



RGB laser projection for premium cinema screens

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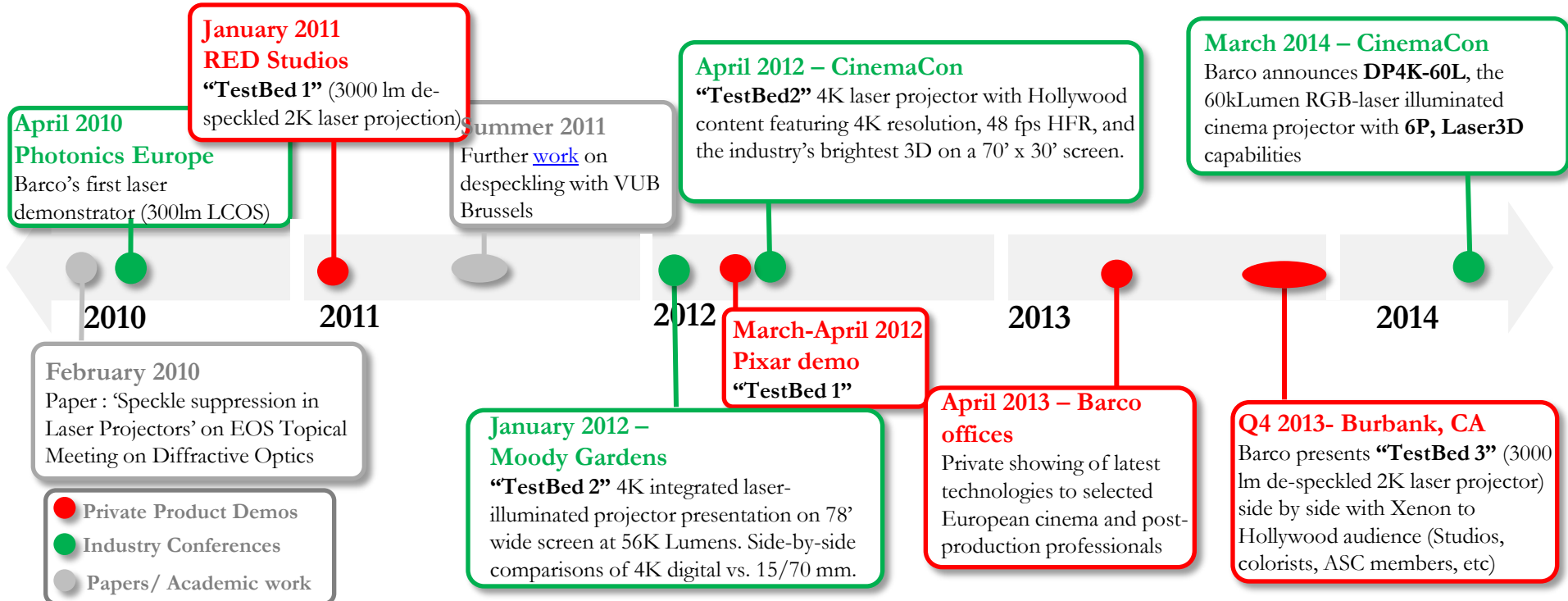
CinemaCon review

- First showing of Barco DP4K-60L projector
- Cinemark XD auditorium (45ft white 1.8 gain screen)
- Screening of Hobbit 2 trailer, 14fL 3D with 6P Laser3D with a single projector
- Commercial sales announcements
 - Cinemark (5x), Santikos(1x) (US)
 - Kinopolis(4x) (Europe)
 - JinYi (2x), Sichuan Pacific, Henan Oscar (China)
- Installations Q2 through Q4 2014





Barco track record in laser projection

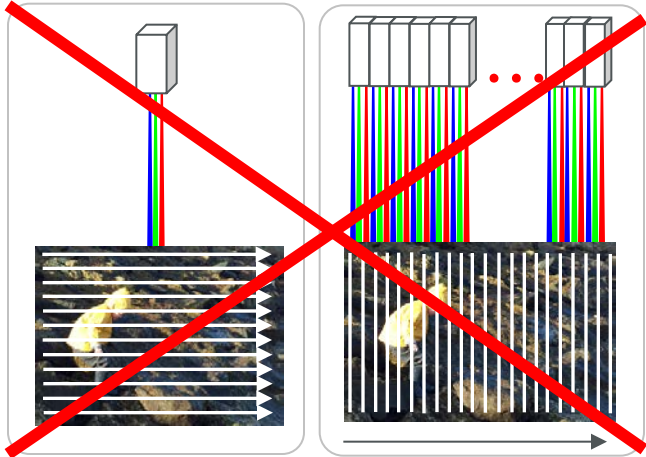


- Private Product Demos
- Industry Conferences
- Papers/ Academic work

Concepts of laser projection

Direct Scanned Laser Projection

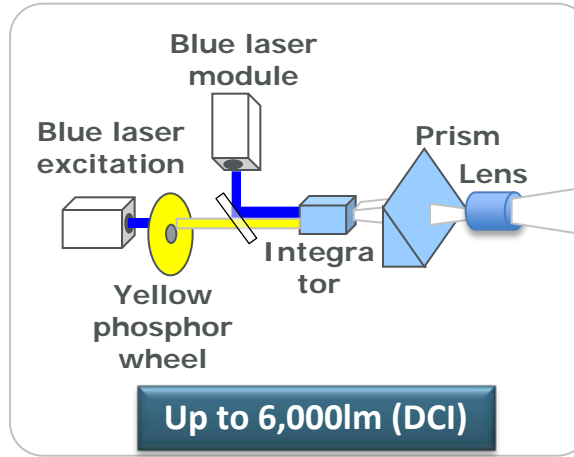
One laser beam Array of laser beams



Direct laser light projected on the screen
 Eye-Safety hazards
 Image quality challenges
 Not used in front projection applications

Laser Illuminated Projection

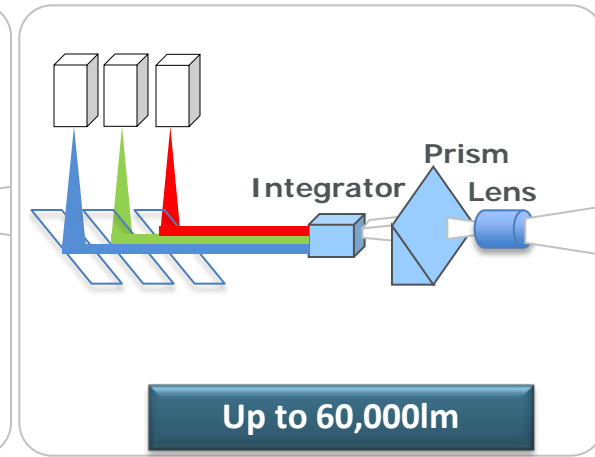
Laser Phosphor Illumination



Up to 6,000lm (DCI)

Direct laser light + laser pumped phosphor
 Diffuse laser light
 Limited brightness

RGB Laser Illumination

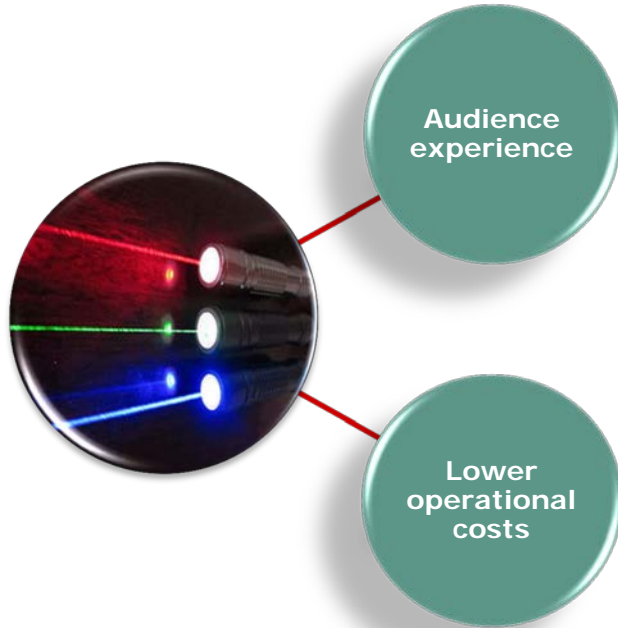


Up to 60,000lm

Direct laser light for R, G, B
 High Brightness



Benefits of laser technology for cinema



- Premium experience RGB laser only
 - Brighter 3D (DCI HFR 3D: 7fL)
 - Better contrast, gamut, uniformity, sharpness.
- Consistent experience
 - Constant brightness
 - No lamp flicker
 - No lamp failures/lost shows

- No lamp costs
 - no purchase, stocking, replacement, disposal
- No sudden lamp failures
 - No lost shows
 - No warranty claims for lamp explosions
- Better efficiency
 - Better lumen/Watt performance vs. Xenon



Challenges of laser technology

A circular inset image showing a laser projector with three beams of light (red, green, and blue) emanating from it.

Regulatory

- Old regulations coming from laser light shows
- LIPA actively working on changing this
- Barco LIP FDA variance in the approval process

Image quality

- Speckle

Cost

- High purchase price
- (but: operational cost beneficial vs. Xenon)





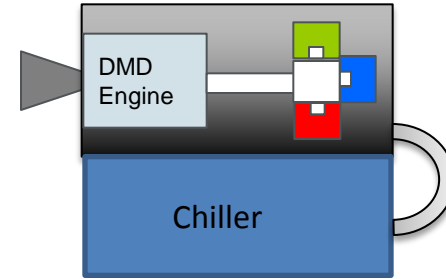
Barco approach

- “Same or better than Xenon”
 - Focus on high brightness
 - Focus on speckle removal
 - Sharpness and uniformity improvement
 - Improving Color3D efficiency with the 6P concept.
- Minimize OPEX
 - Conditioning of laser working temperature for longer lifetime
 - Minimize losses in optical components (e.g. no fibers)



Barco product concept

- **Integrated** laser light source
 - “Direct coupling”, no fibers and fiber losses
 - Increasing Lm/W projector efficiency
- **Active cooling**
 - Prolonging lifetime of DMDs and laser diodes.
- **6P** in a **single projector**
 - Avoid dual projector installation, maintenance and service
- Proprietary **despeckling**
 - Using diversity of wavelengths, angles, polarizations to reach very low speckle contrast ratios on screen





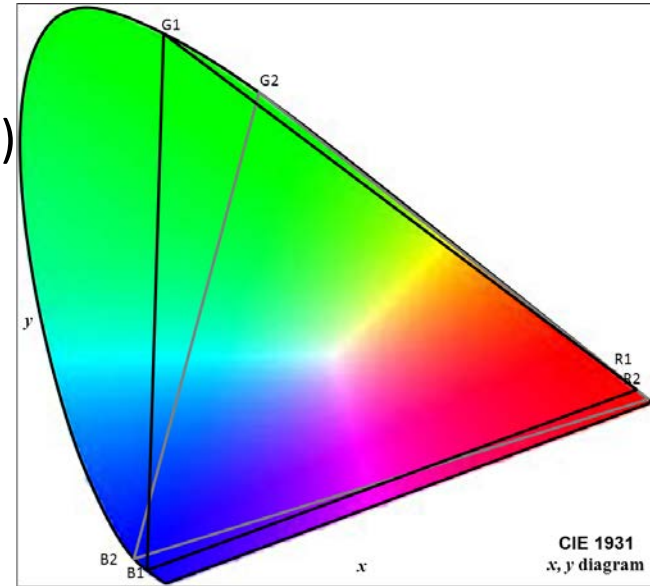
DP4K-60L – product performance

- 60.000 DCI lumens
- 30.000 hrs light source lifetime
 - With 80% remaining light
- Active 6P, “Barco Laser3D”
 - >22% efficiency
- 4K-60fps and 4K-3D capable
 - Barco Alchemy media processor

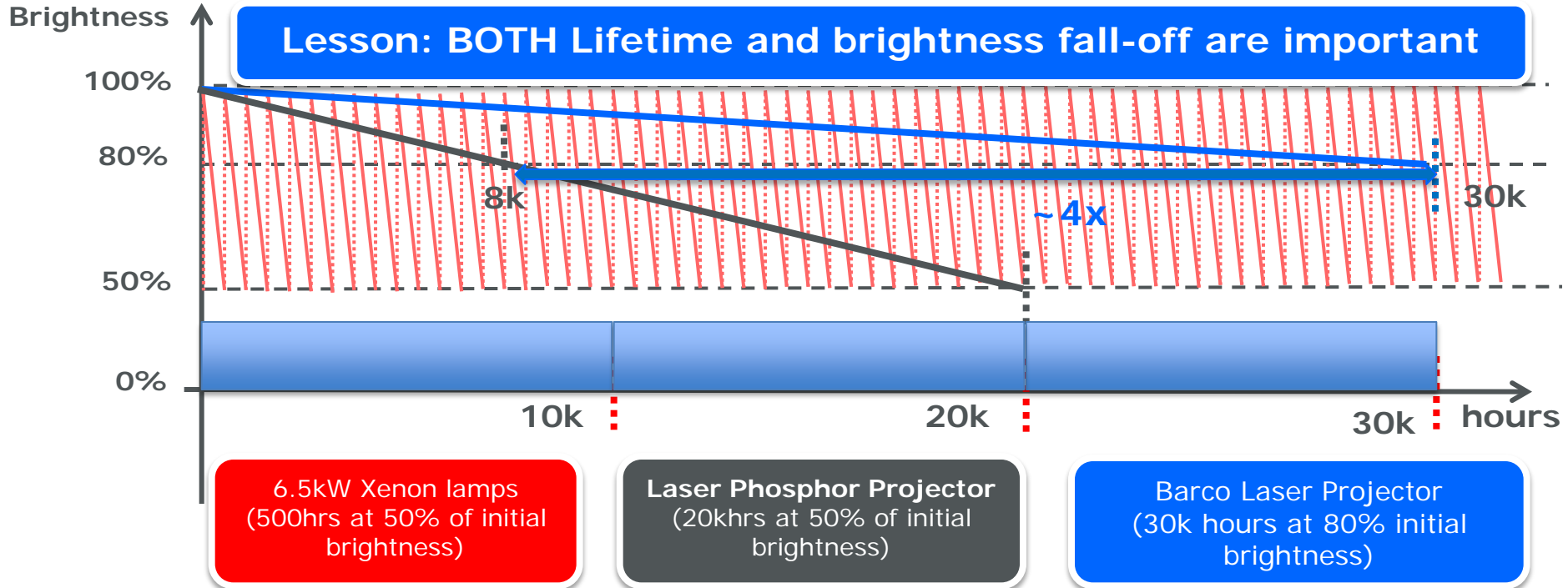


What is 6P (six primaries)?

- “6P”: Laser projection with two sets of R, G and B primaries ($R_1G_1B_1$ for left eye, $R_2G_2B_2$ for right eye)
- Special glasses (e.g. coating tuned for laser wavelengths)
- No Dolby Wheel or additional hardware needed
- Result:
 - Clear 3D with no cross-talk (very high extinction ratio)
 - 2x higher efficiency than Dolby3D (with a single projector)
 - Similar efficiency as RealD XL
 - No silver screens needed

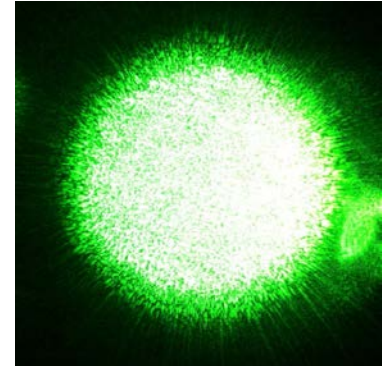


Focus on lifetime and TCO



Speckle

- Barco has long history in speckle research and despeckling techniques
- 2010-11: Milestone papers on speckle metrology which are used as a reference now
- Speckle contrast improvement:
 - Osiris: 16%
 - Testbed1: 4%
 - Testbed2: 6%
 - Testbed3: 3%
 - **DP4K-60L: 2%**





Lumen/watt comparison

- Single Xenon (e.g. Barco DP4K-32B)
 - With new lamp: $33.000 \text{ lumens} / 7.5 \text{ kW} = 4.4 \text{ lm/W}$
 - On average (75% brightness): $= 24750 / 7.5 \text{ kW} = 3.3 \text{ lm/W}$
- Single Barco DP4K-60L
 - Out of the box: $60.000 \text{ lumens} / 10 \text{ kW} = 6.0 \text{ lm/W}$ (36% better)
 - Average (90% brightness) = $54.000 / 10 \text{ kW} = 5.4 \text{ lm/W}$ (63% better)





Application examples

- A **single** DP4K-60kL projector can do:
 - Up to 24m screens in 7fL 3D with 1.8 gain and Barco Laser3D.
 - Up to 17m screens in 14fL 3D with 1.8 gain and Barco Laser3D.
- *A single 60kL projector can provide 7fL 3D to almost all premium screens!*





Please be invited to our Laser projection demo:

- Cinemark Century 16 South Point, XD theatre
- Sunday April 6th (technical) and Monday April 7th (general)
at 18:30