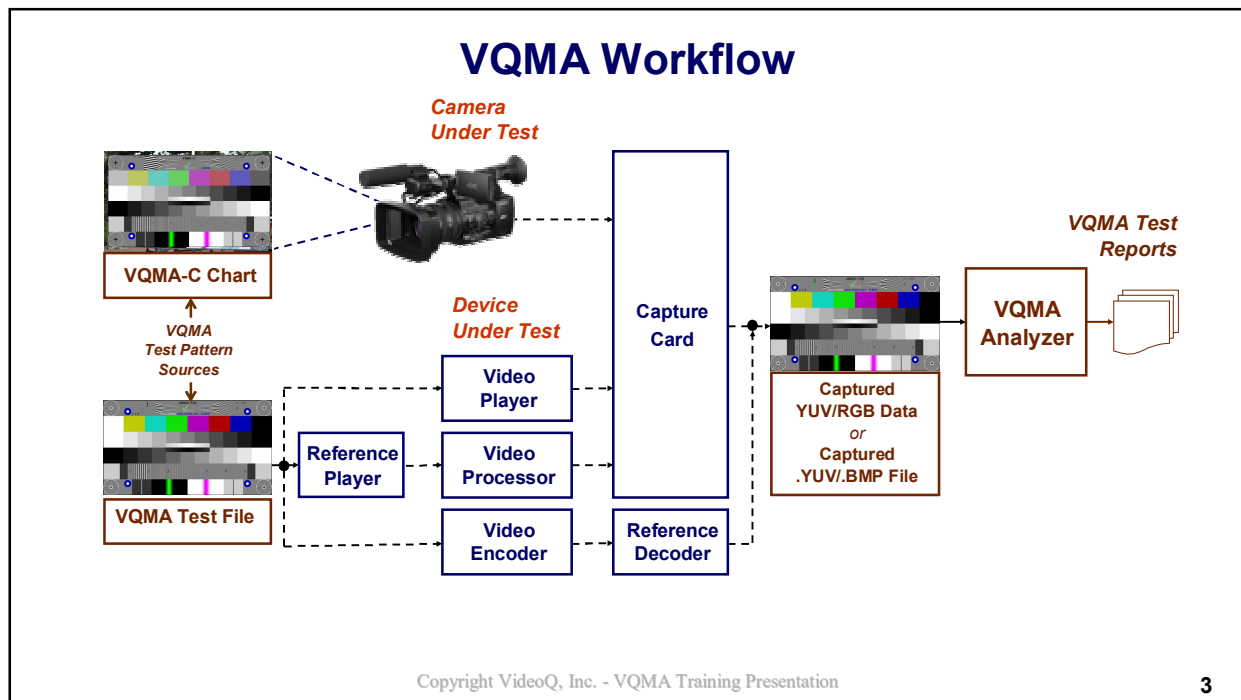


www.videoq.com

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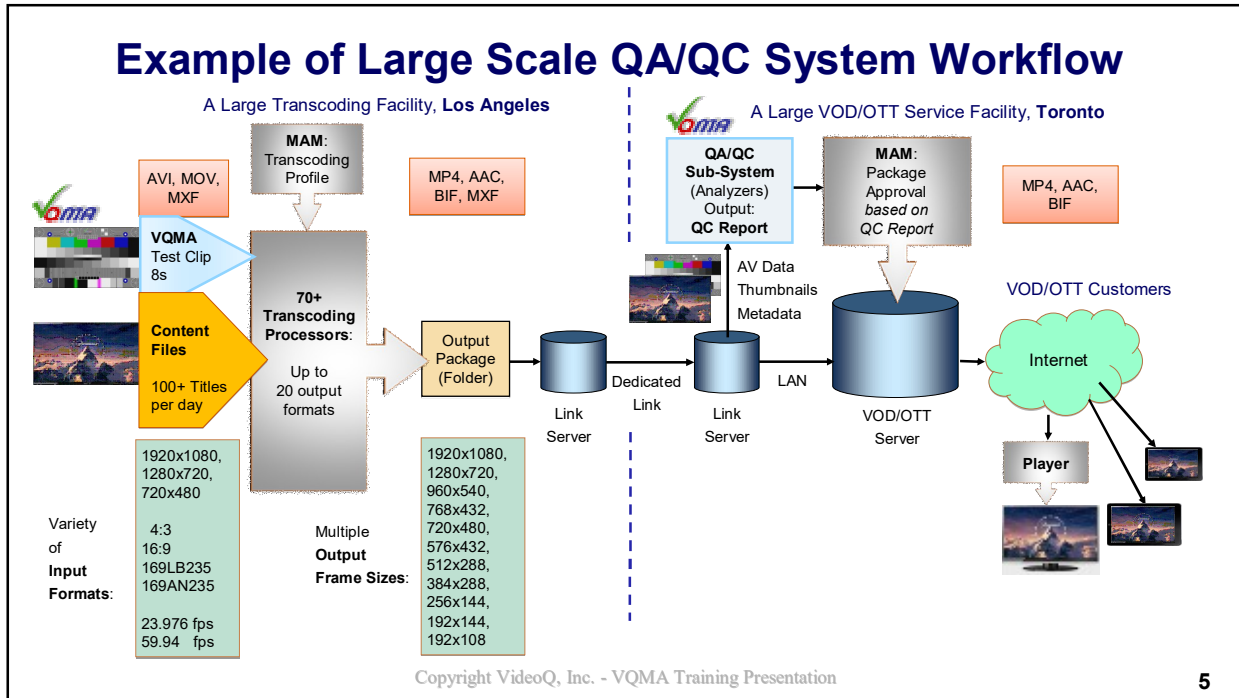
Applications

- Video Analyzer for objective Video Processing Chain Integrity & Performance Validation
- With the VideoQ VQMA-C Optical Reflectance Chart it measures video cameras
- With VQFF adapter VQMA opens media files in a variety of compressed and uncompressed formats
- Easy-to-use tool, instantly revealing performance of your hardware and/or software video devices: transcoders, encoders, scalers, media players, STBs, video cameras, etc.
- User-selectable reporting modes:
 - a) machine-readable file with Pass/Fail marks,
 - b) detailed multi-page on-screen document, printable to PDF
- Combined with the appropriate capture device, e.g. Unigraf, BMD or AJA card, VQMA measures the quality of SDI, DVI/HDMI, DisplayPort or LVDS video signals



VQMA Features

- 4th generation of VideoQ best-selling software product, *suitable for any video format, any frame size (from 192x108 to 4096x3072), any frame rate, HDR & WCG support coming soon*
- Software executable under Windows™ (XP, 7, 8, 10)
- USB dongle copy-protected, dongle-per-workstation
- Automated analysis on the companion VQMA Matrix Test Pattern
- Variety of VQMA Test Pattern formats: Optical Chart, File, Signal, Stream
- Unique patented algorithms for accurate & fast measurements (typically 2-5 seconds)
- Built-in YUV/RGB Waveform Scope
- Noise Measurement and Waveform Scope work on any static image
- Windows GUI Mode for R&D and product verification
- Command Line Interface (Batch) Mode for automated QA/QC operation



Analyzed Parameters

PASS

FAIL

- **Geometry:** Scaling, Aspect Ratio, Position, Tilt, Keystone
- **Levels:** Black, White, Color Bars, RGB Balance, Gamma
- **H & V Shading** (Levels Spatial Uniformity)
- **Frequency Response:** in dB vs. scalable tvl, including aliasing levels
- **UV vs. Y Gain** (Color Saturation)
- **K-rating** on needle pulse
- Comprehensive **Noise Analysis**
- Optionally: **Frames Cadence** Check and **AV Sync Error** Check

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

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VQMA Summary Page (GUI Mode)

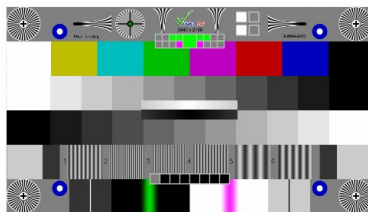
C:\VQMA Demo Files\VQMA_UHD_24fps_8frms_BMPs & YUV\VQMA_UHD_24fps_8frms_BMP2UYVY.YUV

File YUV Frame Size Color Space View Page# Scope View Scope Line Scope Averaging Filter Help

Frame Size: 3840 x 2160, Chart: 3840 x 2160 **1. Test Summary** VQMA Test Result: **PASSED**

Parameter	Measurement	Unit	Target	Pass
Black Level	0.0 % (16.0)	% (0.0-255.0)	-5.0 -- +5.0 %	✓
White Level	100.0 % (255.0)	% (0.0-255.0)	95.0 -- 105.0 %	✓
Unfiltered Y SNR	100.0	dB	> 40 dB	✓
K Rating on 2T Pulse	0.0	%	< 3.0 %	✓
UV vs. Y Gain	-0.0	dB	-1.0 -- +1.0 dB	✓
Luminance Gamma	2.2		1.8 -- 2.5	✓
RGB Balance Error	0.0	%	< 10 %	✓
Y Range Black Overload	0.0	%	< 15 %	✓
Y Range White Overload	0.0	%	< 15 %	✓
Frequency Response F1 = 100 tvl	-0.0	dB	-1.0 -- +0.5 dB	✓
Frequency Response F2 = 200 tvl	0.0	dB	-2.0 -- +1.0 dB	✓
Frequency Response F3 = 300 tvl	0.0	dB	-3.0 -- +1.0 dB	✓
Frequency Response F4 = 400 tvl	0.1	dB	-4.0 -- +1.0 dB	✓
Frequency Response F5 = 500 tvl	0.0	dB	-5.0 -- +1.0 dB	✓
Frequency Response F6 = 600 tvl	0.0	dB	-6.0 -- +1.0 dB	✓

C:\VQMA Demo Files\VQMA.INI
Automatically selected YRGB Nominal Range: 16-235 Automatically selected Rec709 (HD) YUV<RGB Matrix VQMA Test Pattern detected



VideoQ VQMA, version 4.1.2 - Tue May 23 20:35:38 2017
C:\VQMA Demo Files\VQMA_UHD_24fps_8frms_BMPs & YUV\VQMA_UHD_24fps_8frms_BMP2UYVY.YUV

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VQMA CLI & Machine-readable Report (CLI Mode)

```

C:\VQMA Demo Files> start notepad TestReport1_PASS.TXT
C:\VQMA Demo Files> start notepad TestReport2_PASS.TXT
C:\VQMA Demo Files> start vqma -i c:\VQMA Demo Files\current2.yuv -o TestReport1.txt -h 1920 -v 1080
C:\VQMA Demo Files> start vqma -i c:\VQMA Demo Files\current2.yuv -o TestReport2.txt -h 1920 -v 1080
C:\VQMA Demo Files> start notepad TestReport1_PASS.TXT
C:\VQMA Demo Files> start notepad TestReport2_PASS.TXT
    
```

```

TestReport2_PASS.TXT - Notepad
File Edit Format View Help
; VideoQ Inc. Copyright [c] 2005-2015
; VQMA v4.1.2.2 Test Report
TEST_DATE_TIME_YEAR, Tue Sep 13 23:23:51 2016
;
REPORT_FILE, "c:\VQMA Demo Files\TestReport2_PASS.TXT"
TEST_FILE, "c:\VQMA Demo Files\current2.yuv"
INI_FILE, "c:\VQMA Demo Files\current2.INI"
;
TEST_RESULT, PASSED
;
DATA_TYPE, YUV
FRAMES_ANALYZED, 8
FRAME_WIDTH, 1920
FRAME_HEIGHT, 1080
VQMA_CHART_VALIDATION, Success
CHART_TYPE, Test Pattern
ORIGINAL_FRAME_WIDTH, 1920
ORIGINAL_FRAME_HEIGHT, 1080
CHART_WIDTH, 1920
CHART_HEIGHT, 1080
YRGB_RANGE_SELECTION, Auto
SELECTED_YRGB_RANGE, 16-235
COLOR_MATRIX_DETECTED, Rec709-HD
COLOR_BARS_MAX_RGB_ERROR, 2, 8 bit value
MAX_RGB_ERROR_COLOR, Green
;
    
```

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VQMA Test Pattern Features

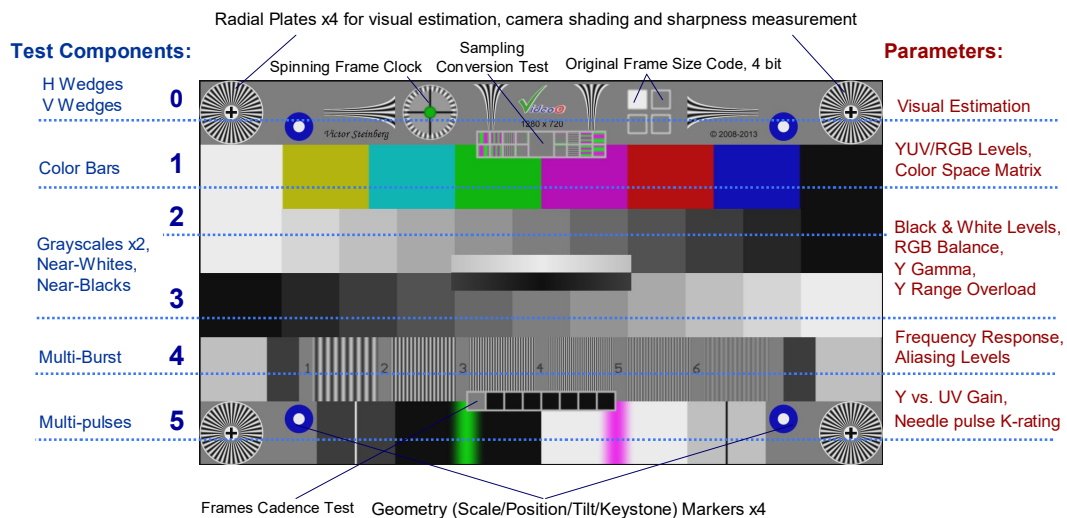
- VQMA test pattern exists in a variety of formats: VQMA-C Optical Chart, File, Signal, Stream
Some test components are different or not present on VQMA-C Optical Chart
- VideoQ methodology allows triple usage: visual, instrumental and fully automated
- VQMA test pattern contains specially designed components making video calibration an easy and straight forward procedure
- The test pattern components are designed to be compatible with a majority of video cameras, software or hardware codecs and media players
- VQMA test pattern contains 6 relatively large bands, so it remains suitable for accurate measurements even after low bitrate coding and severe position and/or scaling errors; zoom-out down to 25% of original size, overscan up to 105%, optical chart tilt, flickering or non-uniform illumination are acceptable

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VQMA Test Pattern Composition

All-In-One: Single pattern allows automatic measurement of multiple video image parameters

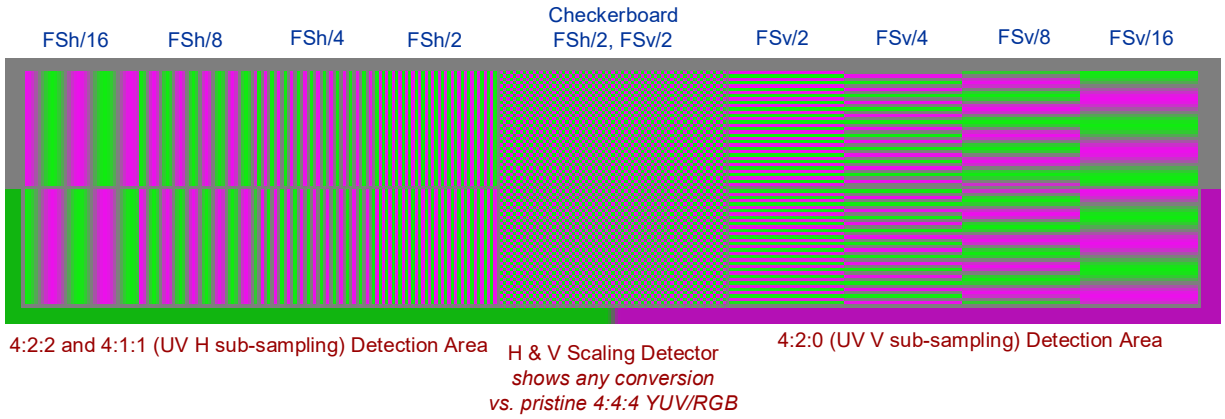


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Sampling Conversion Test Details

FSh: Original Horizontal Sampling Rate, FSh value in tvl is equal to the original Frame Width, pixels
 FSv: Original Vertical Sampling Rate, FSv value in tvl is equal to the original Frame Height, pixels

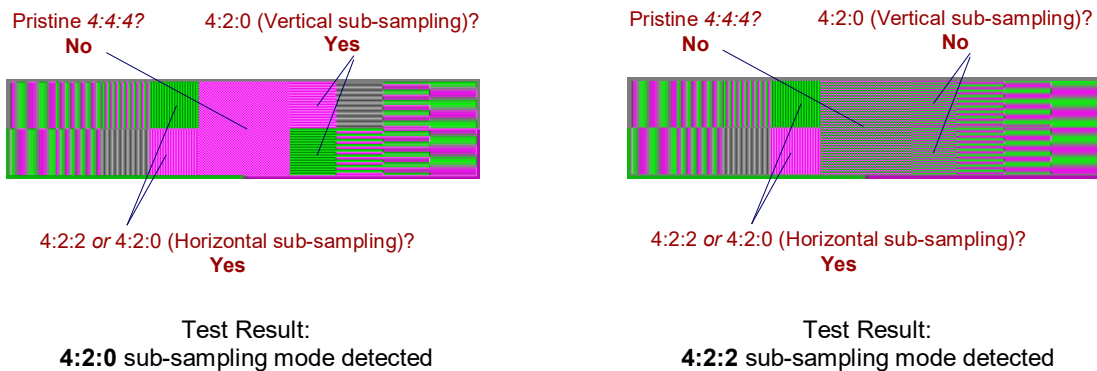


Note: Sampling Conversion Test is not present on VQMA-C Optical Test Chart

Sampling Conversion Test Usage

The Sampling Conversion Test appearance may change after codec

Particular dedicated areas indicate particular UV sub-sampling issues:



Variant with AV Sync & Dynamic Text

Original Video Format **Original Time Code** **Original Frame Size** **Timeline distance wrt AV Sync Reference Position, milliseconds**

p59.94 00:00:00:00 1920 x 1080 -1001 ms

AV Error = -1 F (-16.6 ms @ 60 fps) If "Beep" sounds at this moment, then AV Error = 0 F (0 ms). White Square Marker can be used for auto-measurement. AV Error = +1 F (+16.6 ms @ 60 fps)

Time →

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AV Sync Audio

Loop duration: 2,000 ms (2,006 ms for 23.976, 29.97 and 59.94 fps)

AV Sync Reference: "Beep" burst, -3 dBfs, 1000 Hz, 26 ms

AV Sync Reference Position = 1000 ms (1001 ms for 23.976, 29.97 and 59.94 fps)

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VQMA Reference Files AV Formats

Set of test pattern video files (optional extras: audio files and compressed media files):

- Raw formats:
 - .**YUV**, interleaved UYVY 4:2:2 8 bit or planar YUV 4:4:4 10 bit,
 - .**WAV**: 2.0 LR or 5.1 surround sound, 48 kHz, 24 bit.
- Encoded format: **.MP4**, 4:2:0, 8 bit, AVC, AAC, fixed GOP size = 1s, medium to high bitrate
- 5 frame sizes, various frame rates and interlace formats:
 - 720x480p (SD 4:3), 23.976, 24.0, 29.97, 30.0, 59.94, and 60.0 fps
 - 720x480i (SD 4:3), 29.97 fps (i29.97 aka 59.94i)
 - 720x576p (SD 4:3), 25, 50 fps
 - 720x576i (SD 4:3), 25 fps (i25 aka 50i)
 - 1280x720p (SubHD 16:9), 50, 59.94 and 60.0 fps
 - 1920x1080p (HD 16:9), 23.976, 24.0, 25.0, 29.97, 30.0, 50.0, 59.94, and 60.0 fps
 - 1920x1080i (HD 16:9), 25.0 fps (i25 aka 50i), 29.97 fps (i29.97 aka 59.94i),
 - 3840x2160p (UHD 16:9), 23.976, 24.0, 25.0, 29.97, 30.0, 50.0, 59.94, and 60.0 fps

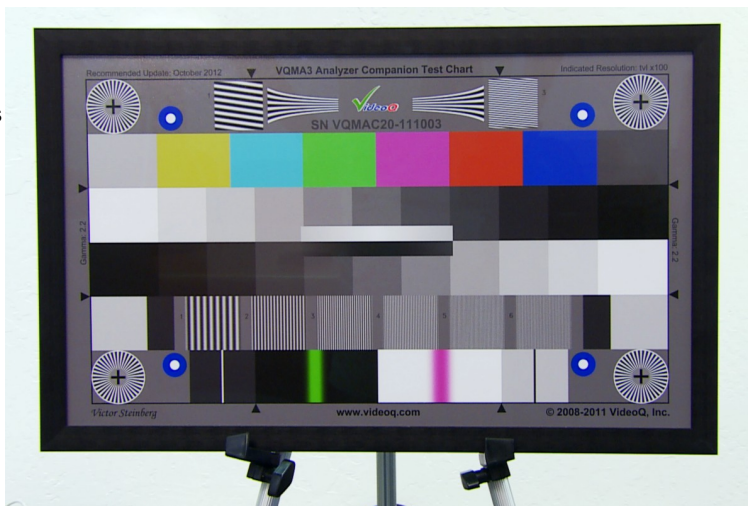
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VQMA-C Optical Chart

- Precise color bars XYZ and grayscale densities
- Robust metal frame
- Abrasion-resistant low-glare glass
- Adjustable tilt to minimize reflections

VQMAC20: 20" diagonal size variant



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File Menu

File	YUV Frame Size	Color Space	View Page #	Scope View	S
Open File (.yuv, .bmp)					Ctrl+O
Reopen Valid File					Ctrl+R
<input checked="" type="checkbox"/> Use VQMA.INI File in the Application Folder					
Use INI File Path matching YUV/BMP File					
Open INI File (.ini)					
Print Report Page(s)					Ctrl+P
Quick Print (all pages, default printer)					Ctrl+Alt+P
Save Short Report (.txt, .csv)					Ctrl+S
Quit VQMA (Exit)					Ctrl+Q

VQMA locks the analyzed file only for very short time needed to read video data from hard drive.

Then YUV/BMP file can be modified by the user, while VQMA presents/print/save Test Report Pages.

Reopening YUV/BMP file also updates all target values read from customizable .INI file. This feature can be very useful to check the same test file against different sets of target values.

Open File invokes standard "File Open" dialog box.

Reopen Valid File is useful for recurrent test sessions, allowing manual update as desired.

The .INI file location depends on three mutually exclusive items in the File menu:

Use VQMA.INI File in the Application Folder (default: fixed VQMA.INI file name).

Use File Path matching YUV/BMP File, e.g. opening of c:/temp/current.yuv file automatically implies opening and use of c:/temp/current.ini file.

Open INI File – browse for any *.ini file located in a local/network folder.

Print Report Page(s) – seven on-screen pages of VQMA test results can be printed separately or all pages together. **Quick Print** allows bypassing printer selection and page number dialog.

It is recommended to choose PDF printer, e.g. pdfFactory, as a default printer. By default PDF file is co-sited with the analyzed YUV/BMP file.

Save Short Report – save report in .TXT or .CSV format. See next slides for the Short Report file structure.

YUV Frame Size Menu

YUV Frame Size	Color Space	View Page #	S
Auto Size: OFF. Click to re-enable			
4096x2160 (DCI 4K)			
3840x2160 (UHD-1)			
<input checked="" type="checkbox"/> 1920x1080 (HD)			
1280x720 (SubHD)			
720x576 (PAL)			
720x480 (NTSC)			
<input checked="" type="checkbox"/> Custom Size: 1920 x 1080			
Set Custom Frame Size...			

This menu allows selection of "Auto Size" mode (default) or particular Frame Size in Y pixels and choose either custom size or one of six standard sizes from 720x480 to 4096x2304.

Selection of particular size disables Auto Size mode, which can be re-enabled by clicking on the corresponding menu item. Any change in this menu leads to input file reloading and new analysis cycle.

In case of compressed/wrapped file opening via front-end VQFF adapter the "Custom Size" mode is enabled automatically.

Custom Frame Size X

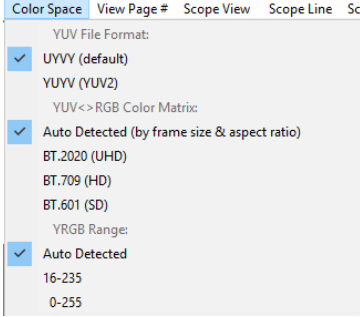
Horizontal Frame Size

even integer: 192 - 4096
Odd numbers will be converted to the nearest even

Vertical Frame Size

an integer: 108 - 3072

Color Space Menu



The screenshot shows a menu with three main sections: 'YUV File Format' with options 'UYVY (default)' and 'YUV2 (YUV2)'; 'YUV<->RGB Color Matrix' with options 'Auto Detected (by frame size & aspect ratio)', 'BT.2020 (UHD)', 'BT.709 (HD)', and 'BT.601 (SD)'; and 'YRGB Range' with options 'Auto Detected', '16-235', and '0-255'. The 'Auto Detected' options are selected.

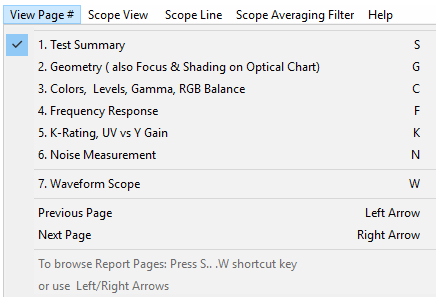
This menu is divided in 3 sections (sub-menus):

- **YUV File Format** – user may select one of two alternative formats:
 - UYVY
 - YUV2
- **YUV<->RGB Color Matrix** – user may select "Auto" (recommended default) or one of 3 standard color matrices:
 - BT.2020 (UHD)
 - BT.709 (HD)
 - BT.601 (SD)
- **YRGB Range** – user may select "Auto" or one of 2 ranges:
 - 16-235 aka 'Narrow Range'
 - 0-255 aka 'Full Range'

The YURGB Range selection affects both .YUV and .BMP file formats.

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View Page Menu



The screenshot shows a menu with a list of 7 report pages: 1. Test Summary (S), 2. Geometry (also Focus & Shading on Optical Chart) (G), 3. Colors, Levels, Gamma, RGB Balance (C), 4. Frequency Response (F), 5. K-Rating, UV vs Y Gain (K), 6. Noise Measurement (N), and 7. Waveform Scope (W). Below the list are 'Previous Page' (Left Arrow) and 'Next Page' (Right Arrow) options. A note at the bottom says: 'To browse Report Pages: Press S...W shortcut key or use Left/Right Arrows'.

User may browse pages by:

- Clicking the corresponding menu item
- Pressing the shortcut letter key, e.g. "W" for Waveform Scope Page or "S" for Summary
- Quickly browse thru all 7 pages by pressing Left Arrow / Right Arrow.

This method is especially useful for "at glance" check of all parameters.

Choice of selected page is persistent, same page will be shown after analysis of any new file or reopening of the updated file.

It is possible to pre-select any desired page before opening YUV/BMP file, e.g. page # 7 "Waveform Scope". In this case, VQMA opens the selected file and then goes straight to the selected page display, skipping summary page.

This menu allows selection of Test Summary page or partial test result Pages described in the following sub-sections.

Default page selection is "Test Summary".

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YUV/RGB Waveform Scope Menus

There are 3 menus controlling Waveform Scope:

- **Scope View** allowing selection of Y, R, G, B components or YUV, UV, RGB combinations, and display time-base: frame parade, line parade, line overlay, single component line, frame histogram vector.
- **Scope Line** allowing selection of desired line, desired band center (8 presets) or overlay modes
- **Scope Averaging Filter** allowing selection of temporal and/or spatial noise reduction filters

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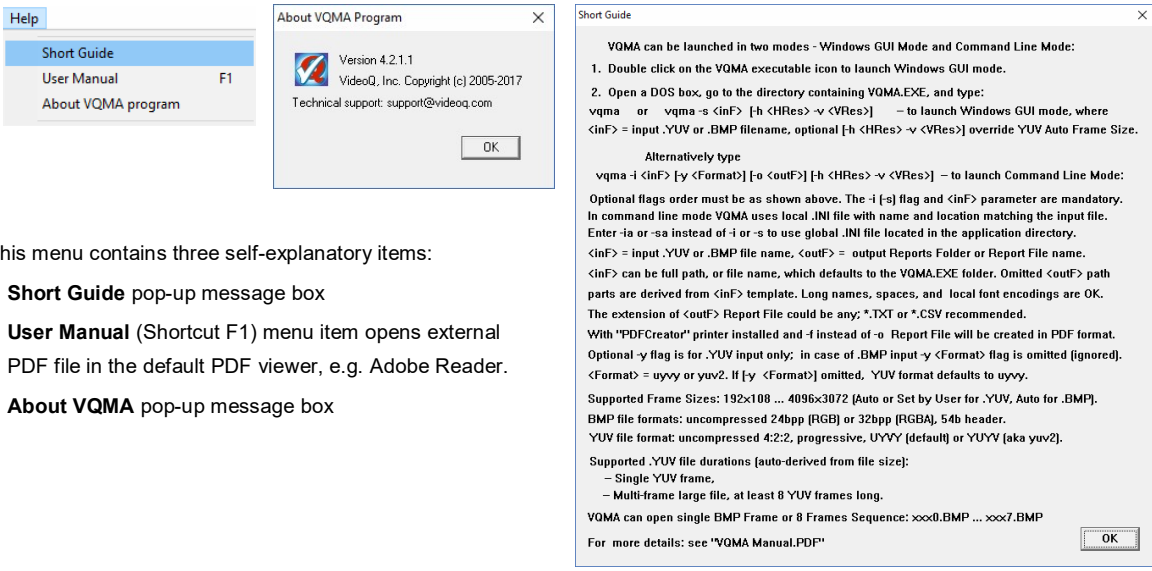
Waveform Scope Line Selection Controls

There are two controls allowing manual selection of the analyzed line number:

- **Dialog Box**, where user can directly type-in the desired line number
- **Up/Down Arrows** moving up or down highlighted line on the thumbnail image.

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Help Menu



This menu contains three self-explanatory items:

- **Short Guide** pop-up message box
- **User Manual** (Shortcut F1) menu item opens external PDF file in the default PDF viewer, e.g. Adobe Reader.
- **About VQMA** pop-up message box

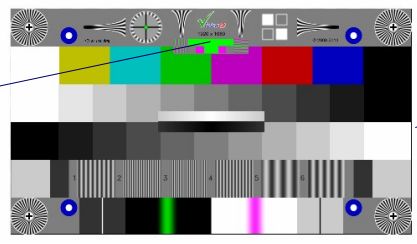
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Summary Page Example (Reference File)

1. Test Summary VQMA Test Result: **PASSED**

Parameter	Measurement	Unit	Target	Pass
Black Level	0.0 % (16.0)	%, (0.0-255.0)	-5.0 -- +5.0 %	✓
White Level	100.0 % (235.0)	%, (0.0-255.0)	95.0 -- 105.0 %	✓
Unfiltered Y SNR	100.0	dB	> 40 dB	✓
K Rating on 2T Pulse	0.0	s	< 1.0 s	✓
UV vs. Y Gain	0.1	dB	-1.0 -- +1.0 dB	✓
Luminance Gamma	2.2		1.8 -- 2.5	✓
RGB Balance Error	0.0	%	< 10 %	✓
Y Range Black Overload	0.0	%	< 15 %	✓
Y Range White Overload	0.0	%	< 15 %	✓
Frequency Response SF1 = 100 tvl	-0.0	dB	-0.5 -- +0.5 dB	✓
Frequency Response SF2 = 200 tvl	-0.0	dB	-0.8 -- +0.8 dB	✓
Frequency Response SF3 = 300 tvl	0.0	dB	-1.0 -- +1.0 dB	✓
Frequency Response SF4 = 400 tvl	-0.0	dB	-1.3 -- +1.3 dB	✓
Frequency Response SF5 = 500 tvl	-0.0	dB	-1.5 -- +1.5 dB	✓
Frequency Response SF6 = 600 tvl	-0.1	dB	-1.8 -- +1.8 dB	✓

Automatically selected YRGB Nominal Range: 16-235 Automatically selected Rec709(HD) YUV\leftrightarrowRGB Matrix VQMA Test Pattern detected



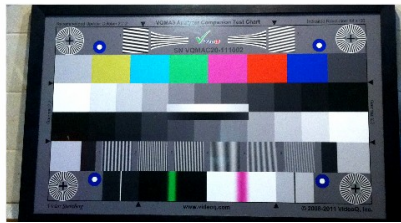
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Summary Page Example (Smartphone Camera)

Frame Size: 1920 x 1080, Chart: 1512 x 851 **1. Test Summary** VQMA Test Result: **FAILED**

Parameter	Measurement	Unit	Target	Pass
Black Level	2.7 %, (21.9)	%, (0.0-255.0)	-5.0 -- +5.0 %	✓
White Level	102.3 %, (240.0)	%, (0.0-255.0)	95.0 -- 105.0 %	✓
Unfiltered Y SNR	34.7	dB	> 40 dB	✗
K Rating on 2T Pulse	2.2	%	< 1.5 %	✗
UV vs. Y Gain	2.0	dB	-1.0 -- +1.0 dB	✗
Luminance Gamma	1.6		1.8 -- 2.5	✗
RGB Balance Error	12.3	%	< 10 %	✗
Y Range Black Overload	0.0	%	< 15 %	✓
Y Range White Overload	0.0	%	< 15 %	✓
Frequency Response SF1 = 128 tvl	-0.3	dB	-0.5 -- +0.5 dB	✓
Frequency Response SF2 = 255 tvl	-0.5	dB	-1.0 -- +1.0 dB	✓
Frequency Response SF3 = 382 tvl	-1.0	dB	-2.0 -- +1.0 dB	✓
Frequency Response SF4 = 509 tvl	-2.2	dB	-4.0 -- +1.0 dB	✓
Frequency Response SF5 = 636 tvl	-4.4	dB	-6.0 -- +2.0 dB	✓
Frequency Response SF6 = 763 tvl	-6.5	dB	-12.0 -- +3.0 dB	✓

Automatically selected YRGB Nominal Range: 16-235 Automatically selected Rec709 (HD) YUV<>RGB Matrix VQMA-C Optical Test Chart detected



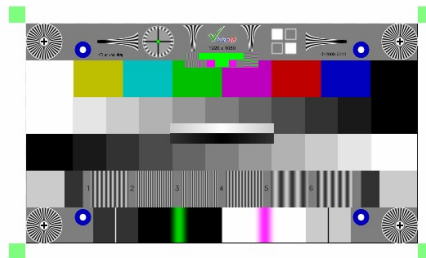
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Geometry Page Example (Reference File)

Frame Size: 1920 x 1080, Chart: 1920 x 1080 Frame Aspect Ratio: 1.778, Chart Aspect Ratio: 1.778
2. Geometry

	Horizontal	Vertical
Chart to Frame Ratio:	100 %	100 %
Position Offset:	0.0 %	0.0 %

Test Conditions Validated



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Geometry Page Example (Camera)

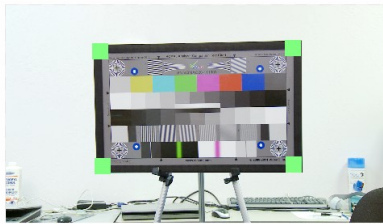
Frame Size: 1920 x 1080, Chart: 875 x 492 Frame Aspect Ratio: 1.778, Chart Aspect Ratio: 1.778

2. Geometry, Focus, Shading

Avrg. Corner Contrast:	83 ‰	
Avrg. Corner Focus:	70 ‰	
Test Chart Tilt:	-1.1 °	
	Horizontal	Vertical
Chart to Frame Ratio:	46 ‰	46 ‰
Position Offset:	-0.5 ‰	-2.7 ‰
Keystone Distortions:	-2.4 ‰	1.0 ‰
Black Level Shading:	10.6 ‰	10.6 ‰
White Level Shading:	5.2 ‰	4.5 ‰

Test Conditions Validated

Contrast 89 ‰
Focus 71 ‰



66 ‰ Contrast
73 ‰ Focus

Contrast 89 ‰
Focus 65 ‰

87 ‰ Contrast
68 ‰ Focus

VQMA Chart Detected

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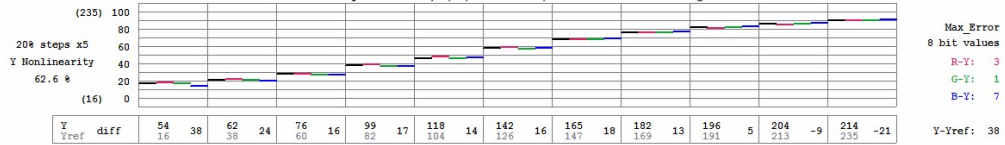
Levels and Colors Page Example (Camera)

Frame Size: 1920 x 1080, Chart: 875 x 492 Mean values for 16 lines of 8 frames
Nominal Y,R,G,B Range: 16-235

3. Levels, Gamma, RGB Balance

Black Level: 17.3 ‰ (53.8)	Y Gamma: 3.0, Inverse Y Gamma: 0.33	White Level: 90.3 ‰ (213.8)
Black Crash (Y Range Overload): 0.0 ‰	with reference to display gamma 2.2	White Crash (Y Range Overload): 0.0 ‰
RGB Black Balance Error: 4.1 ‰	RGB Dynamic Balance Error: 4.1 ‰	RGB White Balance Error: 1.6 ‰

Grayscale: Y,R,G,B Levels, ‰ of Nominal Range



Color Bars: Y,U,V,R,G,B Levels, 8 bit values

		White	Yellow	Cyan	Green	Magenta	Red	Blue	Black	Max_Error
Captured Data	Y	189	9	187	178	174	138	115	88	113
	Yref	180	9	174	157	157	122	116	104	98
	diff	129	1	86	140	93	154	106	180	129
Derived Values	U	128	1	86	138	96	160	118	170	128
	Uref	128	0	131	93	101	162	176	105	129
	diff	128	0	132	86	90	166	170	124	128
Derived Values	V	189	9	192	124	132	189	8	53	115
	Vref	180	9	180	98	98	181	8	98	98
	diff	189	9	193	124	132	189	8	53	115
Derived Values	G	189	9	193	124	132	189	8	53	115
	Gref	180	9	180	98	98	181	8	98	98
	diff	189	9	193	124	132	189	8	53	115
Derived Values	B	191	11	111	200	110	185	5	75	183
	Bref	180	9	98	181	99	180	5	98	180
	diff	191	11	111	200	110	185	5	75	183

VQMA-C Optical Test Chart detected

Automatically selected Rec709(BD) YUV->RGB Matrix

Max RGB Error: 45

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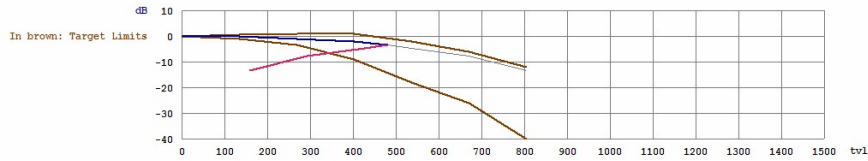
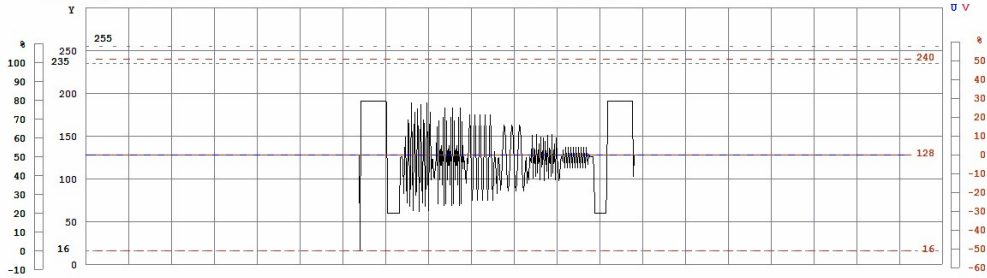
Frequency Response Page Example (1080 down to 480)

Frame Size: 640 x 480 , Chart: 640 x 480

Mean values for 16 lines of single frame

4. Frequency Response

Burst Number	1	2	3	4	5	6	
Frequency, % of Limit	28	56	84	112	140	167	Flimit = 480 tvl
Frequency, tvl	135	268	402	536	670	803	In Red: Aliasing
Response, dB	-0.2	-1.1	-2.1	-4.9	-7.7	-13.5	



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K-Rating Page Example (Camera)

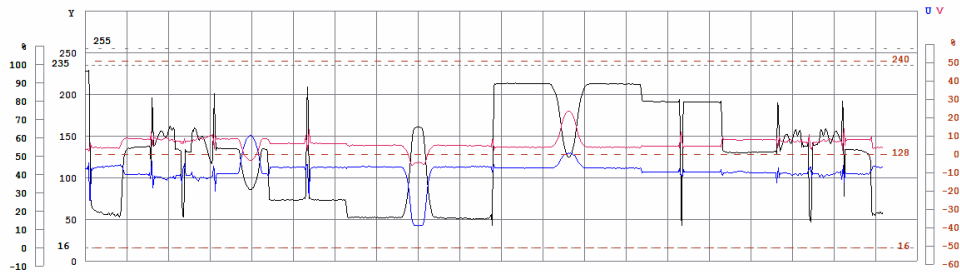
Frame Size: 1920 x 1080, Chart: 1669 x 939

Mean values for 16 lines of 8 frames

5. K-Rating on 2T pulse and UV vs. Y Gain

K-Rating on 2T Pulse 0.9 %

UV vs. Y Gain (Color Saturation) -0.2 dB



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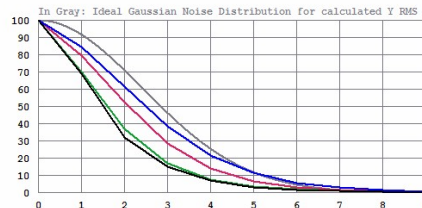
VQMA Noise Analyzer Features

- Y SNR: unfiltered, band-limited and weighted
- UV, R, G, B and "Dark B" SNR values
- Y Noise Spectral Density plots in dB vs. relative frequency (F/Flimit, %)
- Noise Image, +24dB boost for better visibility
- Y, R, G, B Noise Histograms Display
- Reference true Gaussian noise curve overlay
- 0.1 dB accurate SNR measurement
- SNR Read-out match industry standard tools
- Noise measurement on just 8 frames of video

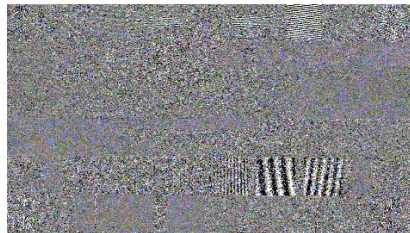
Noise Analyzer Page Example (Camera)

Frame Size: 1920 x 1080, Chart: 1900 x 1069 **6. Noise Measurement** Noise values calculated from 8 frames
 Nominal Y,R,G,B Range: 16-235

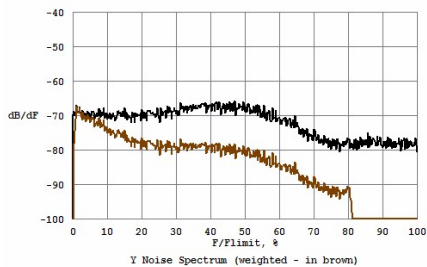
Y RMS unfiltered	1.1 % (2.4 8bD1, 8 mV)
Y SNR unfiltered	39.1 dB
Y SNR bandlimited	39.3 dB
Y SNR weighted	47.0 dB
UV SNR bandlimited	48.1 dB
R SNR unfiltered	36.8 dB
G SNR unfiltered	37.7 dB
B SNR unfiltered	35.8 dB
B SNR on dark areas	37.9 dB



Normalized Probabilities of Y,R,G,B Noise Magnitudes (8 bit levels)



Noise Image (contrast boosted +24 dB)

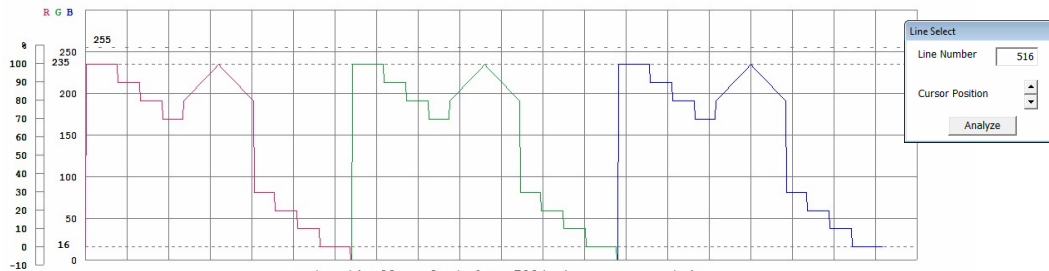


Waveform Scope Features

- **Components Selection:**
Y, R, G, B; UV, YUV or RGB combinations
 - **Cursor:**
Selected/Current Line Position Highlight
 - **Smart Graticules:**
YUV/RGB, in % and 8 bit levels
 - **Smart Read-out:**
YUV & RGB in 8b and in %
 - **Smart Analytics:**
Min, Max, Mean for ROI
 - **Smart Display:**
Shows relevant data only
 - **Smart Navigation:**
Persistent display mode
- UV Vectors Display:**
 - UV Gain x1 for Signal Processors
 - UV Gain x2 for Cameras (Optical Chart)
 - Averaging Filter Controls:**
 - No filtering, labeled "Single Frame Single Line"
 - Spatial filtering only, labeled "Single Frame Multiple Lines"
 - Temporal filtering only, labeled "Multiple Frames Single Line"
 - Spatial and Temporal filtering, labeled "Multiple Frames Multiple Lines"

YUV/RGB Scope Page Example (Reference File)

Frame Size: 1920 x 1080, Chart: 1920 x 1080 **7. YUV/RGB Scope** Mean values for 16 lines of 8 frames
 Nominal Y,R,G,B Range: 16-235 Selected Line Number = 516



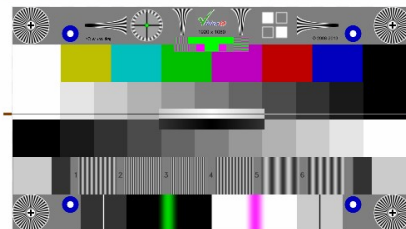
Automatically selected Rec709 (HD) YUV->RGB Matrix

Within Selected Line:
 RGBmin = 16.0 (0.0 %)
 Ymin = 16.0 (0.0 %)

 Rmin = 16.0 (0.0 %)
 Gmin = 16.0 (0.0 %)
 Bmin = 16.0 (0.0 %)

 Umin = 128.0 (0.0 %)
 Vmin = 128.0 (0.0 %)

 Umean = 128.0 (0.0 %)



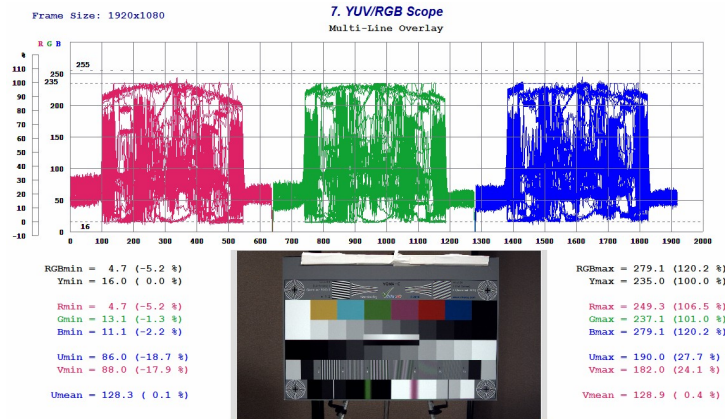
Within Selected Line:
 RGBmax = 235.0 (100.0 %)
 Ymax = 235.0 (100.0 %)

 Rmax = 235.0 (100.0 %)
 Gmax = 235.0 (100.0 %)
 Bmax = 235.0 (100.0 %)

 Umax = 128.0 (0.0 %)
 Vmax = 128.0 (0.0 %)

 Vmean = 128.0 (0.0 %)

Waveform Scope Page Example (Camera)



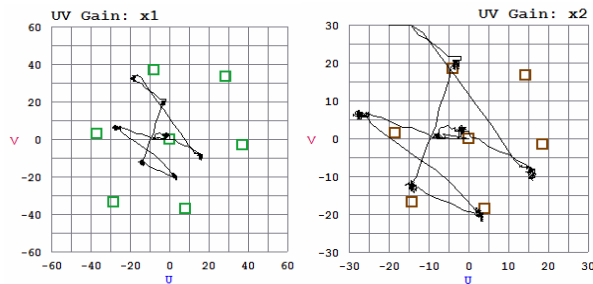
RGB Line Parade with Multi-line Overlay shows:

- Good RGB Black Balance and White Balance
- Moderate White Shading - about 10% (camera lens?)
- No significant Black Shading or Black Crush

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UV VectorScope Example (Camera Color Rendition)



UV Vectors Display shows:

- UV Gain x1 display:
Color saturation is much lower than 75%, marked by green target boxes (*optical chart saturation = 37.5%*)
- UV Gain x2 display:
Saturation is good, but black and white balances are biased and colors are far away from 37.5% brown target boxes

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Transcoder Test – Screenshot #1

Test Session #1: reference 1920x1080 test pattern and default VQMA.INI file with relatively strict target values

Visual Check:
T-shaped Green
Area indicates that
pattern is unscaled

All tests OK

Frequency Response Test
is OK because the rather strict
target values are applied to the
original unscaled file

Original Frame Size Code:
"1920x1080"

Test Session
Date & Time

File Name

Parameter	Measurement	Unit	Target	Pass
Black Level	0.0 % (16.0)	% (0.0-255.0)	-5.0 -- +5.0 %	✓
White Level	100.0 % (235.0)	% (0.0-255.0)	95.0 -- 105.0 %	✓
Unfiltered Y SNR	100.0	dB	> 40 dB	✓
K Satting on 2F Pulse	0.0	%	< 1.0 %	✓
UV vs. Gain	0.1	dB	-1.0 -- +1.0 dB	✓
Luminance Gamma	2.2	%	1.8 -- 2.6	✓
RGB Balance Error	0.0	%	< 10 %	✓
Y Range Black Overload	0.0	%	< 15 %	✓
Y Range White Overload	0.0	%	< 15 %	✓
Frequency Response RF1 = 100 tvl	-0.0	dB	-0.5 -- +0.5 dB	✓
Frequency Response RF2 = 200 tvl	-0.0	dB	-0.5 -- +0.5 dB	✓
Frequency Response RF3 = 300 tvl	0.0	dB	-1.0 -- +1.0 dB	✓
Frequency Response RF4 = 400 tvl	-0.0	dB	-1.5 -- +1.5 dB	✓
Frequency Response RF5 = 500 tvl	-0.0	dB	-1.5 -- +1.5 dB	✓
Frequency Response RF6 = 600 tvl	-0.1	dB	-1.8 -- +1.8 dB	✓

Automatically selected VQMA Nominal Range: 16-235 Automatically selected Rec709(HD) YUV420RGB Matrix VQMA Test Pattern detected

VideoQ VQMA, version 3.75, Sat Aug 24 20:32:19 2013
C:\VQMA3 Demo Files\VQMA_1b_1920x1080.yuv

Transcoder Test – Screenshot #2

Test Session #2: 1080 to 720 down-sampled file, same VQMA.INI file as #1 – **too strict** for this case!

Visual Check

T-shaped Green
not visible; it means
H & V down-scaling

Green & Magenta
squares indicate
4:2:0 encoding

Some tests
failed

Frequency Response Test
failed because target values
are **too strict** for the case

Original Frame Size Code:
"1920x1080"

File Name

Parameter	Measurement	Unit	Target	Pass
Black Level	0.0 % (16.0)	% (0.0-255.0)	-5.0 -- +5.0 %	✓
White Level	100.0 % (235.0)	% (0.0-255.0)	95.0 -- 105.0 %	✓
Unfiltered Y SNR	100.0	dB	> 40 dB	✓
K Satting on 2F Pulse	0.0	%	< 1.0 %	✓
UV vs. Y Gain	0.1	dB	-1.0 -- +1.0 dB	✓
Luminance Gamma	2.2	%	1.8 -- 2.6	✓
RGB Balance Error	0.0	%	< 10 %	✓
Y Range Black Overload	0.0	%	< 15 %	✓
Y Range White Overload	0.0	%	< 15 %	✓
Frequency Response RF1 = 100 tvl	-0.1	dB	-0.5 -- +0.5 dB	✓
Frequency Response RF2 = 200 tvl	-0.5	dB	-0.5 -- +0.5 dB	✓
Frequency Response RF3 = 300 tvl	-1.1	dB	-1.0 -- +1.0 dB	✗
Frequency Response RF4 = 400 tvl	-2.5	dB	-1.5 -- +1.5 dB	✗
Frequency Response RF5 = 500 tvl	-4.9	dB	-1.5 -- +1.5 dB	✗
Frequency Response RF6 = 600 tvl	-8.7	dB	-1.8 -- +1.8 dB	✗

Automatically selected VQMA Nominal Range: 16-235 Automatically selected Rec709(HD) YUV420RGB Matrix VQMA Test Pattern detected

VideoQ VQMA, version 3.75, Sat Aug 24 20:31:44 2013
C:\VQMA3 Demo Files\Full Run\13_1280x720.yuv

Transcoder Test – Screenshot #3

Test Session #3: as #2, but using *modified* VQMA.INI file with *amended* target values

Visual Check

T-shaped Green not visible; it means H & V down-scaling

Green & Magenta squares indicate 4:2:0 encoding

Same File Name as #2

Parameter	Measurement	Unit	Target	Pass
Black Level	0.0 % (16.0)	% (0.0-255.0)	-5.0 -- +5.0 %	✓
White Level	100.0 % (239.0)	% (0.0-255.0)	95.0 -- 105.0 %	✓
Unfiltered Y SNR	100.0	dB	> 40 dB	✓
K Rating on 2F Pulse	0.7	%	< 1.5 %	✓
UV vs. Y Gain	0.1	dB	-1.0 -- +1.0 dB	✓
Luminance Gamma	2.2	%	1.8 -- 2.5	✓
RGB Balance Error	0.0	%	< 10 %	✓
Y Range Black Overload	0.0	%	< 15 %	✓
Y Range White Overload	0.0	%	< 15 %	✓
Frequency Response F1 = 100 tvl	-0.1	dB	-0.5 -- +0.5 dB	✓
Frequency Response F2 = 200 tvl	-0.5	dB	-1.0 -- +1.0 dB	✓
Frequency Response F3 = 400 tvl	-1.1	dB	-2.0 -- +1.0 dB	✓
Frequency Response F4 = 800 tvl	-2.5	dB	-4.0 -- +1.0 dB	✓
Frequency Response F5 = 1600 tvl	-4.9	dB	-6.0 -- +2.0 dB	✓
Frequency Response F6 = 3200 tvl	-9.7	dB	-12.0 -- +3.0 dB	✓

All tests now OK

Frequency Response Test is now OK because the amended target values are matching the down-conversion case

Original Frame Size Code: "1920x1080"

Broadcast Camera Test with VQMAC20 Optical Chart



Fragment of VQMA.INI file used

```

:VideoQ VQMA v3.1.6.1, .INI file created Thu Aug 15 02:27:30 2013
[V_BLACK_LEVEL]
V_BLACK_LEVEL_UNIT=%
V_BLACK_LEVEL_MIN=5.00
V_BLACK_LEVEL_MAX=5.00
[V_WHITE_LEVEL]
V_WHITE_LEVEL_UNIT=%
V_WHITE_LEVEL_MIN=95.00
V_WHITE_LEVEL_MAX=105.00
[V_SNR]
V_SNR_UNIT=dB
V_SNR_MIN=40.00
[K_RATING]
K_RATING_UNIT=%
K_RATING_MAX=1.00
    
```

Fragment of VQMA_Log.TXT file created

```

20130825_141855, File opened in GUI Mode:
"C:\VQMA3 Demo Files\VGTS200\Sony PMW-EX3 Test 16Sep2012\VGTS_20120916_173402.yuv"
TEST_RESULT_FAILED
20130825_141922, Report file saved in GUI Mode:
"C:\VQMA3 Demo Files\VGTS200\Sony PMW-EX3 Test 16Sep2012\VGTS_20120916_173402_20130825_141903_FAIL.TXT"
    
```

Example of Test Report in machine-readable format

```

: VideoQ Inc. Copyright [c] 2005-2013
: VQMA v3.1.6.1 Test Report
TEST_DATE, TIME, YEAR, Sun Aug 25 14:19:22 2013
REPORT_FILE, "C:\VQMA3 Demo Files\VGTS200\Sony PMW-EX3 Test 16Sep2012\VGTS_20120916_173402_20130825_141903_FAIL.TXT"
TEST_FILE, "C:\VQMA3 Demo Files\VGTS200\Sony PMW-EX3 Test 16Sep2012\VGTS_20120916_173402.yuv"
TEST_RESULT_FAILED
DATA_TYPE, YUV
FRAMES_ANALYZED, 8
FRAME_WIDTH, 1920
FRAME_HEIGHT, 1080
VQMA_CHART_VALIDATION, Success
CHART_TYPE, Optical_Chart
CHART_WIDTH, 875
CHART_HEIGHT, 462
YRGB_RANGE_SELECTION, Auto
SELECTED_YRGB_RANGE, 16-235
COLOR_MATRIX_DETECTED, NA
:
: BLACK, 17.3, %, Failure
: WHITE, 90.3, %, Failure
: SNR, 43.2, dB, Success
: K_RATING, 1.0, %, Success
: UV_Y_GAIN, -1.1, dB, Failure
: GAMMA, 3.0, Failure
: RGB_BALANCE_ERROR, 4.1, %, Success
: Y_BLACK_RANGE_ERROR, 0.0, %, Success
: Y_WHITE_RANGE_ERROR, 0.0, %, Success
: FREQUENCY_RESPONSE_1, 1.1, dB, Failure
: FREQUENCY_RESPONSE_2, 0.3, dB, Success
: FREQUENCY_RESPONSE_3, -2.4, dB, Failure
: FREQUENCY_RESPONSE_4, -8.8, dB, Failure
: FREQUENCY_RESPONSE_5, -18.8, dB, Failure
: FREQUENCY_RESPONSE_6, -20.5, dB, Failure
:
: BURSTS_SPATIAL_FREQUENCIES_IV:
F1, 220
F2, 440
F3, 660
F4, 875
F5, 1098, ALIASED, 1092
F6, 1317, ALIASED, 843
:
: BARS, Y, U, V, 8 bit values
WHITE, 189, 129, 129
YELLOW, 187, 88, 131
CYAN, 178, 140, 93
GREEN, 174, 93, 101
MAGENTA, 158, 154, 162
RED, 115, 106, 178
BLUE, 88, 190, 165
    
```

Fisheye Surveillance Camera Test

Wall-mounted VQMA-C Chart (2.3 m diagonal variant), fluorescent light source

Frame Size: 1280 x 960 , Chart: 868 x 488 **1. Test Summary** VQMA Test Result: **FAILED**

Parameter	Measurement	Unit	Target	Pass
Black Level	-2.3 % (111.0)	%, (0.0-255.0)	-5.0 -- +5.0 %	Yes
White Level	91.2 % (219.6)	%, (0.0-255.0)	85.0 -- 105.0 %	No
Unfiltered Y SNR	48.5	dB	> 40 dB	Yes
F Rating on 2T Pulse	-7.5	μ	< 3.0 μ	No
UV vs. V Gain	-0.8	dB	-1.0 -- +1.0 dB	Yes
Luminance Gamma	1.3		1.8 -- 2.5	No
PGB Balance Error	3.3	μ	< 10 μ	Yes
Y Range Black Overload	0.0	μ	< 15 μ	Yes
Y Range White Overload	0.0	μ	< 15 μ	Yes
Freq. Response @ 148 (100) tvl	-1.3	dB	-1.0 -- +0.5 dB	No
Freq. Response @ 296 (200) tvl	-3.4	dB	-2.0 -- +1.0 dB	No
Freq. Response @ 443 (300) tvl	-7.6	dB	-3.0 -- +1.0 dB	No
Freq. Response @ 591 (400) tvl	-14.3	dB	-4.0 -- +1.0 dB	No
Aliasing Level @ 738 (500) tvl	-51.3	dB	-5.0 -- +1.0 dB	No
Aliasing Level @ 886 (600) tvl	-26.8	dB	-6.0 -- +1.0 dB	No

Automatically selected YRGB Nominal Range: 16-235 VQMA-C Optical Test Chart detected



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Teleconference Camera Test with 10" Backlit Chart

Measuring camera performance in very low light conditions



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VQL – Comprehensive library of sophisticated static and dynamic test patterns and live sequences

Library files are in compressed and uncompressed formats. VQL provides basis for:

- Instant visual-aural quality estimation
- Objective measurements of video and audio performance
- Fully automated (robotic) Quality Control Analysis

<http://www.videoq.com/vql.html>

VQTS-4K – 12G / 4K / SDI / HDMI Video Generator-Analyzer

Industrial PC with SDI / HDMI Interfaces, VideoQ Test Patterns Library and VQMA Analyzer & Scope

<http://www.videoq.com/vqts4k.html>

VQV – Media Files Player / Viewer / Analyzer

<http://www.videoq.com/vqv.html>

About VideoQ



Company History

- Founded in 2005
- Formed by an Engineering Awards winning team sharing between them decades of global video technology.
- VideoQ is a renown player in calibration and benchmarking of Video Processors, Transcoders and Displays, providing tools and technologies instantly revealing artifacts, problems and deficiencies, thus raising the bar in productivity and video quality experience.
- VideoQ products and services cover all aspects of video processing and quality assurance - from visual picture quality estimation and quality control to fully automated processing, utilizing advanced VideoQ algorithms and robotic video quality analyzers, including latest UHD and HDR developments.

Operations

- Headquarters in Sunnyvale, CA, USA
- Software developers in Silicon Valley and worldwide
- Distributors and partners in several countries
- Sales & support offices in USA, UK