

# 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<sup>®</sup> - 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 <sup>®</sup>	>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
<b>Active</b>						
single CRT or DLP	0.45	0.55	0.65	0.16		
2 DILA (beacon)	0.45	0.9	0.65	0.26		
<b>Passive</b>						
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	<b>0.90</b>	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	<b>1000</b>	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

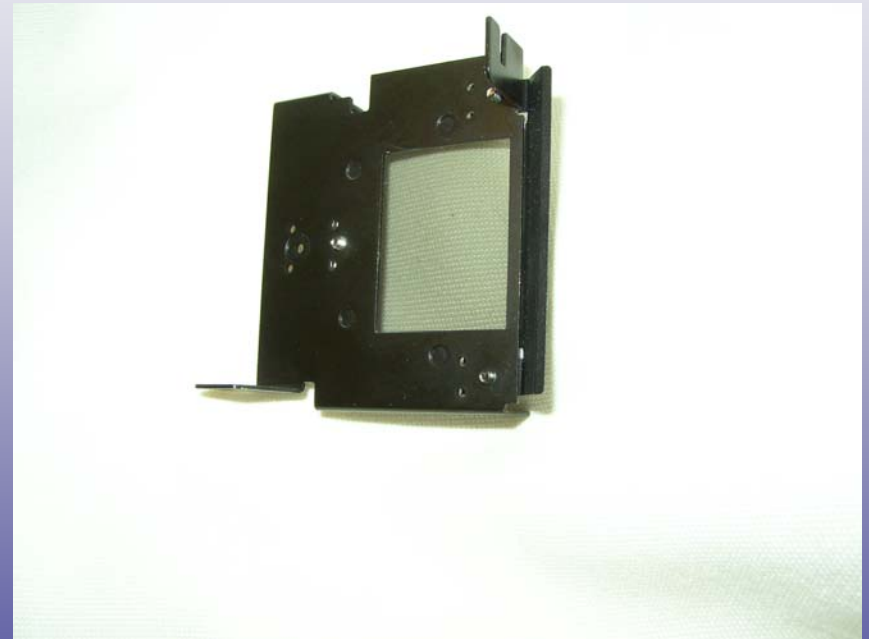
# HD-2K Circular Polarization

- 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

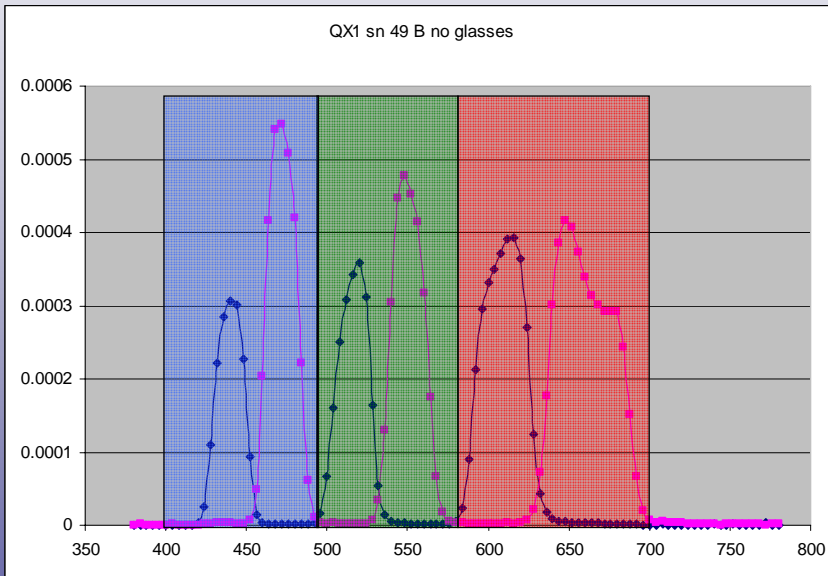


# JVC QX1

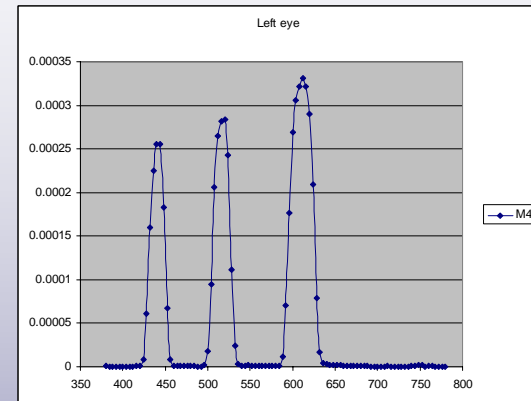
- QX1 DILA Projector
  - 2048x1536 native resolution
  - >2500:1 CR
  - 7000 Lumens
  - 94% aperture ratio
  - HD-SDI/DVI input
  - Internal Infitec<sup>®</sup> filter method
    - Extinction ratio >1000:1



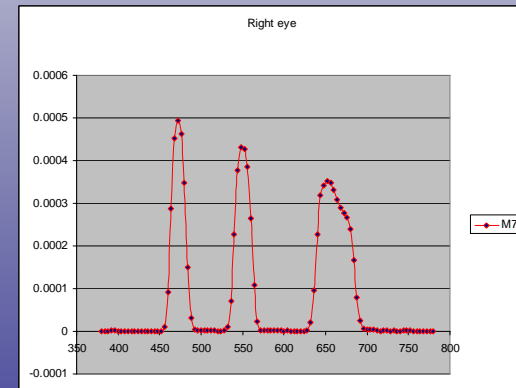
# Infitec<sup>®</sup> Filter System



RGB colors with L/R notches

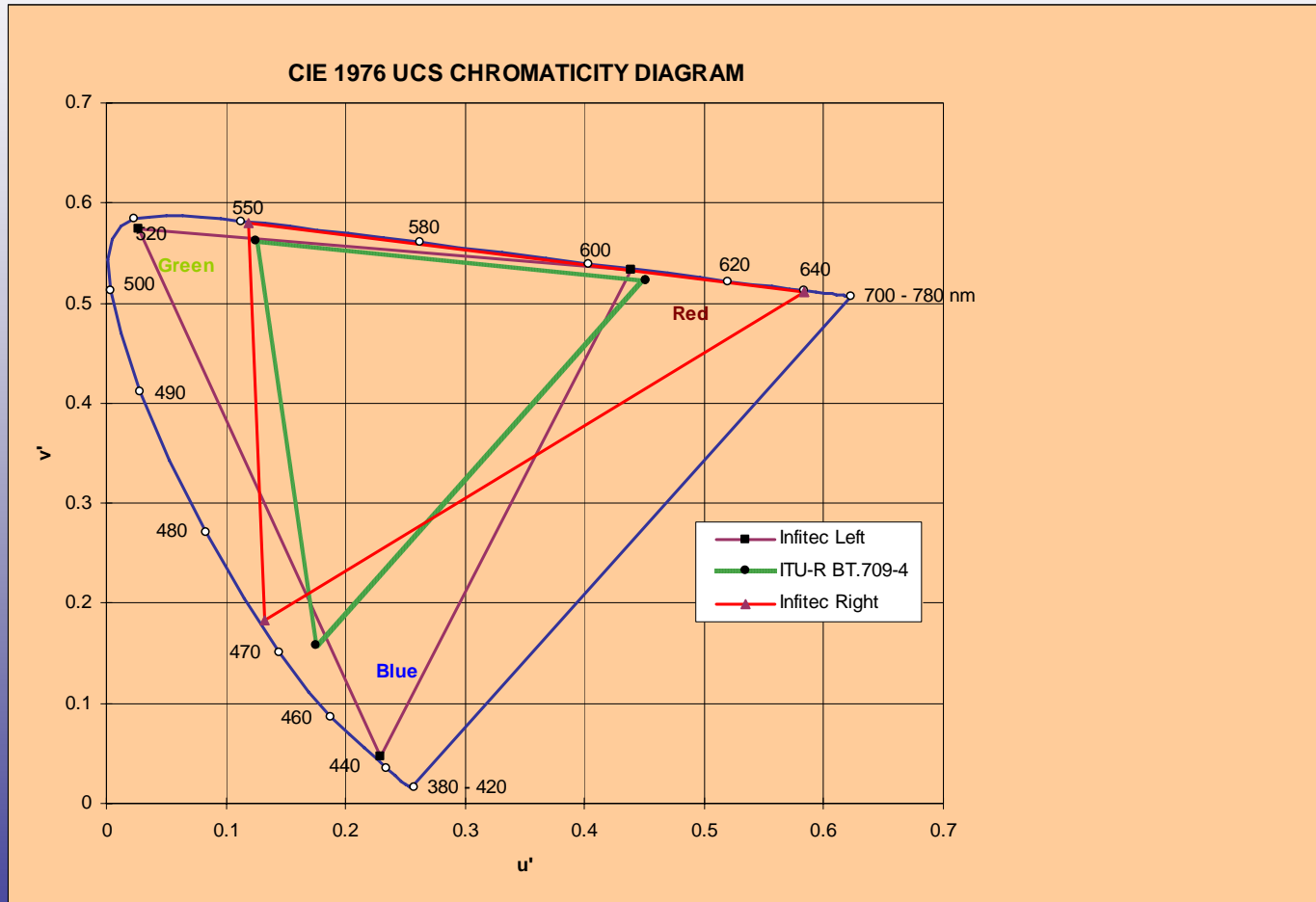


Left eye Glasses



Right eye Glasses

# Infitec<sup>®</sup> Color Gamut



# JVC Stereoscopic Projection

- JVC High Performance Stereoscopic 3-D Stereographic Projection System using DILA Projectors with Infitec<sup>®</sup> 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