

harkness[®]

90 YEARS OF INNOVATION

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Speckle Observation Tests at Christie Digital Wokingham: Summary version for Christie and Harkness commercial team customer guidelines.



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Introduction

In November 2018 Christie Digital conducted RealLaser projector evaluations with screen surfaces from different manufacturers including Harkness.

The result of this trial lead to the broad customer advice breaking out screen types into three groups irrespective of manufacturer and with the following advice.

- Matt White surfaces – all good with no discernible speckle
- White gain screens – useable but likely issues with many customers with higher gain versions and levels of distracting speckle
- Silver screens – not acceptable in all cases without screen vibration, high levels of distracting speckle

Introduction Continued

Continued development of the RealLaser Laser Optical System (LOS) through Extended Wavelength Diversity (EWD) has meant that laser speckle mitigation has been greatly improved.

During CineEurope 2019 it was therefore proposed to conduct new tests using Harkness screen surfaces to understand how well the speckle has been mitigated and what new aligned messaging can Christie and Harkness give to their customers and dealers.

This took the form of visual evaluations under movie content and white light at predefined distances and relative Speckle Contrast Ratio (SCR) measurements. In addition comparisons of side by side screen surfaces were conducted which was a most accurate real world comparison between two screen types.

These tests allowed new recommended EWD guidelines (following slide) to be broadly agreed and these guidelines are what we would recommend our joint messaging to be.

Recommended new RealLaser EWD guidance based on trials using Harkness screen surfaces

- Matt White surfaces – all good, no visible speckle
- White gain surfaces – Low gain exceptionally good, with 1.4 being close to Matt White with no discernible speckle. This negates the need for only advising Matt White or woven screens for premium customers due to RealLaser speckle.
- White gain surfaces – Higher gain no major problems with some speckle visible, not likely distracting during movie content, likely to be ok with most customers.
- Silver screens – Lower gain PWT 1.4 and Clarus 1.7 very good and performing similarly with only very little noticeable speckle during movie content, nothing particularly distracting likely to be reported by most customers.
- Silver screens - Higher gain options will show visible speckle that will be distracting to some customers but acceptable to others. Still a big improvement over before where shakers were essential, which isn't necessarily the case now.

Projector setup

- Christie CP2320-RGB using the latest Laser Optical System (LOS)
- Image size was fixed for all the screen samples
- For every screen sample the projector was setup to 14 ± 2 fL and the colour was adjusted to the DCI target
- Two Neutral Density filters (0.6 optical density) were placed in front of the projector to allow the light level to be adjusted to the realistic 14 fL cinema level. The filters were in place during all tests. Tests were made to ensure that the filters made no effect to the speckle perception.

Screens samples

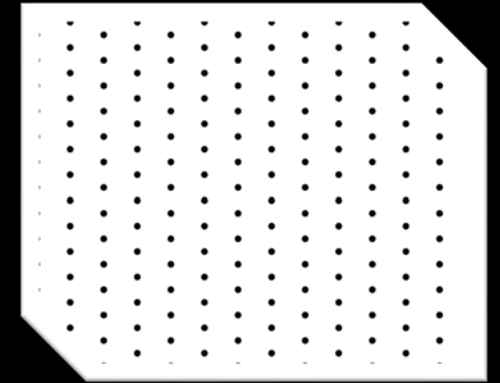
Coated silver screens:

Clarus XC 290
Clarus XC 220
Clarus XC 170
Spectral 240
Precision White (PWT) 2.0
Precision White (PWT) 1.4

Clarus XC: Next generation passive 3D silver screen technology with a whiter looking surface and improved brightness uniformity above Spectral.

Spectral 240: Considered by cinema exhibitors the optimum 3D projection silver screen surface for passive 3D application using polarized light.

Precision White: Combines RealD coating technology with Harkness' state-of-the-art screen engineering and manufacturing techniques to form a premium offering for RealD Customers.



All samples used Digital Perf

Coated White Gain screens

Perlux HiWhite 220
Perlux HiWhite 180
Perlux HiWhite 140

Perlux HiWhite: Next generation white gain screen surface technology. Considered by leading cinema exhibitors to be the premium surface for 2D and active 3D movies.

Non coated screen

Matt Plus

Matt Plus: Is a versatile screen surface intended for a variety of auditoria utilising a proprietary PVC based material by Harkness. Engineered to completely mitigate laser speckle using phase, angular and polarisation diversity and provides the base product for all other Harkness screen surfaces.

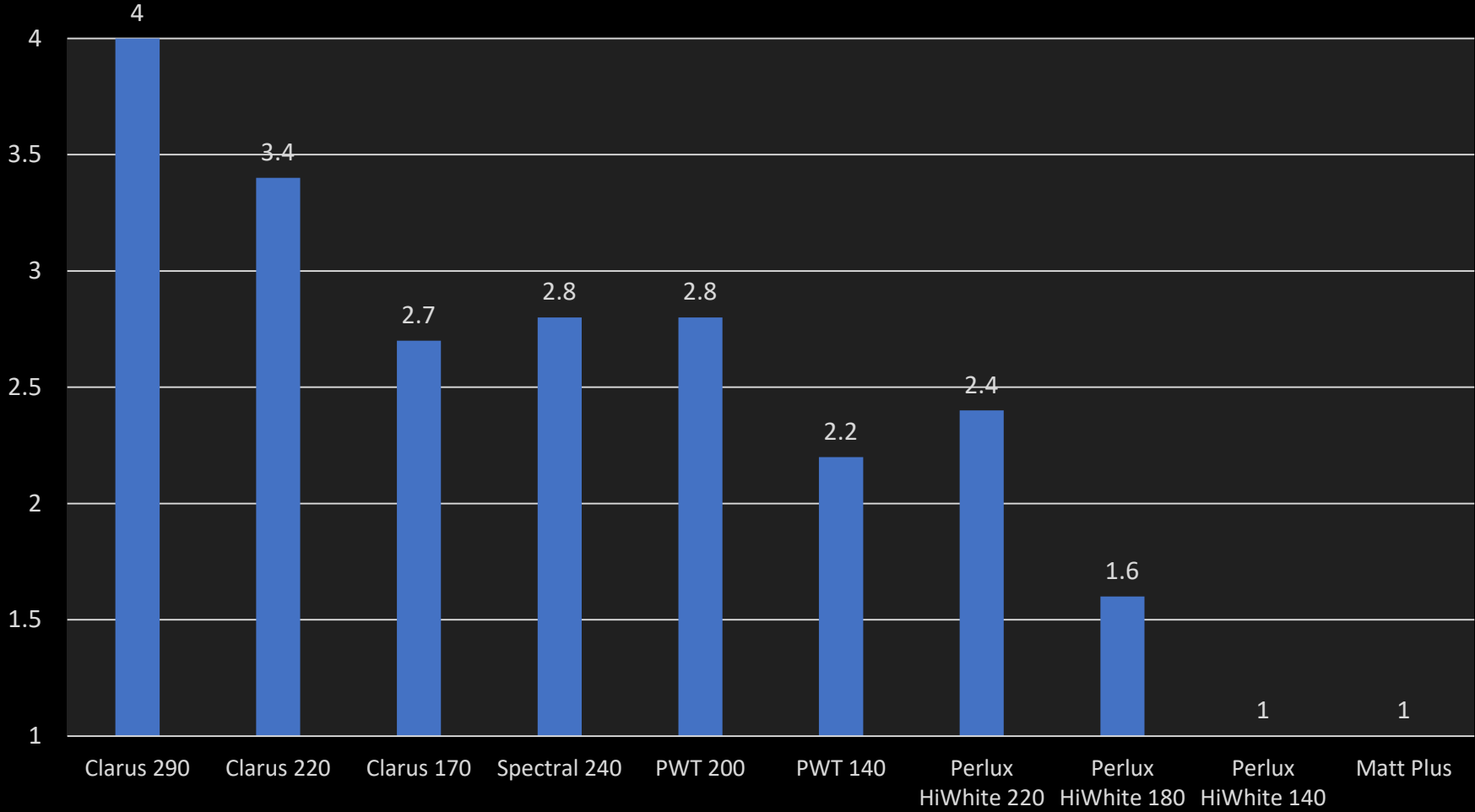
Test Considerations and Methods

- Laser speckle is visually very subjective
 - Distance from the screen surface is a perception factor
 - Brightness levels are a perception factor
 - Each individual's eye is a perception factor, although most will agree what is good and what is bad
 - SCR measurements are subjective and cannot be compared with SCR measurements made elsewhere using different equipment in different environments
- Laser speckle was evaluated using three subjective methods:
 - Method 1: Qualitative by visual inspection
 - Method 2: Quantitative SCR measurements using a Camera
 - Method 3: Qualitative by side-by-side visual comparison

Method 1 – Visual Inspection

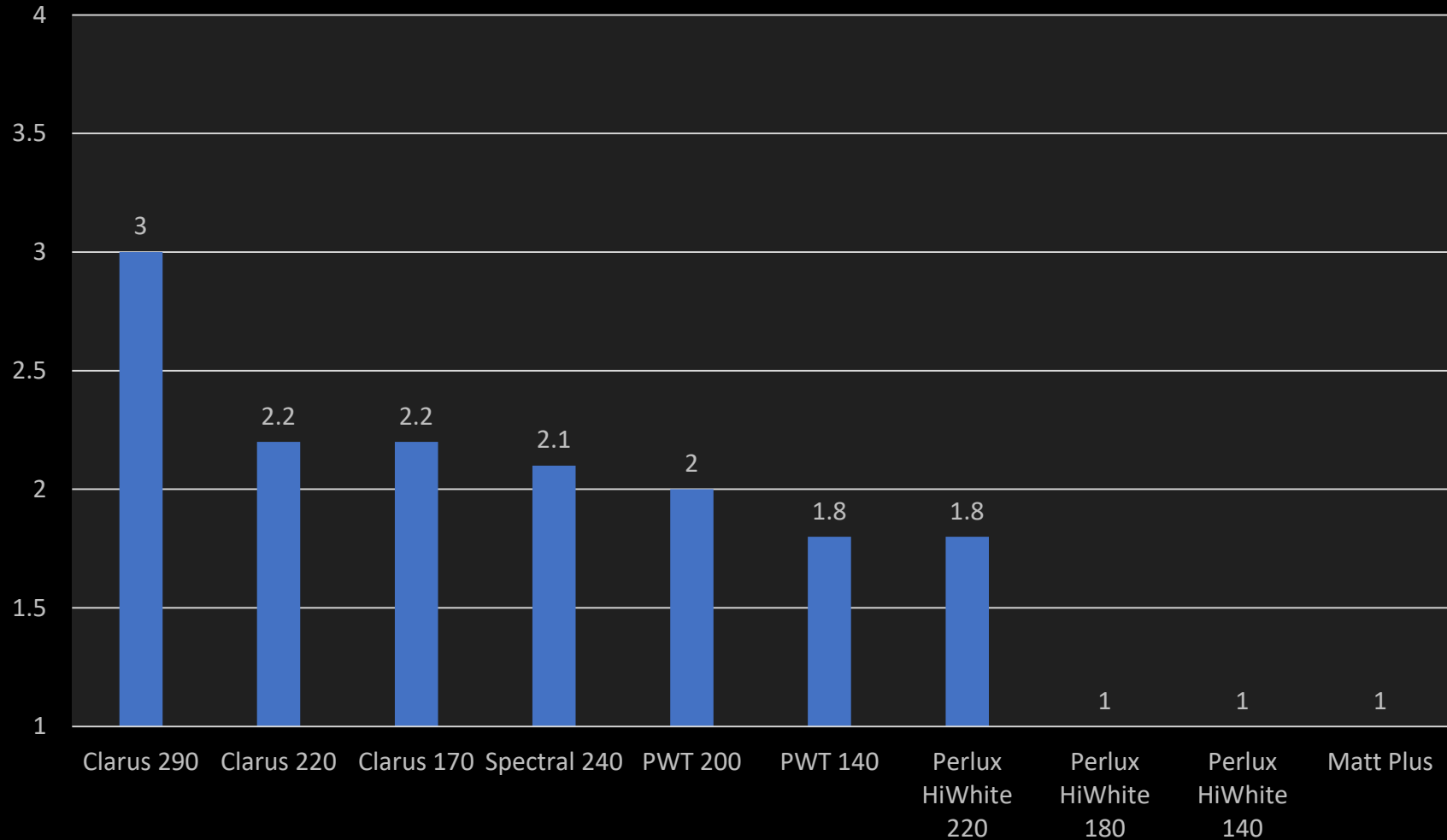
- The perceived speckle level was rated at two distances from the screen:
 - At approximately 4m from screen and at approximately 10m from the screen (at the back of the Wokingham auditorium)
- Speckle was rated with projected white light and with movie content at each position for each screen surface. Movie content with a mix of light and dark scenes provided a realistic impression similar to what a customer might experience
- For each location and projected image or white light the speckle was rated by a number between 1 and 4 for each screen:
 - 1 - No speckle
 - 2 - Barely discernible
 - 3 - Noticeable but not too distracting
 - 4 - Distracting
- The five observer scores were averaged to give the final result

Movie content visual inspection (4m)



Speckle Ratings:
1 - No speckle
2 - Barely discernible
3 - Noticeable but not too distracting
4 - Distracting

Movie content visual inspection (9.5m)



Speckle Ratings:
1 - No speckle
2 - Barely discernible
3 - Noticeable but not too distracting
4 - Distracting

Side by side comparisons on movie content

- Two screens of comparable interest were viewed together with the image split across both surfaces.



Side by side movie content observation

SAMPLES	Observations
Clarus 290 vs Spectral 240	The visually perceived speckle was similar for both surfaces side by side although it seemed marginally more distracting with the Spectral 240, perhaps due to its wider hotspot with this particular geometry, certainly when sitting close.
Clarus 220 vs Clarus 170	The visually perceived speckle was similar for both surfaces but marginally more distracting with the Clarus 220 as would typically be expected with the slightly higher gain.
Clarus 170 vs PWT 140	Slight difference in colour (colour correction would handle this in cinema), visually no appreciable speckle differences between the two. Clarus 170 is therefore a cost effective alternative to PWT 140.
Clarus 220 vs Perlux HighWhite 220	The speckle was more noticeable on the Clarus 220, even if next generation, against the Perlux HiWhite 220, a next generation white gain screen. This is as one would expect for a silver screen, where polarisation is maintained so polarisation diversity does not help to reduce speckle.
Matt Plus vs Perlux HighWhite 140	Matt Plus and Perlux HiWhite 140 were extremely close in performance with no noticeable speckle.

As mentioned in the introduction, the evaluation led to the following comments and therefore new EWD RealLaser recommendations.

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