

D-cinema Developments in Exhibition and what these mean for cinematographers

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Kommer Kleijn SBC

Active Cinematographer and Stereographer

Chair of IMAGO Technical Committee

Board member of SBC, EDCF, UP3D

SMPTE 21DC TC P-member since 2006

Chaired several SMPTE 21DC Frame Rates Groups

Teacher, researcher, consultant

Whats Cooking in Cinema exhibition

High Frame Rates for 2D and 3D

White screen for polarised 3D

Laser Light Sources in Projection

High / Extended Color Gamut

High / Extended Dynamic Range

Whats Cooking in Cinema exhibition

Barco Escape

Second Screen

High pressure mercury lamps

Boothless Cinemas

Emissive Screens

Additional Frame Rates

The IMAGO Proposals first presented to EDCF in 2004.
Work been done in EDCF-T

2006: Presentation of the proposals during Amsterdam SMPTE DC28 meeting: AFR Study group was formed

2007: Study Group report finished, SMPTE Ad Hoc Group formed.

2009: Additional Frame Rates published by SMPTE

2010: Archival Frame Rates published by SMPTE

2011: Additional Frame Rates to be published by ISO

2011: Creation of High Frame Rates Study Group

Additional Frame Rates

25 fps

30 fps

50 fps

60 fps

Bert Easey Award from BSC



“To Kommer Kleijn, for his achievement in implementing the 60 frame rate proposal as an addition to the International Standard for digital projection”

Archival Frame Rates

In collaboration with the FIAF Technical Committee

Goal: better access to archive content

Goal is not to approach shooting speed, but to approach the projection speeds used at the time of first presentation of the movies.

Agreement on acceptable error of 1 fps

Archival Frame Rates

16 fps

18 fps

20 fps

22 fps

What's New Standardization

High Frame Rates 48, 50 and 60 fps per eye (96, 100, 120 fps total) standardized by SMPTE 21DC in 2013

ISO standardization soon to follow (expt 2017)

What's New

Industry need for HFR

Peter Jackson's "Hobbit" @48 fps/eye 3D

Eugenie Jansen's "Above Us All" @50 fps/eye 3D

Avatar II and III shooting parts in 60 fps/eye 3D

New Ang Lee movie now shooting 120 fps/eye

Reason: lack of temporal resolution and strobing more disturbing in 3D than in 2D

Detail perception much better in HFR

Douglas Trumbull and Showscan Digital

HFR before 4K ? - 2D HFR widely available

ABOVE US ALL



2 Passionate HFR supporters united



Hardware support for AFR/HFR

		IMAGO, The European Federation of Cinematographers, Technical Committee																										
		Documented and reported frame rate support of Digital Cinema Servers (JP2000 Playback)												DRAFT October 2015														
DCS			2K-2D						2K-3D						4K-2D						4K-3D							
Brand	Model	IMB	24	25	30	48	50	60	24	25	30	48	50	60	24	25	30	48	50	60	24	25	30	48	50	60		
Doremi	DCP2000/4K	No	1	1	1	1	1	1	1	1	1	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	ShowVault with IMB in projector	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8	8	8	8	8	8	8	8
	IMS1000	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8	8	8	8	8	8	8	8
NEC	IMS (rebranded Doremi IMS1000)	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8	8	8	8	8	8	8	8
USL	CMS2200	r	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8	8	8	8	8	8	8	8
Sony	LMT-300	r	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8	8	8	8	8	8	8	8
	XCT-M10	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8	8	8	8	8	8	8	8
Christie	IMB-S2 V1.5.3	r	Yes	1	1	1	1	1	5	5	1	4	1	1	1	1	1	1	1	8	8	8	8	8	8	8	8	
Barco	IMS Alchemy	r	Yes	1	4	5	1	4	1	1	5	5	1	4	1	1	5	5	9	8	9	9	8	9	8	8	8	
Dolby	DSS100	No	1	6	5	1	5	5	1	5	5	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	
	DSS200 with CAT 862 MB	No	1	1	1	1	11	11	1	1	1	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	
	DSS200 or DSS220 with CAT 745 IMB prior to V4.7.1	Yes	1	1	5	1	5	1	1	5	1	6	1	1	1	5	8	8	8	8	8	8	8	8	8	8	8	
	DSS200 or DSS220 with CAT 745 IMB after V4.7.1	Yes	1	1	1	1	1	1	1	1	1	10	1	1	1	5	8	8	8	8	8	8	8	8	8	8	8	
Qube	XP-D	No	1	5	5	1	5	5	1	5	5	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	
	IMB XP-I	Yes	1	5	5	1	5	5	1	5	5	1	4	1	1	5	5	8	8	8	8	8	8	8	8	8	8	
GDC	SA-2100A	r	No	1	12	12	1	5	5	1	5	5	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	
	SX2001A	No	1	12	12	1	5	5	1	5	5	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7		
	SX2000 with IMB	Yes	1	12	12	1	5	5	1	5	5	5	5	5	1	5	5	8	8	8	8	8	8	8	8	8		
	SX2000AR/TR with IMB	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8	8	8	8	8	8	8	8		
	Stand alone IMB SX3000	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8	8	8	8	8	8	8	8		
Kodak	Server (discontinued)	No	1	6	5	1	5	5	1	5	5	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7		
XDC	Server (discontinued)	No	1	1	1	1	5	5	1	5	5	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7		

Status	
1	Officially supported according to manufacturer documentation
4	Not officially supported to our knowledge but reported to actually work
5	Not officially supported to our knowledge
6	Not officially supported to our knowledge and reported to indeed actually fail (The Kodak server played 25fps DCP but without sound)
7	Physically impossible speed for a non-IMB setup, limited by the physical data capacity of the Dual HD-HDI connection to the projector
8	Unspecified in actual standards
9	Announced feature, unspecified in actual standards, available if installed in Barco 4K projectors
10	Officially supported but reported to Fail. (UK, Okt 2014 V.8, ingest possible but no playback, a red icon stating 'error: incompatible video format')
11	Confidential report of failure, USA, March 2014
12	Info from manufacturer: DCP will playback but will be cropped to HD (cropped from right)

HFR – compatibility

2D HFR almost universally available in digital cinema theatres today

3D HFR is proposed as an optional theatre feature. (Like 3D and 4K already are)

Some HFR content will have LFR versions, but not all (not like 3D and 4K)

3D MFR (30 fps) very widely available

4K HFR emerging - yet only one (but large) manufacturer – needed for full use of 4K

Advantages of HFR

Significant enhancement of visual detail (spacial resolution) during movement, but also in general

Significantly better movement portrayal

Removes occurrences of “Judder” or “Strobo”

Freedom of movement for camera and action allows for new developments in film language

Removes obligation to use large sensors and shallow depth of field while it stays available but now as an esthetic creative choice

24 fps “Nostalgia” (or the love for artefacts)

Low temporal resolution creates artefacts like “Judder”, “Strobo” and motion blur

Many people associate these artefacts with the distinction “cinema / television”

TV enjoys HFR from its very beginning!

Storytelling and theater environment is what defines cinema. Spectators will adapt quickly.

Compare with dust, weaving, sound, color

24/25 SFR will remain available as a choice

It is possible to switch HFR/SFR during a show

HFR - Movement Portrayal

Frame Rate is like a sample rate for movement

A higher sample rate will describe movement with more resolution - temporal resolution

Actors moves are more precisely recorded and rendered - higher dramatic impact

Absence of artefacts allows for more attention to the story and more creative freedom

Absence of judder particularly beneficial to 3D

HFR - Freedom of Movement

Temporal resolution of the HVS is much higher than 24, close to 60 (cfr Marty Banks et al)

24/25 creates “Forbidden movement range” (between 7 and 1 second per screen with)

HFR abolishes this restriction and therefore allows for new developments in film language

If HFR movement portrayal capabilities are used to its full extend then SFR reductions are not possible (these would become unwatchable)

HFR main goal: Spacial Resolution

24 fps filming exposes $1/48^{\text{th}}$ of a second:
Anything that moves is severely blurred even
when moving only slightly, hardly ever more than
1K) - Q: Why not shorten exposure?

A: Blurring is needed to hide strobing / judder

-> HFR is a condition to enhance resolution <-

We can not really have a higher resolution than 1
or 2K on our main subjects unless we go HFR

Large sensors and shallow depth of field are also
used to remove background strobing / judder

HFR to enhance spacial resolution

Studies are needed to evaluate the detailed parameters and quantify the exact gain

Research project to be started at RITCS Film School in Brussels next year

It is possible that the enhancements seen with 120fps recording are actually due to the shortened exposure time only.

When 60 fps is shot with a 90 degree shutter it may yield the same result as 120fps. (1/240 exp)

60 fps seems to fully exclude all judder

HFR – SFR compatibility

The Hobbit : HFR features could be used only partly to allow also for 24 fps copies to be made because there still was an abundant presence of analog film theatres at that time

Now that digital conversion of theaters is complete, HFR may hopefully develop fully

Speed of 48 fps expected to disappear because of limited aftermarked incompatibility

60 fps privileged for distribution to all media

HFR – SFR media compatibility

~~48 fps~~ → 60 fps

48 fps was useful for making 24 fps reductions

But 48 fps is not supported on DVD or Blu-Ray

Blu-Ray and DVD supports 60 fps (and 50 fps)

3D Blu-Ray supports 60 fps/eye (and 50 fps/eye)

60 fps supported by all image rendering devices

Frame rate conversions damage image quality, both resolution as well as movement portrayal quality, movement smoothness and thus modify the original content (especially animation)

Low light levels for 3D projection

Recom. light level for 2D projection is 14fl

All 3D systems have important light loss

Light levels for 3D projection - 4 to 5 fl

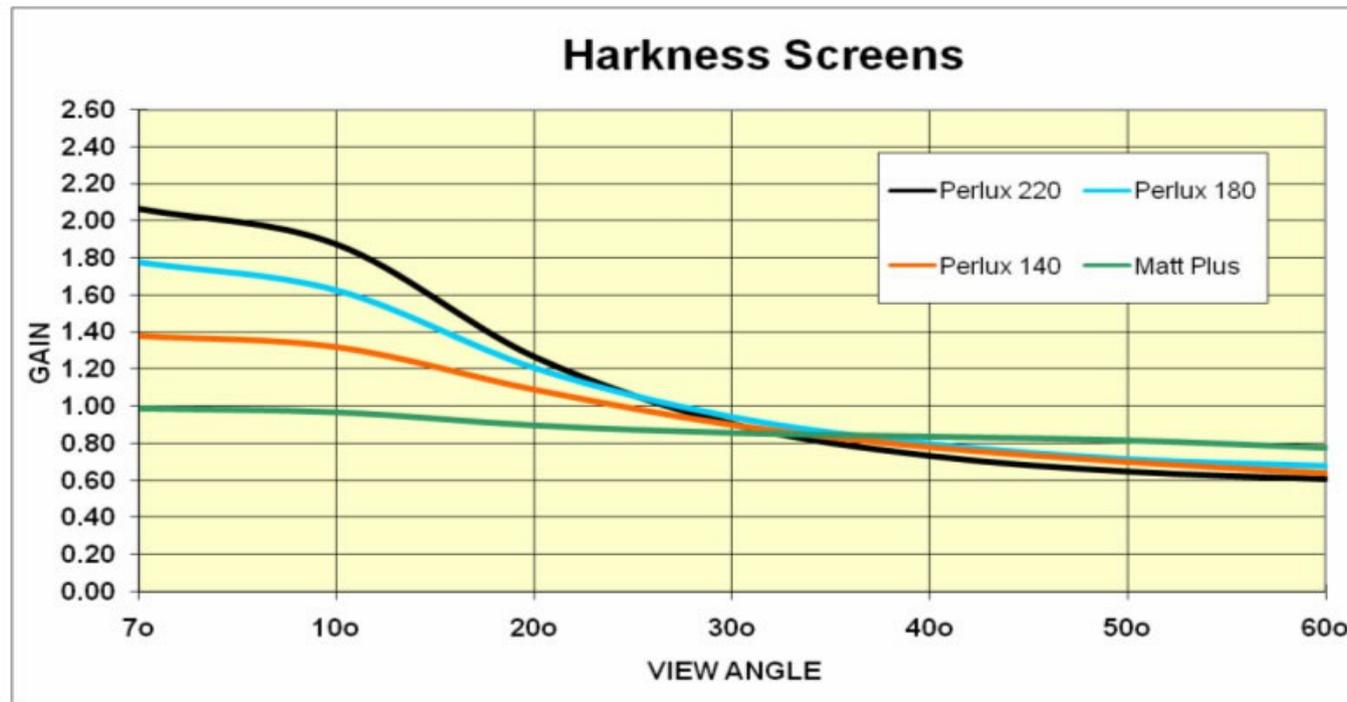
Lower levels than these are often seen

Significant reduction in contrast and power

Inferior perception of shadow detail

Cinema Screen Gain

Gain screens : viewing angles



Source: www.harkness-screens.com

Cinema Screen Gain

Gain screens : viewing angles

screen type	peak gain	half-gain angles
Perlux 140	1.4	50
Perlux 180	1.8	34
Perlux 220	2.2	26
Spectral 240	2.4	25

Cinema Screen Gain

Gain screens : theatre shape

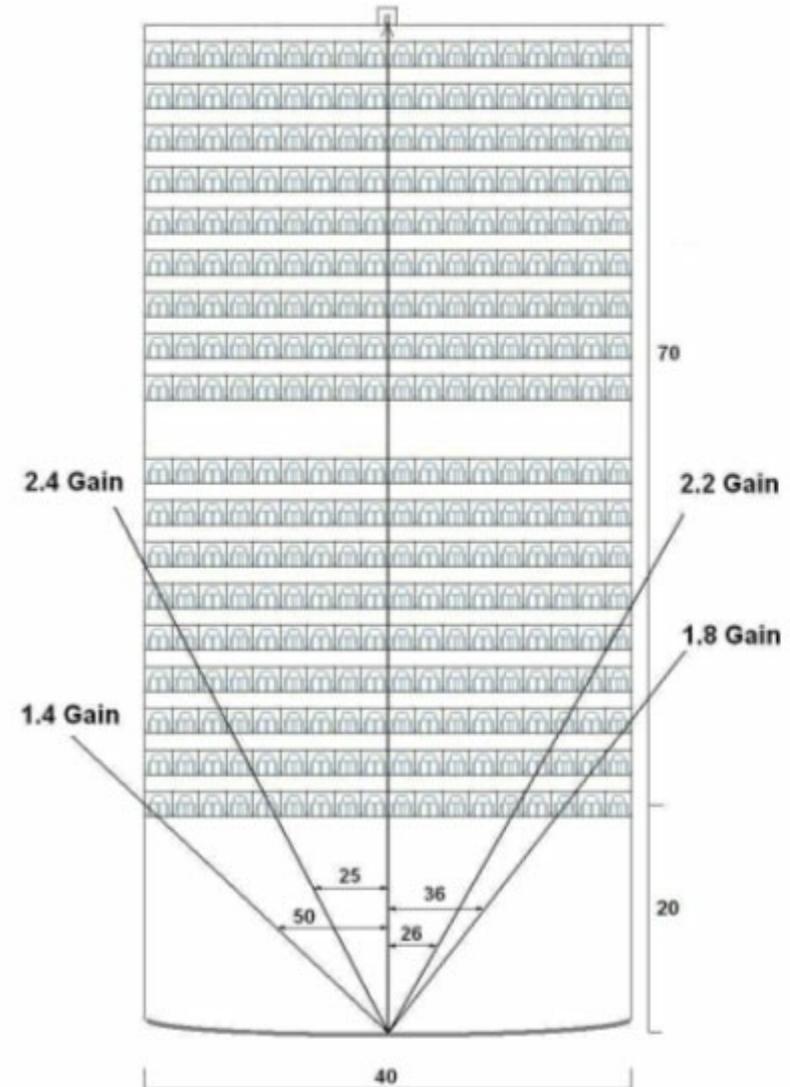
standard shape theatre

90' long

50' wide

40' screens

20' to front row



Cinema Screen Gain

Gain screens : theatre shape

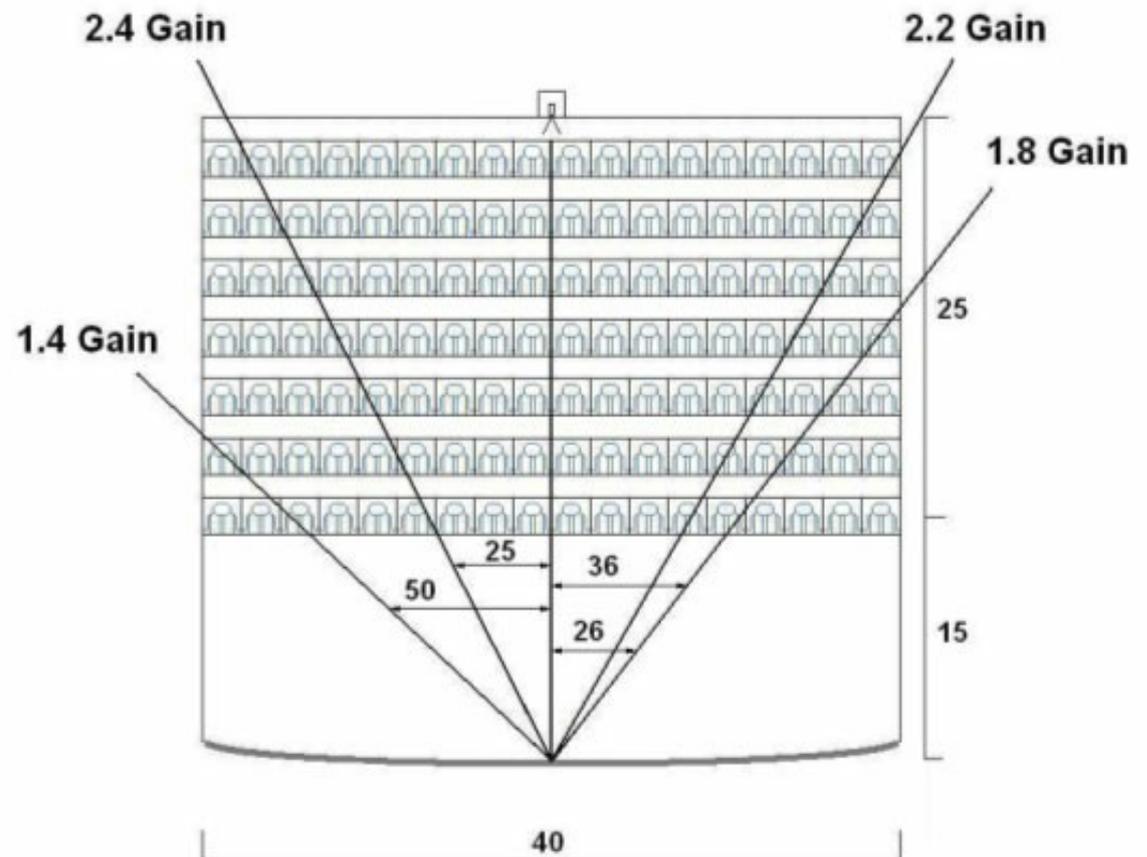
**very short theatre
(e.g. screening room)**

40' long

50' wide

40' screens

15' to front row





Source: John Christian Rosenlund FNF, "People in the sun", C
Maipo 2011, Screen: Cinema: Klingenberg Kino Oslo



Source: John Christian Rosenlund FNF, "People in the sun", C
Maipo 2011, Screen: Cinema: Klingenberg Kino Oslo

Silver Screen for 3D



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E-Mail sales@harkness-screens.com
www.harkness-screens.com

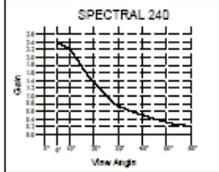
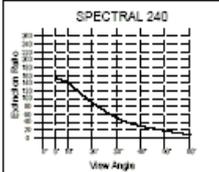
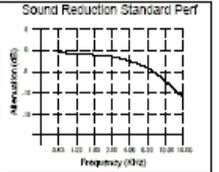
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**SPECTRAL™ 240 3D
FRONT PROJECTION SCREEN
DATA SHEET**

Document Ref DS-008 Issue 15 June 2010

Spectra™ 240 3D screens are considered by leading cinema exhibitors and special venue operators worldwide to be the optimum 3D projection surfaces. Silver aluminium flake based coating applied to a unique base material provides high gain characteristics, very low depolarisation level (extinction ratio) and excellent colour temperature. The surface type also supports conventional 2D pictures. *Noted for invisible seams under normal projection conditions.*

Application
Spectra™ 240 3D screens are recommended for face-in stretching to wrap-round (floating) or conventional style flat or curved frames. Harkness manufactured roller screens and Easy-Rect systems are other ideal applications. The surface cannot be folded for transit or storage, roll packing must always be used. Available in full screen perforated form where behind screen speakers are required (see attenuation curve). Mini-perforated and non-perforated options are also available.

<p>General Detail</p> <p>View Distance Minimum of 5mtr (15') recommended on perforated surfaces</p> <p>Maximum Size USA manufacture 23.77m x 12.19m (78' x 40') Europe manufacture 33m x 11m (108' 3" x 36' 1")</p> <p>Perforation Size Ø1.2mm (0.047")</p> <p>Perforation Density 4.5%</p> <p>Weight 0.52kg/m² (0.10lb/yd²)</p> <p>Eyelet Spacing 150mm (6") nominal (US) / 200mm (8") France</p> <p>Typical Packing Rolled in a cardboard tube; packed in a long wooden box when height is over 7m (23').</p> <p>Recyclability/Storage Screens should normally be transported and stored at temperatures between 5°C and 30°C (40°F and 86°F), with relative humidity less than 80%. If screens are very cold (e.g. following air transport) then they must be allowed to warm up before unrolling, otherwise cold cracking may occur. Screens should be installed within a maximum of 2 months of shipping. Packages should be handled with care to avoid damage.</p> <p>Installation The following principles should be followed when installing Harkness Spectra™ 240 3D screen surfaces: <ul style="list-style-type: none"> • The auditorium should be clean with no building works taking place. • Installation should be at ambient temperature (20/24°C/68/75°F). • Care should be taken to avoid the screen coming into contact with sharp objects during installation. • Excessive loads should not be placed on any specific point of the screen. • Use of cotton gloves is recommended. • The viewing surface should not be touched (the rear of the screen is identified by the product label). • The surface should not be creased during installation. There are two principal methods to install the screen: <ul style="list-style-type: none"> • Flying the screen by attaching several tie lines to the top of the screen, passing these over the top of the frame and using them to pull the screen into place. • Unrolling the screen vertically across the front of the frame. Using one of these methods, the screen surface is loosely attached to the top of the frame. After this, the top of the screen is fully attached to the top lacing bar by working from the centre outwards using each eyelet. The lower edge of the screen should then be laced from the centre outwards, applying sufficient tension to pull the screen flat. Typically, the screen can be stretched up to 5% of its height at ambient temperature of 20/24°C/68/75°F using slack cord lacing. Slack lacing should be from the top down and sufficient to remove the folds. Excessive side tension should be avoided, particularly on a curved frame, as it will result in straightening of the screen across the curve (belly). Springs or elasticated ties are not recommended to install Harkness screen surfaces. The above method can be used for both face-in and for wrap-round frames. Normally, two people are sufficient to install a screen surface. </p> <p>Care and Maintenance The general environment where the screen is installed should be kept reasonably clean to avoid dirt and dust build-up. Screens can be periodically cleaned using a soft brush or cloth, doing this vertically with limited pressure. Screens can be cleaned using a damp cloth wetted with water and a mild detergent. Under no circumstances should screens be cleaned with abrasive materials or harsh chemicals such as acids, bleaches or solvents. Harkness Screens is not liable for damage caused to screens through the use of inappropriate cleaning methods or chemicals.</p> <p style="text-align: center; font-size: small;">In the interest of product enhancement, Harkness Screens reserves the right to introduce modifications or alterations without notice</p>	<p>Surface Finishing Options</p> <ul style="list-style-type: none"> • Web and eye (gronomat). Triple fold web integral with surface • Perforated pipe pocket any size on any side • Cloth web and fittings (straps) for press stud frames • Straight sides or shaped to special order • Cut square (unfinished edge) <p>Fire Retardancy Certification to the following standards: UK USA NFPA 701 France M2 Germany B1 Japan ST-30-050 (regulation requires certification by inspecting company) Korea (regulation requires certification by inspecting company) Australia</p>	
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Source: www.harkness-screens.com

Silver Screen for 3D



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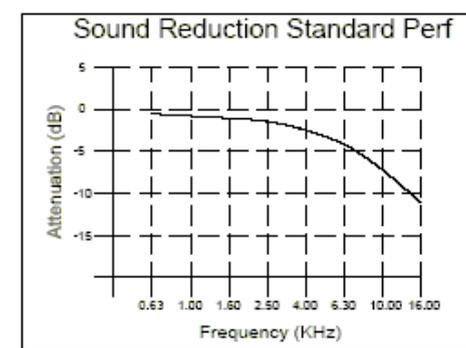
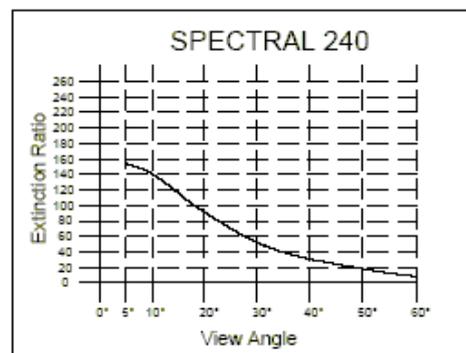
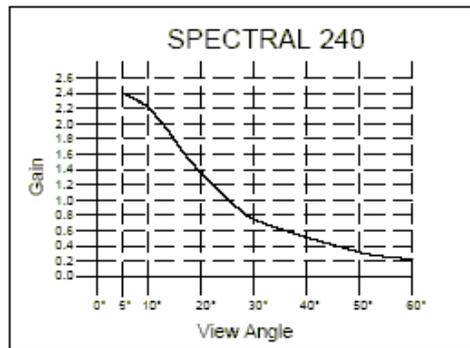
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Available in full screen perforated form where behind screen speakers are required (see attenuation curve).

Mini-perforated and non-perforated options are also available.



General Detail

View Distance Minimum of 5mtr (15') recommended on perforated surfaces

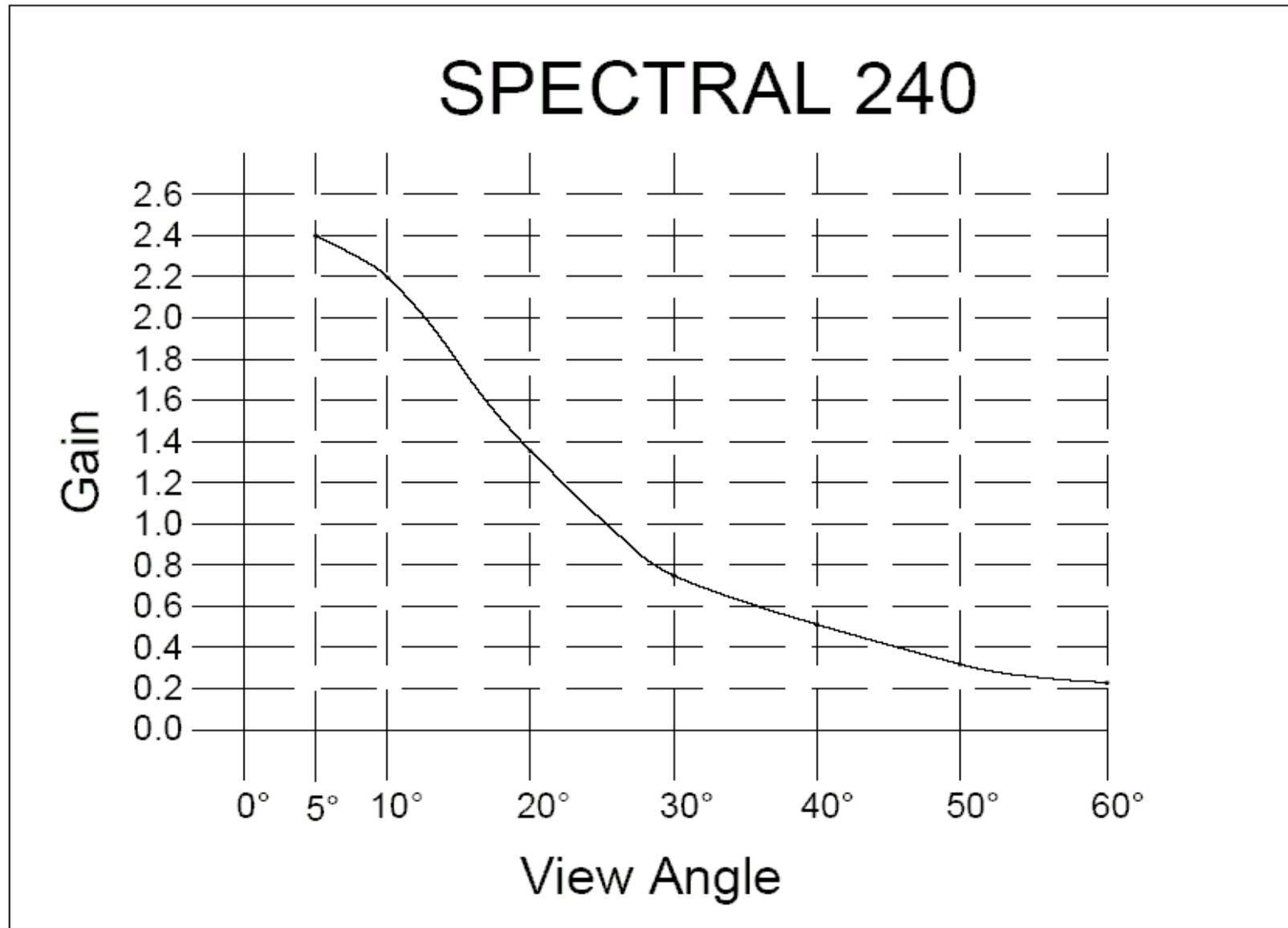
Maximum Size
USA manufacture 23.77m x 12.19m (78' x 40')
Europe manufacture 33m x 11m (108' 3" x 36' 1")

Surface Edging Options

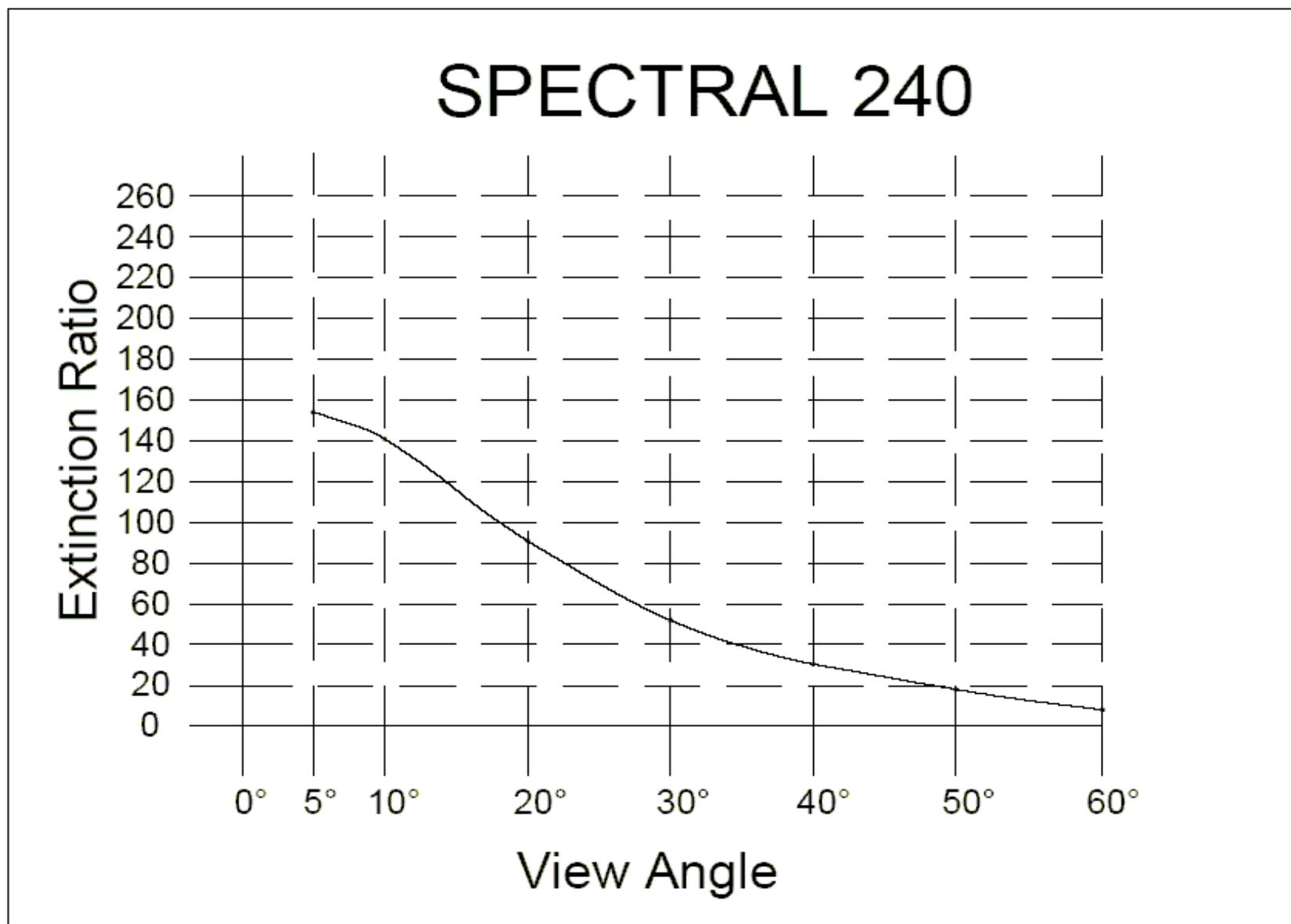
- Web and eye (grommet). Triple fold web integral with surface
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Source: www.harkness-screens.com

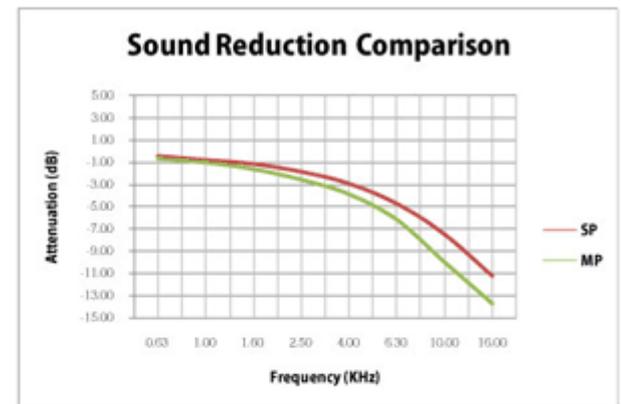
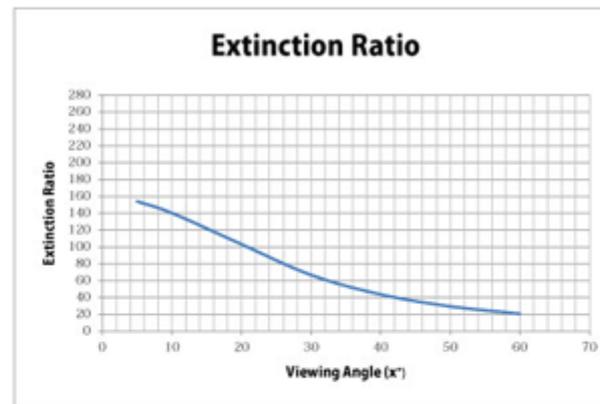
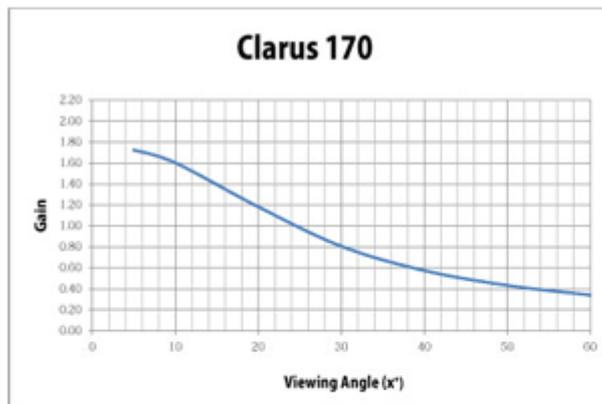
Silver Screen Reflection Gain



Silver Screen 3D Extinction Ratio



RealD precision white 3D screen, better contrast, 1.70 Gain, less compromise for 2D show



MAX GAIN: 1.70

HALF GAIN ANGLE: 28°

EXTINCTION RATIO ON AXIS: 145:1

PERFORATED FORM

Standard Perf

Mini-Perf

HOLE SIZE

1.2mm (0.047")

0.5mm (0.020")

OPEN AREA

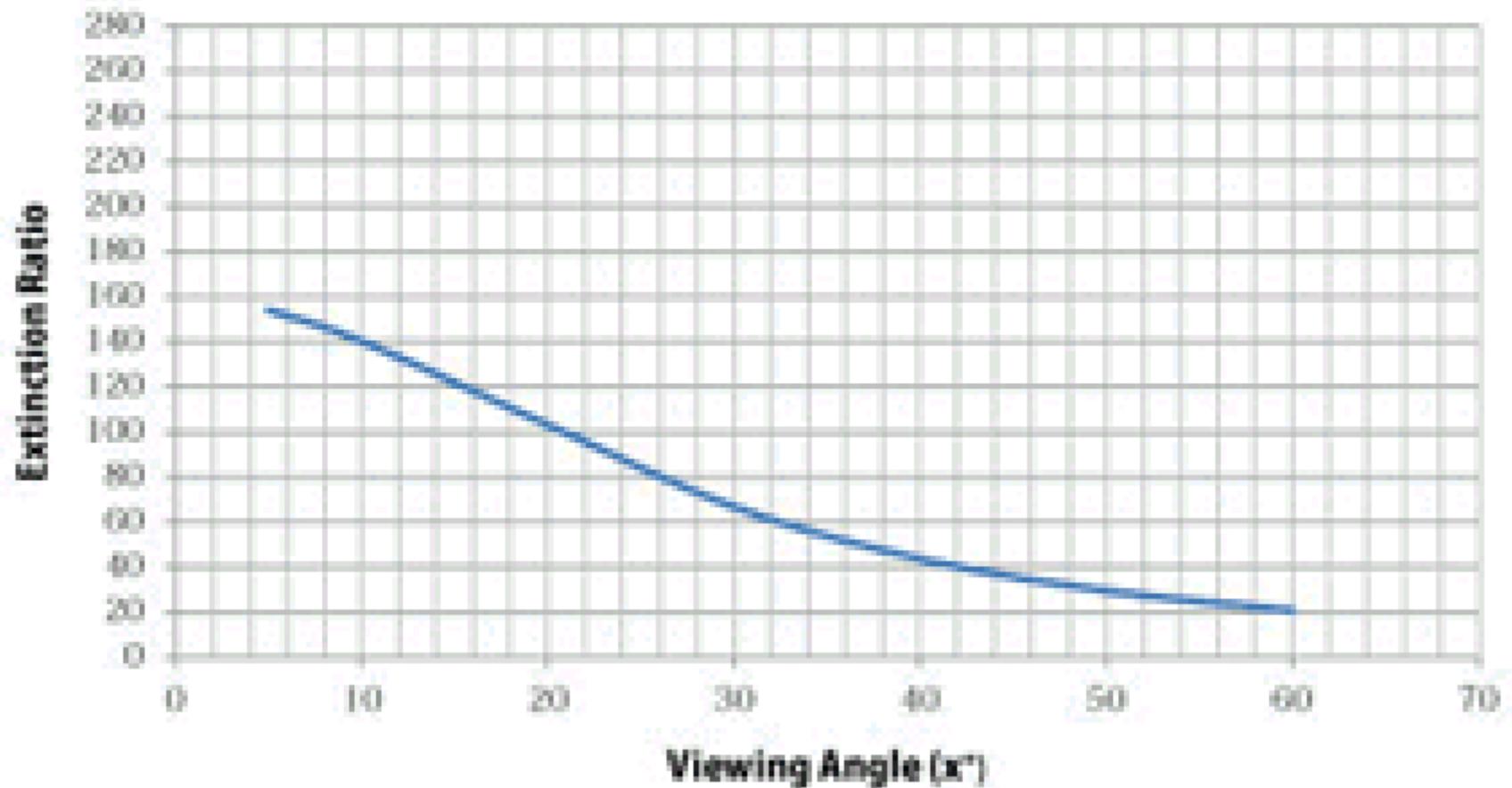
4.5%

1.7%

Source: www.harkness-screens.com

RealD precision white 3D screen, only slightly better ext ratio

Extinction Ratio



Conclusions (from cinematographers pov)

Cinematographers would like to recommend light distribution to stay within one stop (50%) like is required by the standards and is the case with classic 1.4 screens

Cinematographers would like to recommend that in future 3D systems will also achieve 14 fl projection

In the mean time consider to block front row corner seats when the screen is high gain, especially if show is 3D

Consider (automatically) removable (moving) 3D screens to at least preserve 2D presentation quality.

Whats Coocking in Cinema exhibition

~~High Frame Rates for 2D and 3D~~

~~White screen for polarised 3D~~

Laser Light Sources in Projection

High / Extended Dynamic Range

High / Extended Color Gamut

Laser Light Sources in Projection

Replaces Xenon lamp, the image is still rendered with DMD/DLP chips

Direct laser projection not possible yet for security reasons (mainly scanner failure reliability)

Laser light sources have both advantages and disadvantages

Laser Light Sources Advantages

- * Higher light output (+ 1 stop extra compared to Xenon)
 - providing for bigger screens
 - or some slight HDR in 2D
- * Output gain bigger for 3D (+2 stops):
 - because of of 6p systems or build in polarization gaining a second stop (no filter needed in the projector)
 - resulting in bigger 3D screens (but still dark)
 - or 3D screens with better light levels (up to 14 FI)
 - Can help for the use of white polarised screens
 - However, it is or, or, or, only one at the time....

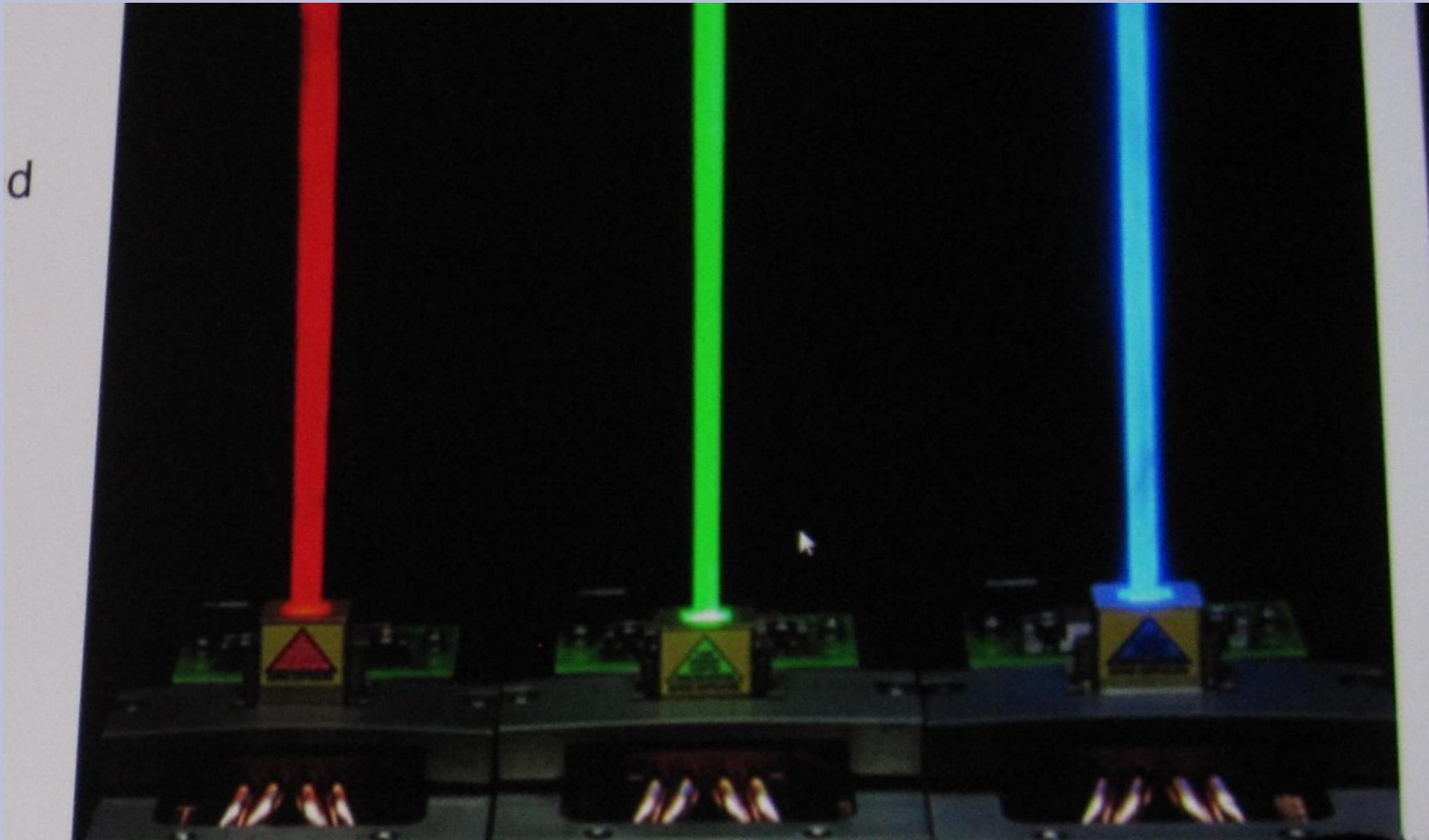
Laser Light Sources

Advantages

- * Larger color space than Xenon (purer primaries)
 - Allows for full P3 color space through 'Dolby' or Infitec style anaglyph glasses
 - or REC2020 color space reproduction (but not both, again, or, or)
- * Can be modulated to adapt between 2D and 3D shows
 - Xenon = only 50% dimming = 1 stop
 - Laser = down to 12% dimming = 3 stops
- * Long or 'projector life' 'bulb life' (up to 30.000 hours)
- * Only 40% power consumption compared to Xenon

Laser Light Sources

Desadvantages



Laser Light Sources Challenges

- * Still **expensive to acquire** although potential reward in long term
- * Problems due to narrow spectrum emission of laser light sources
 - **Speckle** - solved by multiple laser sources - incoherence, but attention because of cost !! May re-appear by economics
 - **Color fringing** due to limited narrow spectrum
 - .This looks a lot like convergence errors (but disappears when you approach the screen)
 - .Fringes generate in HVS not in projection system
 - .Problem stronger for patrons with glasses or lenses
 - .More pronounced when sitting away from the screen
 - .Needs more colors sources to get solved (more continuous spectrum) (not likely to happen because of costs.....)

Laser Light Sources Challenges

- Viewer Metamerism - Viewers are perceiving laser reproduced colors differently from person to person

.Humans have individual spectral sensitivity curves!

.The consecutive brains are trained to these curves but did so while using continuous spectra

.Narrow spectrum illumination makes the individual differences in spectral sensitivity more significant, and creates differences in color perception watching the same laser illuminated performance.....

.Importance of this may possibly be underestimated.

Special case: Phosphor laser source projector

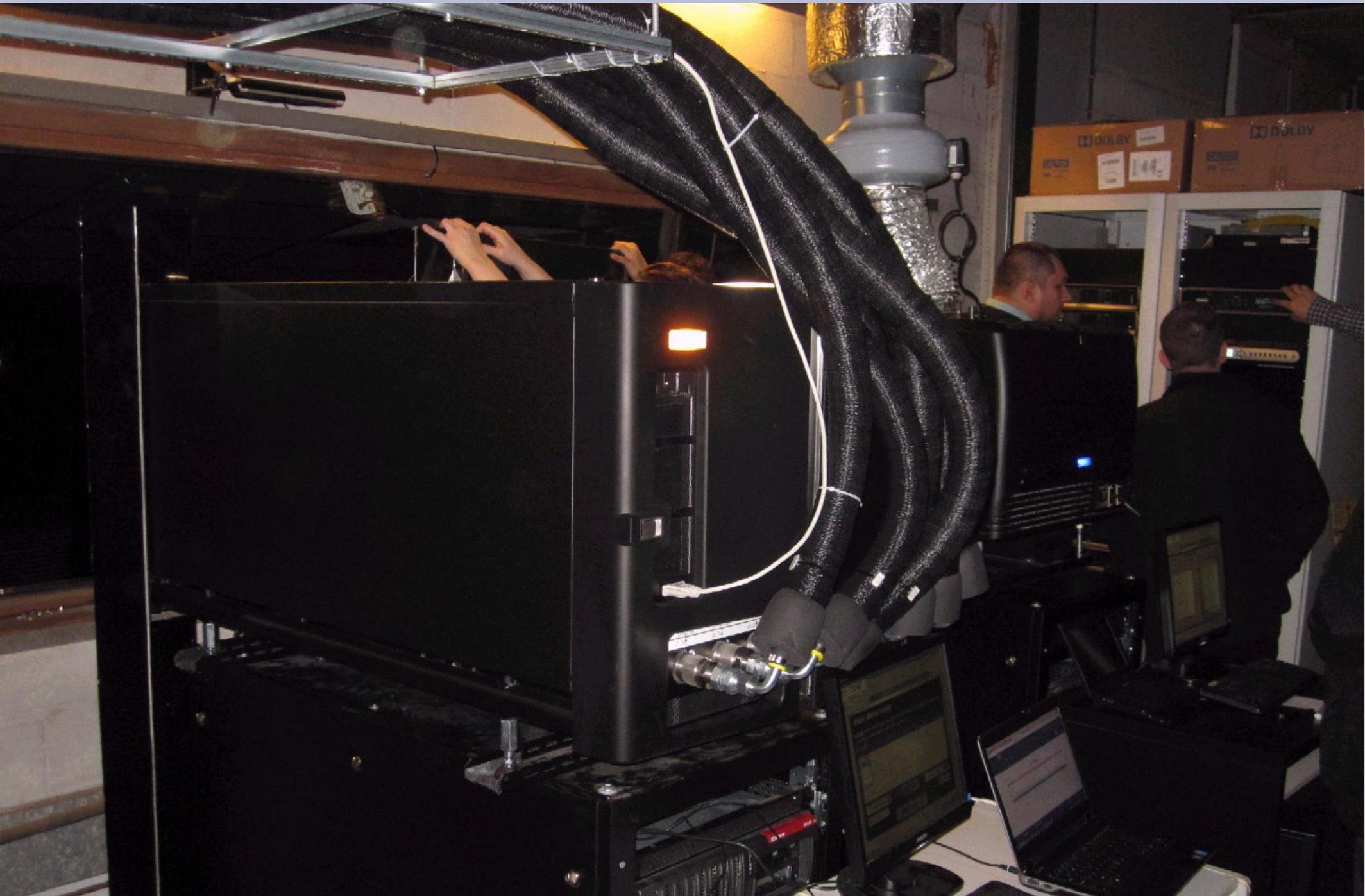
- Only blue lasers (= cheaper)
- Red and Green created by phosphor excitation by blue
- Speckle risk on Blue only (not very disturbing)
- No color fringing (phosphors have wide spectrum)
- Only medium power (For small screens up to 8 metres)
- Interesting solution for small [boothless] theatres
- No lamp changes during projector life
- Low maintenance, low power consumption

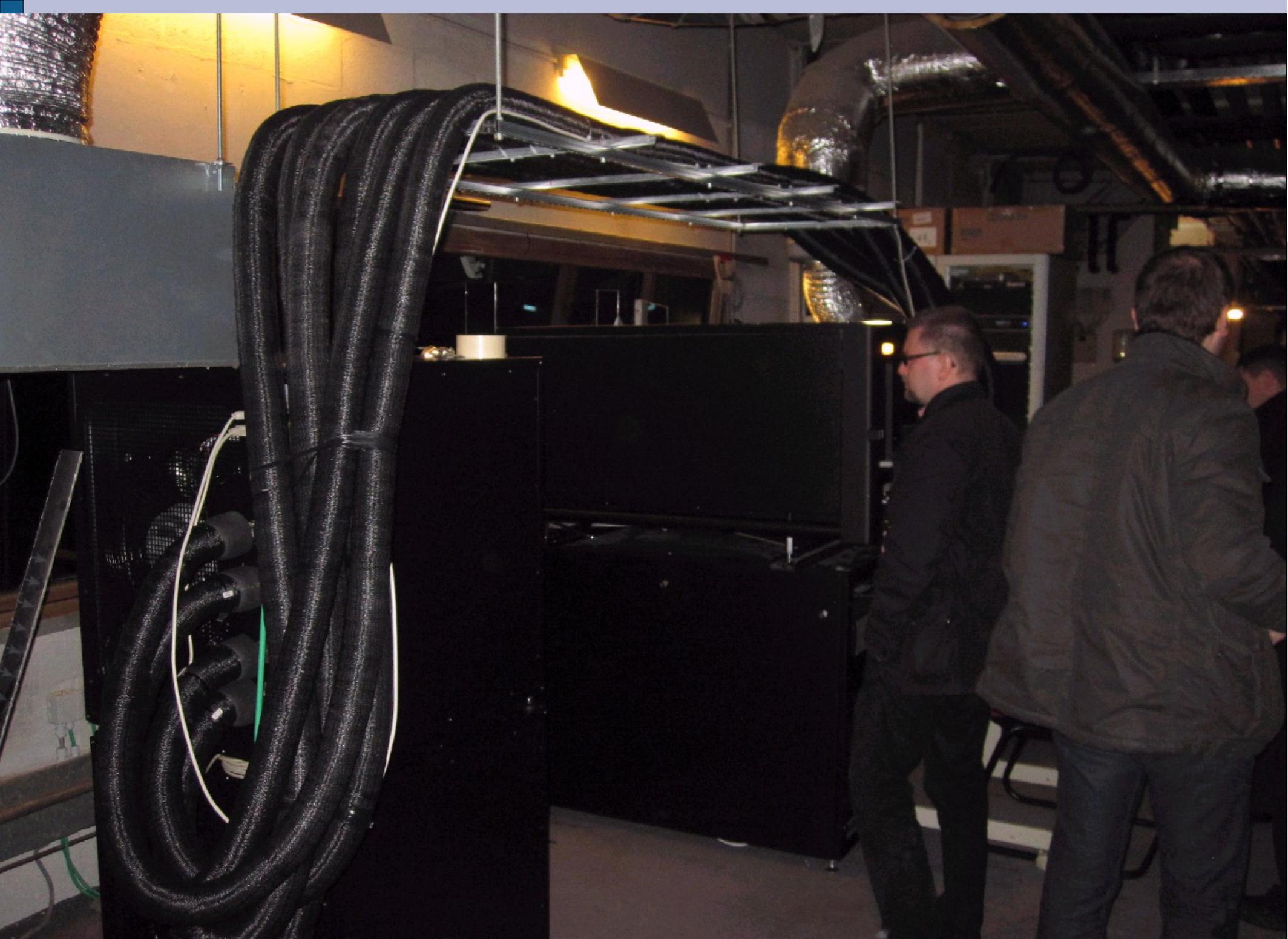
Laser Light Sources

Barco 6p system Brussels



Barco 6p system Brussels





Laser Light Sources

Christie 6p system @ IBC



Whats Coocking in Cinema exhibition

~~High Frame Rates for 2D and 3D~~

~~White screen for polarised 3D~~

~~Laser Light Sources in Projection~~

High / Extended Color Gamut

High / Extended Dynamic Range

High / Extended Color Gamut

- Based on REC 2020 for UHD TV (upgrade from 709)
- Laser light source projectors can achieve this (but not in combination with Dolby / Infitec 3D glasses)
- Visual differences with P3 are quite small (bigger difference when starting from 709)
- Some extremely saturated colors can now be reproduced that were not possible with P3
- No differences in other (regular) colors
- No general image quality enhancement
- Story telling value seems small except for extreme cases
- In combination with HDR it may eventually be of more value

High / Extended Dynamic Range

- Darker Blacks - Brighter whites
- Confusion on what the new levels would be
- Lack of agreement on levels to be applied, let alone standards
- Dolby Vision (+ 8 stops ?)
- Experiential cinema in The Netherlands claims HDR with only 2,5 stops of extra DR
- 'Real HDR' (18 stops) not possible in projection on white screen - Probably only with emissive (dark) screens

High / Extended Dynamic Range

Digital-Cinema Content Creation Today



HUMAN VISUAL DYNAMIC RANGE

 BRIGHTNESS	20,000+ NITS
 DARKNESS	0.001 NITS
 STOPS	24+ STOPS

CINEMA (DCI P3 RANGE)

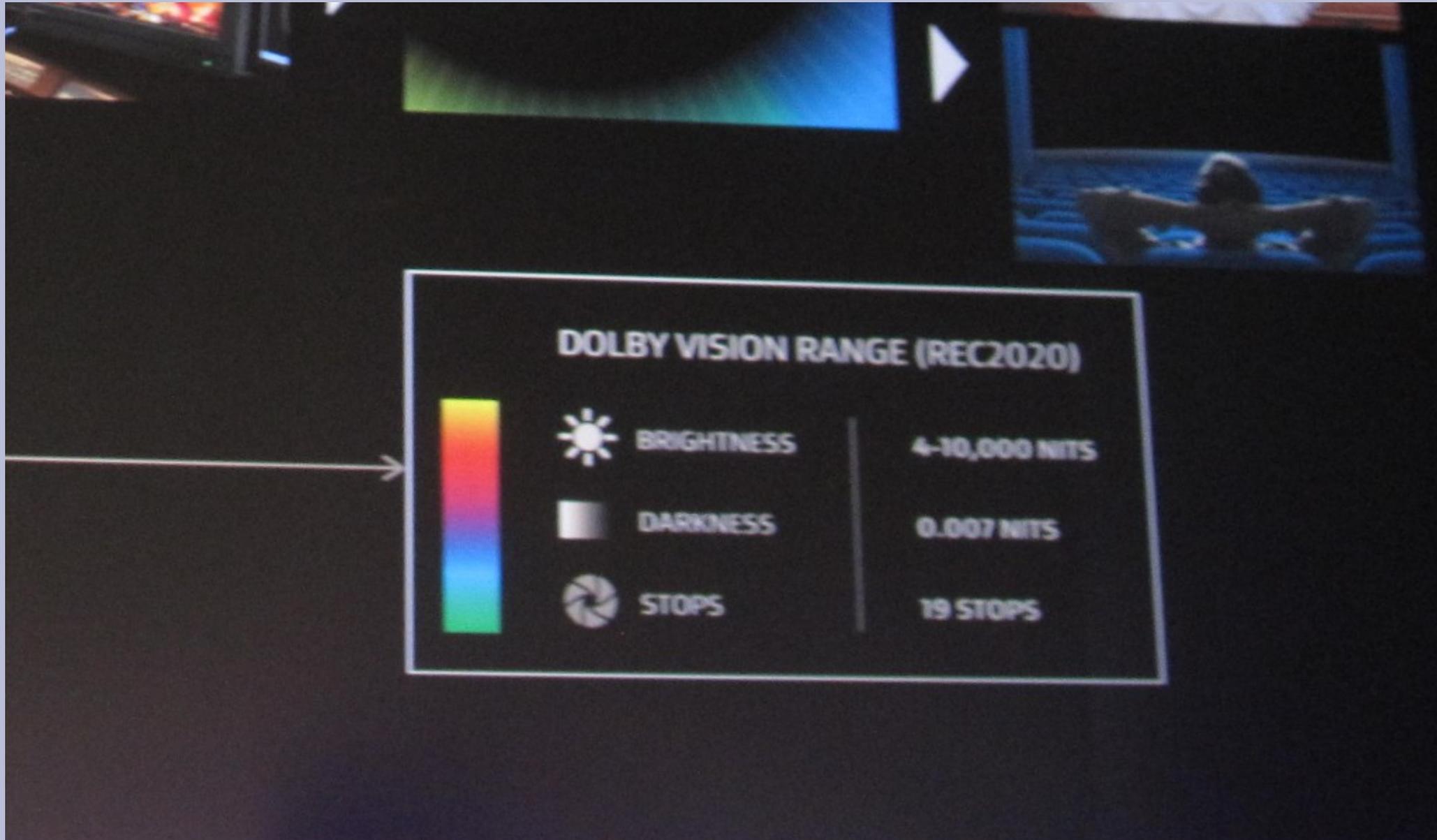
 BRIGHTNESS	48 NITS
 DARKNESS	0.024 NITS
 STOPS	11 STOPS

High / Extended Dynamic Range

Dolby Vision Content Creation Methodology



High / Extended Dynamic Range



High / Extended Dynamic Range – Power consumption

Application	Nits	add stops	Added power factor for eq screen size (kW)						
			Cinema	TV	Typ Cinema	Big Cinema	Laser Cinema	TV	
Cinema	50	0	1	0.5	2	6.5	2.6	0.1	
TV	100	1	2	1	4	13	5.2	0.2	
	200	2	4	2	8	26	10.4	0.4	
	400	3	8	4	16	52	20.8	0.8	
	800	4	16	8	32	104	41.6	1.6	
	1600	5	32	16	64	208	83.2	3.2	
	3200	6	64	32	128	416	166.4	6.4	
Dolby Vision	6400	7	128	64	256	832	332.8	12.8	

High / Extended Dynamic Range

- Economically feasible in cinema ??
- No projection technology is anywhere near powerful enough today, emissive screens are technically possible but but are far too expensive for cinema at this time
 - HDR likely to be used for TV first, before cinema !
 - HDR professional monitors do exist today
- Problem for cinematographers is: What contrast range will we produce for?
Standards needed!! Conversion not trivial!

Whats Coocking in Cinema exhibition

~~High Frame Rates for 2D and 3D~~

~~White screen for polarised 3D~~

~~Laser Light Sources in Projection~~

~~High / Extended Color Gamut~~

~~High / Extended Dynamic Range~~

Whats Coocking in Cinema exhibition

Barco Escape

Second Screen

High pressure mercury lamps

Boothless Cinemas

Emissive Screens

Barco Escape - System 'Triptique'- 3 Projectors



Barco Escape

Reflections hightens black level



Barco Escape Movie title 2014



The image shows a movie poster for 'The Maze Runner'. The top half features a group of young men running through a complex, multi-level maze carved into a rocky landscape. The lighting is dramatic, with strong highlights and deep shadows. Below the image, the title 'THE MAZE RUNNER' is written in large, bold, white capital letters. Underneath the title, there is a promotional message: 'Be the first to see footage in' followed by the Barco logo (a red square with 'BARCO' in white and 'Visibly yours' in a smaller font below it) and the word 'escape' in a red, stylized, lowercase font. At the bottom of the poster, a white text box contains the following text: 'The new ultra-wide movie format with multiple projectors and screens, creates an amazing panoramic experience!'.

THE
MAZE RUNNER

Be the first to see footage in

BARCO
Visibly yours

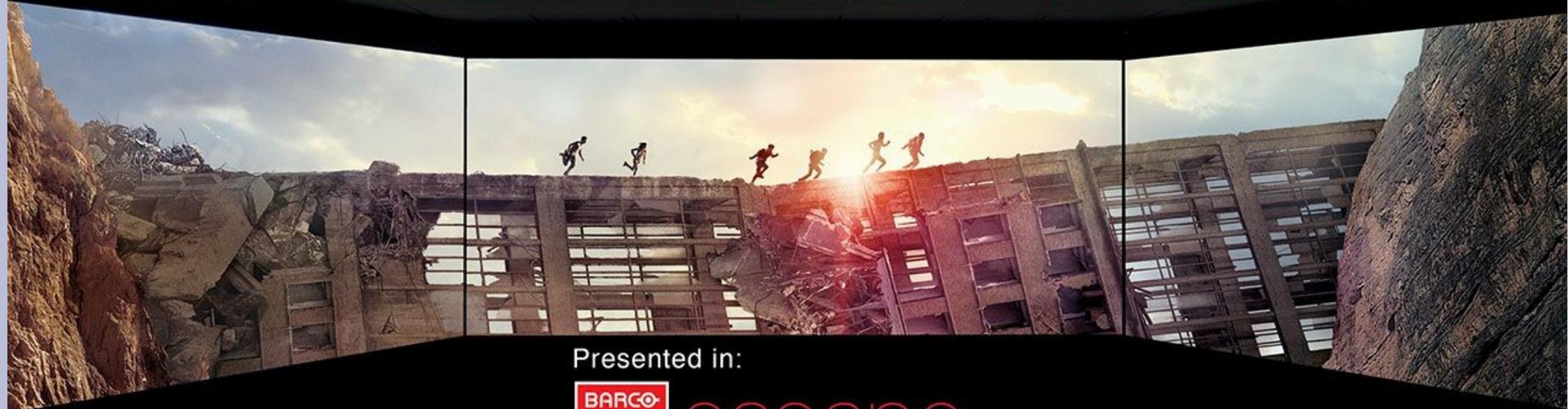
escape

The new ultra-wide movie format with multiple projectors and screens,
creates an amazing panoramic experience!

Barco Escape Movie title 2015

MAZE RUNNER

THE SCORCH TRIALS

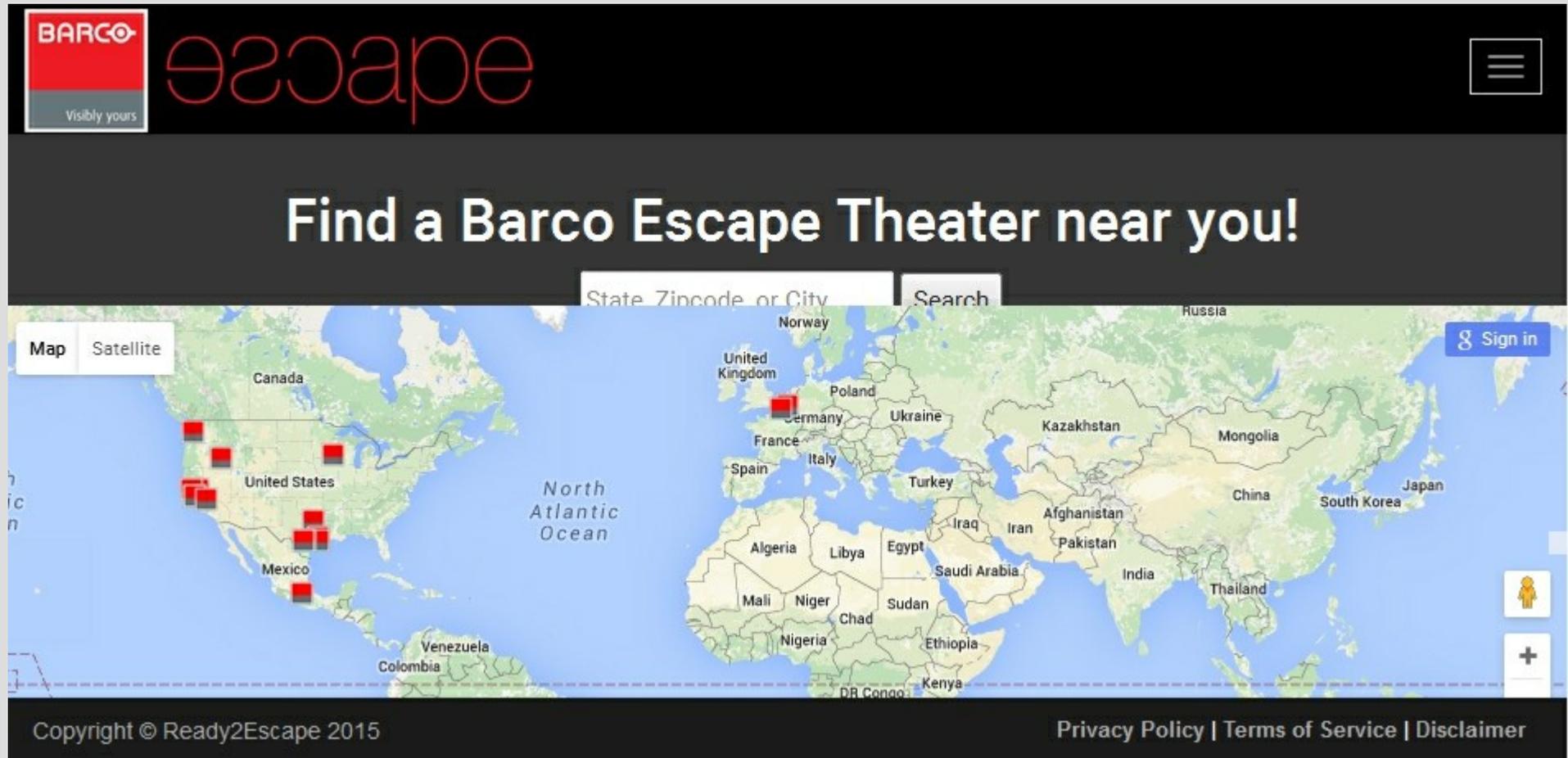


Presented in:



escape

Barco Escape – Only a few Installed Theatres



The screenshot displays the Barco Escape website interface. At the top left is the Barco logo with the tagline "Visibly yours" and the word "escape" in a red, lowercase, sans-serif font. A hamburger menu icon is in the top right. Below the header is a dark banner with the text "Find a Barco Escape Theater near you!". Underneath the banner is a search bar with the placeholder text "State, Zipcode, or City" and a "Search" button. The main content area features a map of the world with red square markers indicating theater locations. The markers are concentrated in North America, specifically in the United States and Mexico. A "Sign in" button is visible in the top right corner of the map area. At the bottom of the page, there is a copyright notice "Copyright © Ready2Escape 2015" and a footer with links for "Privacy Policy | Terms of Service | Disclaimer".

BARCO Visibly yours escape

Find a Barco Escape Theater near you!

State, Zipcode, or City Search

Map Satellite

Sign in

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Second Screen (Interactive Cinema)



Second Screen Titles – Also on BD

Disney
**SECOND
SCREEN**

SELECT YOUR TITLE...



High pressure mercury lamps

- Cheaper Lamps than Xenon, and easier to replace
- Power efficiency limited because of lack of red color, solved by heavy filtering of green to achieve P3
- Proper P3 colors space is achieved
- Not a problem for us at this time

Boothless Cinemas

Projector build into soundproof box against theatre ceiling

Entirely remote controlled

More difficult for maintenance

Extra incentive for laser source

Emissive Screens – Cinema screens of the future?

LED wall, 0,4 or 0,3mm pitch, no projector

* Technology exists but still a number of challenges

- Prohibitively Expensive
- Color uniformity is a particular challenge as LED's need to come from the same batch (solved by spare parts, or local re-calculation with processors build into tiles)
- Directional Color uniformity in tri-color LED
- Copy protection not yet solved for data transport
- + Potential candidate for 'real HDR' (19 stops) BUT
 - Huge Power consumption for HDR (+cooling)
 - High levels of Electro-Magnetic Radiation

Emissive Screens

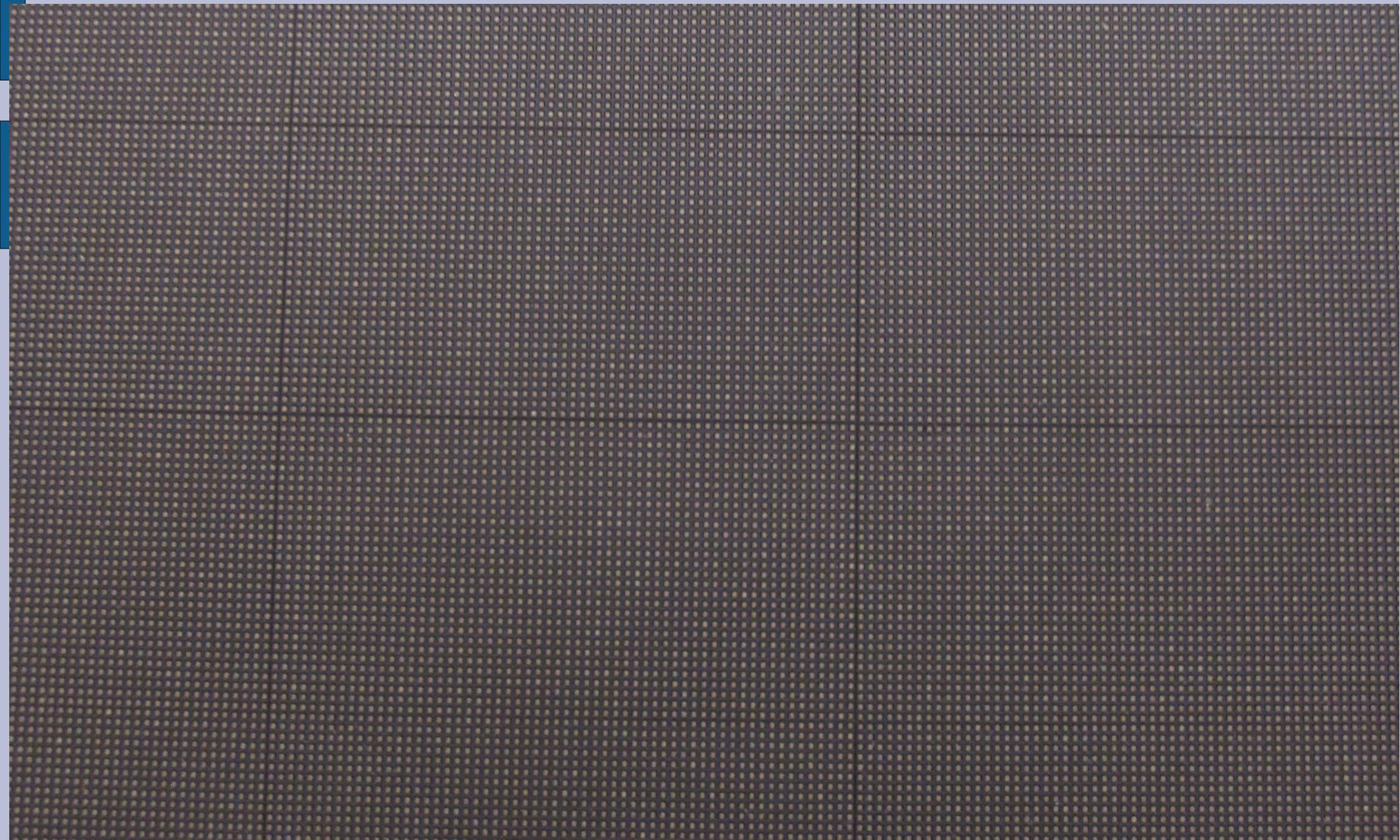








Emissive Screens



Thank you

Thank you for your attention.

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Oslo Digital Cinema Conference, 30 Oktober 2015