

High Performance Stereoscopic Methods for 3-D Viewing using DILA Projectors

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Agenda

- Requirements for Stereoscopic Viewing
- Types of Stereoscopic projection
- Advantages of each type
- Efficiency of each type
- JVC Stereoscopic Projection Systems
- Credit and thanks

Key to Stereoscopic viewing

- The key to any 3-D system, is of course, “CONTENT”, but the projection system should enhance the content, not add artifacts to take away from the true experience.
- True 3-D effect requires high fidelity to “fool” your brain into thinking the image is three dimensional.

3-D Stereoscopic Projection

High Fidelity Viewing Requirements

- Key requirements
 - Lack of projector added artifacts
 - Pixel structure
 - Video noise
 - Flashing due to frame rate
 - Black level
 - Brightness
 - Color

3-D Stereoscopic Projection

- Key requirements
 - Good left/right eye extinction ratio
 - Should be $>100:1$
 - Optical quality screen
 - Front or rear, low gain,
 - Easy to wear glasses
 - Light weight
 - Easy to see through
 - Feel like not there
 - Large field of view

Types of Stereographic Projection

- Active
 - May be one or two projectors
 - Requires synchronous shutter glasses
- Passive
 - Maybe one or two projectors
 - Polarization type
 - Circular
 - Linear
 - Anaglyphic
 - Simple Red/Blue
 - Infitec[®]

Active System

- One projector approach
 - Requires 2x frame rates $>120\text{Hz}$
 - Frame double to eyes
 - Active glasses each person
 - LC Shutter on projector
- Two projector approach
 - Fakespace Beacon system
- Duty cycle $<50\%$ for each system
- Non-polarizing screen required



Passive System

- Polarization types
 - Linear – high extinction ratio, head movement dependant
 - Circular – lower extinction ratio, head movement invariant
- Anaglyphic type
 - Infitec[®] - Highest extinction ratio, head movement invariant, screen independent

Advantages of each Method

Method	Ext Ratio	Head movement	Screen	Glasses Cost	other
Active	>100:1	invariant	Invariant	high	batteries
Passive Linear	>250:1	Strong	Polarizing Required	Low	
Passive Circular	>100:1	Invariant	Polarizing Required	Mid	High Efficiency
Passive Infitec [®]	>1000:1	Invariant	Invariant	Mid	Need color correction

3-D Efficiencies and Crosstalk

method	Transmission				Crosstalk	
	Electronic / timing	Filter	glasses	net eff	CR	extinction Ratio
Active						
single CRT or DLP	0.45	0.55	0.65	0.16		
2 DILA (beacon)	0.45	0.9	0.65	0.26		
Passive						
2 CRT or DLP-Polarization	1	0.45	0.84	0.38		
2 CRT or DLP-Infitec	0.66	0.45	0.9	0.27		
2 LCD Polarization	1	0.7	0.84	0.59		
2 DILA-circular	1	0.7	0.84	0.59	50	0.0200
2 DILA-circular ColorLink	1	1.05	0.86	0.90	120	0.0083
2 DILA-linear	1	0.88983	0.73	0.65	250	0.0040
2 DILA-Infitec®	0.7	0.45	0.85	0.27	1000	0.0010

What is the best system

- Most systems are determined by the overall system requirements.
 - Cost
 - Screen types available
 - Head movement
 - Brightness requirements
 - Ambient conditions
 - Performance requirements

Active system using 2 DILA projectors and LC Shutters



Beacon system Fakespace

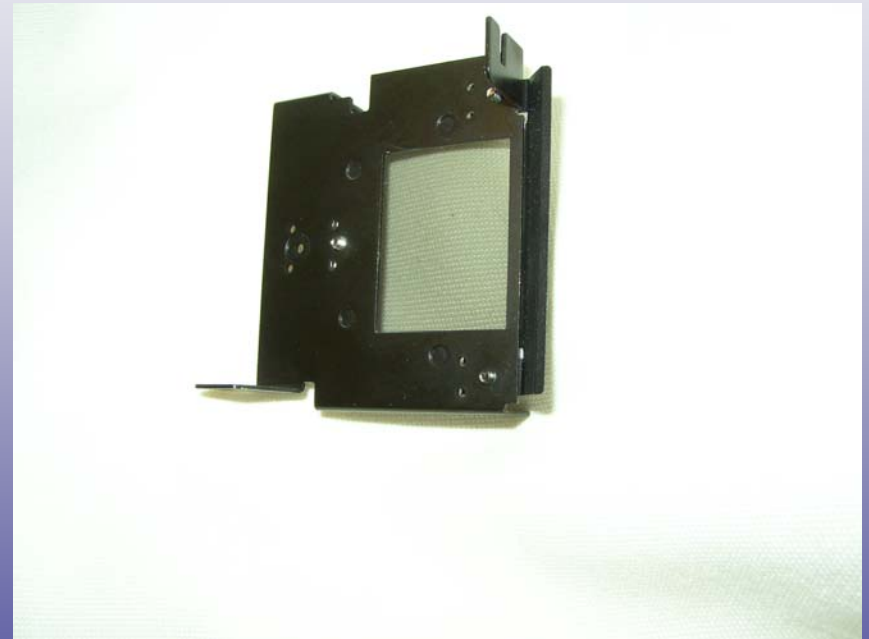
HD-2K Circular Polarization

- HD-2K DILA projector
 - 1920x1080 native resolution, 92% aperture ratio
 - >2000:1 CR
 - DVI input
 - Internal broadband circular polarizer
 - Extinction ratio >120:1
 - Linear option
 - Extinction ratio >350:1



Internal Circular Polarizer

- No external hardware required
- No alignment required
- High efficiency, 105%
- Can be applied to all models

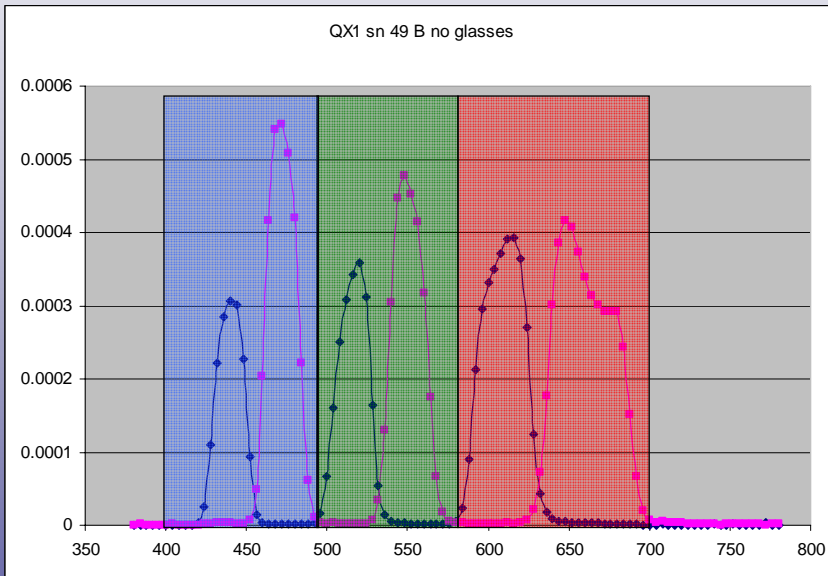


JVC QX1

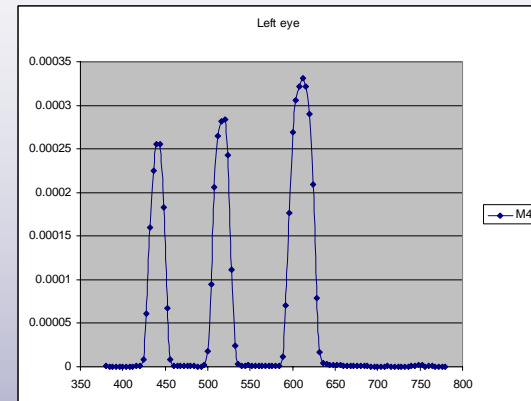
- QX1 DILA Projector
 - 2048x1536 native resolution
 - >2500:1 CR
 - 7000 Lumens
 - 94% aperture ratio
 - HD-SDI/DVI input
 - Internal Infitec[®] filter method
 - Extinction ratio >1000:1



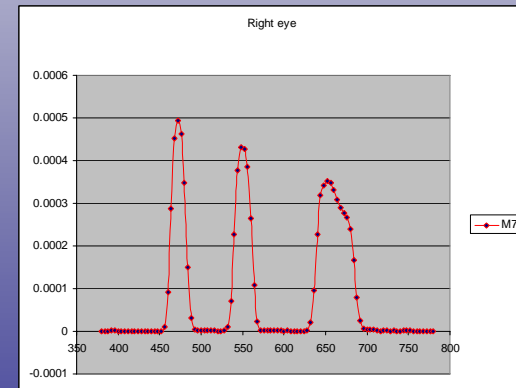
Infitec[®] Filter System



RGB colors with L/R notches

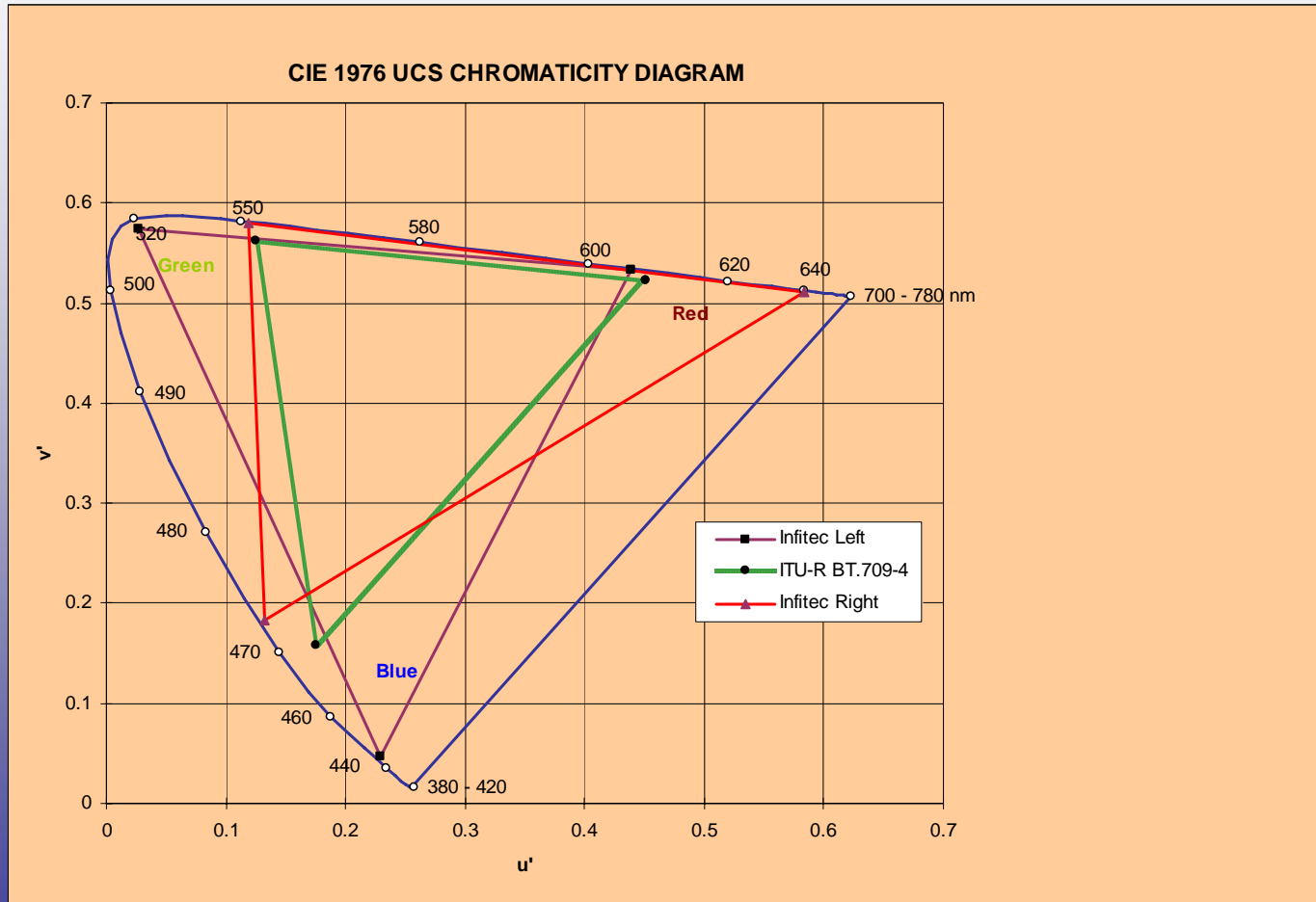


Left eye Glasses



Right eye Glasses

Infitec[®] Color Gamut



JVC Stereoscopic Projection

- JVC High Performance Stereoscopic 3-D Stereographic Projection System using DILA Projectors with Infitec[®] filters method.
 - QX-1 Projectors (2048x1536)
 - DILA LCOS, 94% aperture ratio
 - 96 Hz refresh rate per eye
 - Dual HD-SDI full bandwidth playback by QuVIS
 - Black Level >2500:1
 - L/R extinction ratio >1000:1
 - Passive Glasses, head movement invariant
 - Stewart Filmscreen optical grade screen