Ayrton Perseo-S

By: Mike Wood

Figure 1: Fixture as tested.

The last Ayrton product I looked at was the Ghibli, last year. It was the beginning of Ayrton's move away from its "Creative Solutions" effects products toward a broader portfolio, including workhorse automated wash and spot units. The unit I'm looking at this month, the Perseo-S, continues that expansion, this time into the world of outdoor automated luminaires with IP65-rated enclosures. It shares a lot in common with the Ghibli, but there are differences, too; it's not just a weatherized Ghibli.

Ayrton's US distributor, ACT Lighting, provided me with a unit for this review and everything I report is based on the measurements I took on this single unit. My tests were run on a nominal 115V 60Hz supply (tests run at 117V); however, the unit is rated to run on voltages from 100-240V 50/60Hz (Figure 1). As always, I work through the fixture from light source to output measuring, reporting as I go. The sealed nature of some of the Perseo components meant I was unable or unwilling to completely dismantle sealed areas, but I went as far as I felt comfortable.

Figure 2: Light engine.

Light source

The light source in the Perseo-S is one area where I was loath to break too many seals to fully investigate. From all the evidence, it looks like an Appotronics light engine with the usual array of white LEDs and two sets of fly-eye lenses. However, it may be the same style of engine from a different manufacturer. Figure 2 shows the light engine surrounded by six waterproof fans—three pushing and three pulling—to create an airflow though the heat sink. This rear portion of the Perseo-S is in an unsealed area that is exposed to the elements. The barrier between unsealed and sealed is the copper heat plate to which the LED array is mounted. The only items crossing this barrier are the fan wires, which come through a pair of silicon-sealed bulkhead fittings.

Color

The color system is similar to that used in the Ayrton Ghibli. In fact, it may use the same flags. One difference between the Perseo-S and the Ghibli is that the stack-up of the gobo and animation wheels is different: Both gobo wheels are now on the same axis, and the entire module is not so easily removed in the Perseo-S. It requires removing a wiring harness before it can be unscrewed and slid out. This, plus the close stacking of the two gobo wheels, makes changing gobos a little trickier. However, as this is an IP65-rated unit, which requires opening the main sealed enclosure to access, changing gobos is always going to be a major job. This is the case in all the IP65-rated units I've seen.

As in the Ghibli color system, first in line are the dichroic glass color-mixing flags, arranged as pairs of curtains that come in from each side of the beam. Each of the four sets of graded dichroic colors (cyan, magenta, yellow,

Figure 3: Color and gobo module.

and CTO) come in as two plates. These dichroic filters are also cut and etched with a graded pattern, further helping with the smoothness of the mixing. Figure 3 shows a view of the module installed in the chassis. The two stacked gobo wheels are on the left, and the animation wheel is on the right. The color wheel is visible behind the animation wheel, but the color-mixing flags are hidden in the rear of the module.

I measured the output from the color-mixing system as follows. The mixed colors were well-saturated, and I was able to mix good, even colors with just slight hints of center-to-edge color differences in some pastels.

COLOR MIXING

Color	Cyan	Magenta	Yellow	Red	Green	Blue	CTO
Transmission	17%	9%	76%	8.4%	4.7%	0.3%	38%

Next in line, again just like the Ghibli, is a CTB filter. This is used automatically and comes in whenever a gobo on either wheel is selected to counteract the lowering of color temperature that you see in profile spots when a gobo is inserted. (The effect is partially from the color of the glass used in the gobo and partially an optical effect from the reduced aperture size.) In the Perseo-S the net effect is that, when a gobo is used, the color temperature remains visibly constant, but the light output drops by about 30%. The user can choose to enable or disable the automatic use of this filter though the configuration menu or DMX control channel.

The CTB filter is followed in the optical train by the fixed color wheel. This has six fixed trapezoidal dichroic colors, including a high CRI filter and an open hole.

FIXED COLOR WHEEL

Color	CRI	Congo	Green	Amber	Mid Blue	Red
Transmission	76%	0.6%	21%	16%	5.8%	3.2%

Assuming these are the same filters as used in the Ghibli, we do see differences in the light transmission. This will be because the spectrum of the light engine is different in the Perseo-S. The trapezoidal shape means you can make half colors with almost no bar between colors, although the transitions are inevitably a little fuzzy, being so far from the focal plane. Figure 4 shows an example of a half color used with a gobo. Color change speed was good with very smooth transitions and slow wheel rotations possible.

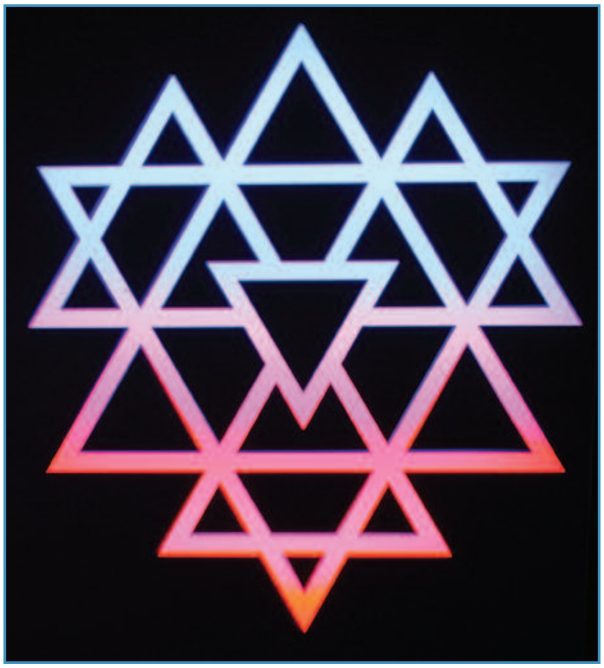

Figure 4: Half color.

COLOR SYSTEMS

Color change speed – adjacent	0.15 sec
Color change speed – worst case	0.4 sec
Color mix speed – worst case	0.8 sec

It is also possible to spin the fixed color wheel, with a maximum spin speed of 0.35 sec/rev (171rpm) and a minimum speed of 160 sec/rev (0.38rpm).

The CRI filter is effectively a minus-green filter that knocks down a portion of the green spike you get with white LEDs and improves the overall mix. When inserted, it dropped the light output by about 25% but raised the color rendering. The native color temperature of the Perseo was 7,319K with color rendering TM-30 values of Rf = 68 and Rg = 95 (CRI Ra 74). With the minus-green color rendering filter in place, the CCT dropped to 7,009K while the rendering improved. TM-30 values were Rf = 73 and Rg = 102 (CRI Ra 85). As we are adding a filter, the light output must drop as well, in this case by 26%. Figures 5 and 6 show the spectrum of the Perseo S output before and after the minus green filter is dropped in. The dip in the green at 540nm is very apparent.

Gobo and animation wheels

Now, onto the gobo and animation wheels: These are mounted on the downstream side of the color and gobo module. First in line is the animation wheel. This can be

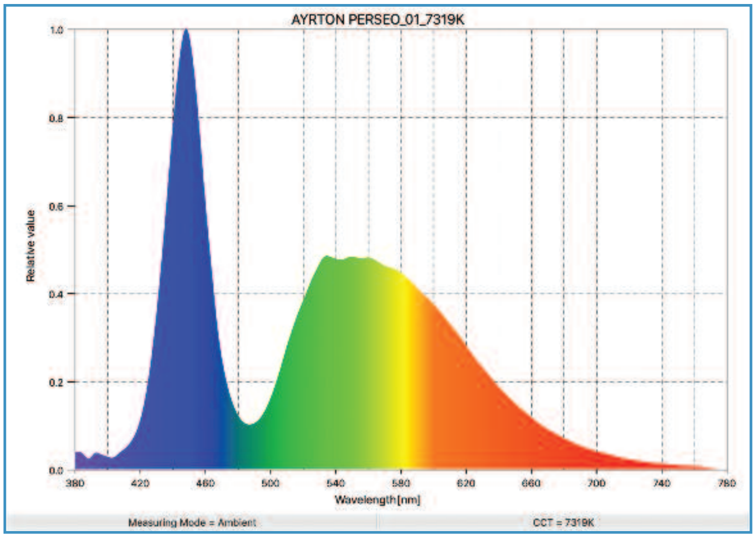

Figure 5: Perseo spectrum.

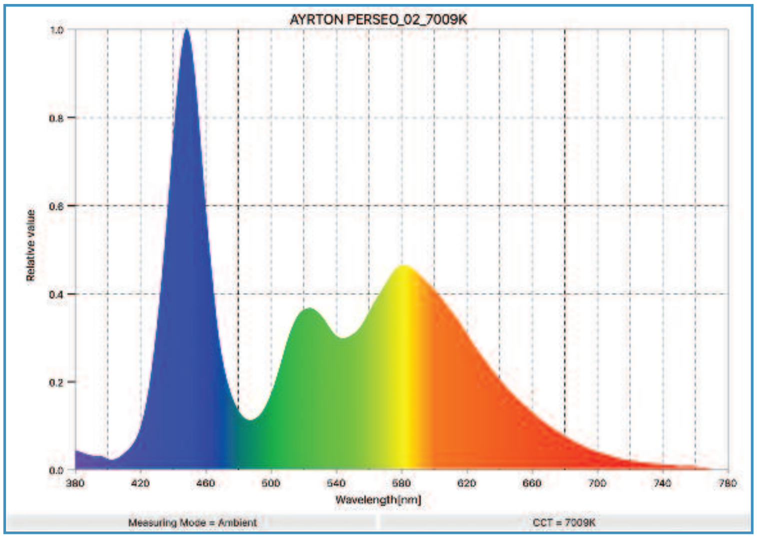

Figure 6: Perseo spectrum with color rendering filter.

inserted or removed from the beam in about one second, and it allows a wide range of rotation speeds. The angle of the rotation axis is fixed.

Just after the animation wheel is the rotating gobo wheel. This has seven (one more than Ghibli) rotating, indexing gobos plus an open hole. The fixed gobo wheel has 11 gobos plus open hole. The rotating gobos are mounted in snap-in cartridges to make for an easier change. They are also individually homed—more on that topic later.

ROTATING GOBO

Gobo change speed – adjacent	0.4 sec
Gobo change speed – worst case	0.8 sec
Maximum gobo spin speed	0.22 sec/rev = 277 rpm
Minimum gobo spin speed	414 sec/rev = 0.15 rpm
Maximum wheel spin speed	0.83 sec/rev = 72 rpm
Minimum wheel spin speed	424 sec/rev = 0.1 rpm

FIXED GOBO

Gobo change speed – adjacent	0.2 sec
Gobo change speed – worst case	0.7 sec
Maximum wheel spin speed	0.68 sec/rev = 88 rpm
Minimum wheel spin speed	408 sec/rev = 0.1 rpm

Positioning and rotation of both wheels was quick and smooth with a good range of rotation speeds. The rotating wheel showed some hysteresis error when changing direction; I measured the indexing position accuracy maximum error at 0.16°, which equates to 0.7" at a throw of 20'. Both wheels use a quick-path algorithm to minimize change times.

Focus quality on both gobo wheels was very good, with almost no color fringing and a small amount of edge to center difference. Figure 7 shows an example of the gobo morph effect as you pull focus from the rotating wheel to the fixed.

Framing

We now move to the second module, which contains the framing and iris. This is easily unplugged and removed from the head. Figures 8 and 9 show the front and back views of this module.

Each blade runs on a central pin in a slot and is driven via two motors, belts, and a three-bar linkage to give control over blade rotation and insertion. Each blade can be tilted approximately 22° in each direction at the center of the beam (45° in total) and can travel fully across the

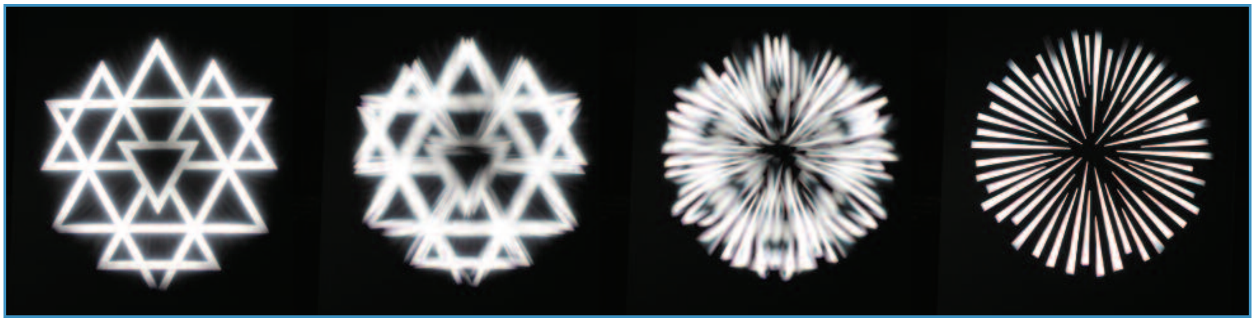

Figure 7: Gobo morph.

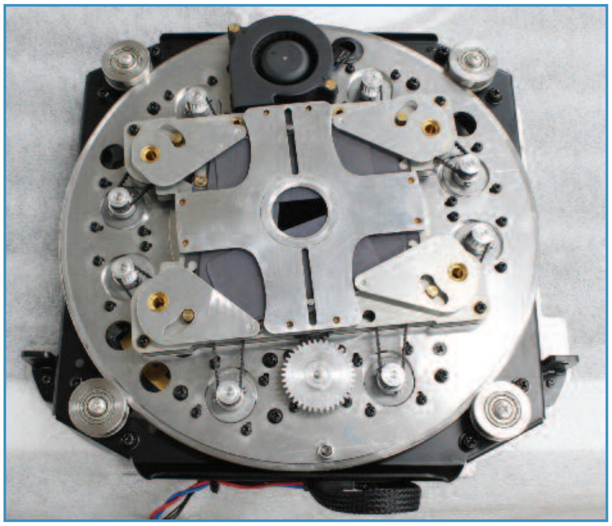

Figure 8: Shutter module framing side.

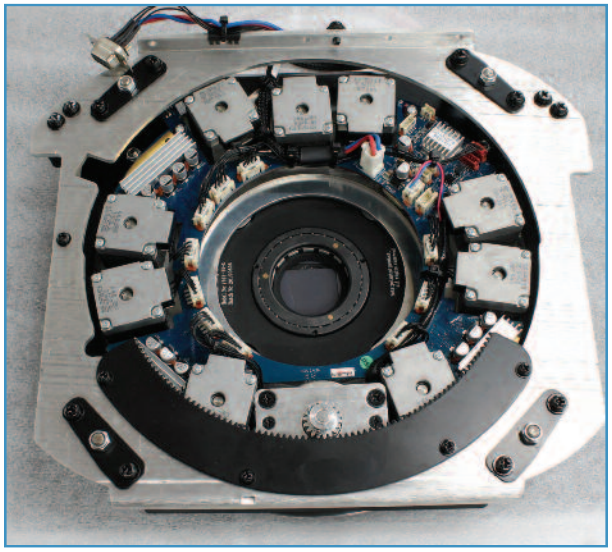

Figure 9: Shutter module iris side.

Figure 10: Framing shutter focus.

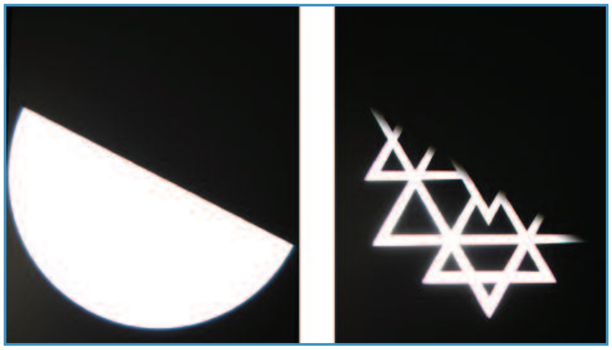

Figure 11: Framing shutters.

beam. The entire framing mechanism can also be rotated by +/-45º. The amount each blade can be tilted varies as the blade is inserted. The maximum available tilt angle is when the blade is just inserted, and that angle reduces down to zero when the blade is fully across the beam. Figure 10 shows the focus difference between the blades when all four blades are inserted to make a square, with focus set on the left-side blade. Figure 11 shows the effect of framing on an open hole and on a gobo. The gobo framing is soft edged, but still useful.

I measured a maximum of 0.5 second to move a blade into position across the beam and two seconds to rotate the mechanism the full 90º travel.

Iris

The iris is mounted immediately after the shutters, as can be seen in Figure 9. I measured the opening/closing time of this at 0.3 second. The fully closed iris reduces the aperture size to 15% of its full size, which gives equivalent field angles of 1.0° at minimum zoom and 7.1° at maximum zoom.

Prism and frost systems

The Perseo-S has two frost flags and two prisms. There are two identical, but mirrored, mechanisms, one on each side of—and traveling back and forward with—the first (zoom) group of lenses. Figure 12 shows one of these mechanisms with a frost flag and prism, both of which can be moved across the beam. The two prisms and two frosts are mutually exclusive—that is, you can insert one or another frost and one or another prism. You can't insert both frosts, or both prisms, at the same time.

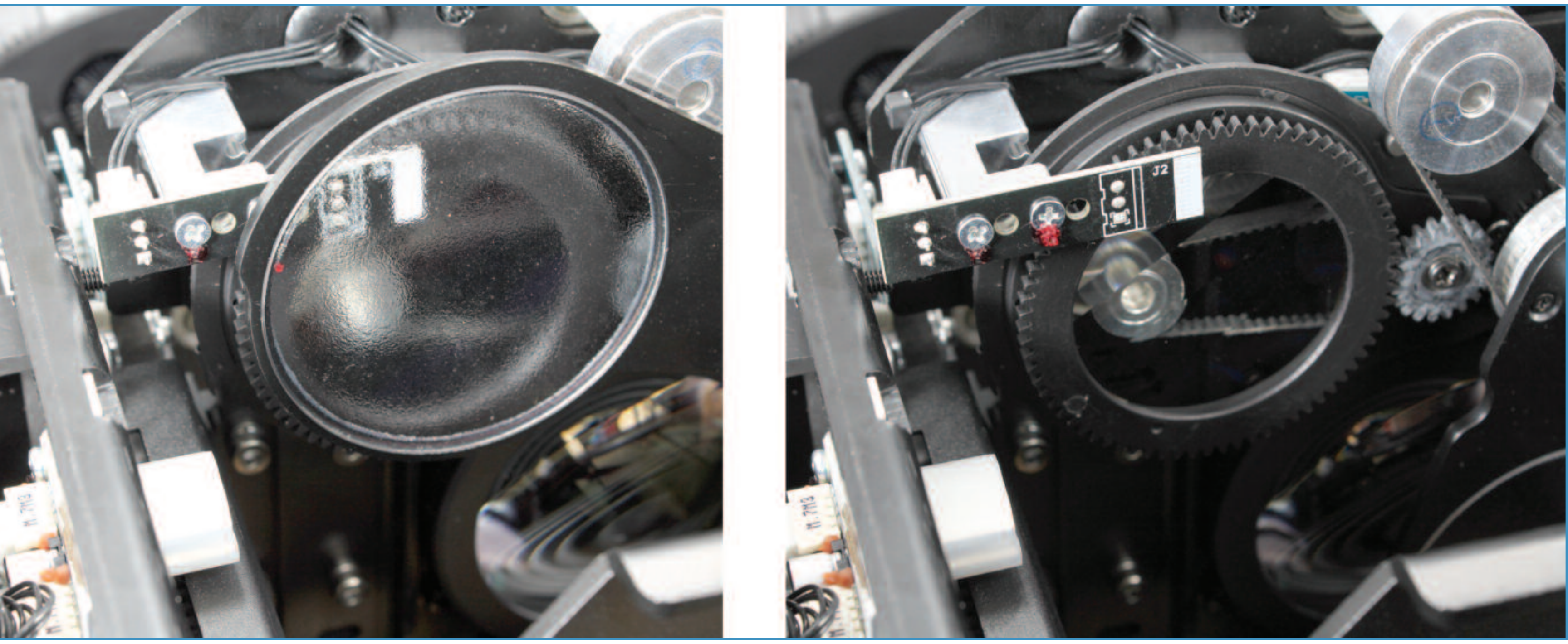

Figure 12: Frost and prism.

Figure 13 shows the effect of Frost 1, the light frost, on a gobo image. The top of Figure 14 shows the unfrosted image, while the bottom shows the same gobo with Frost 1 fully inserted. At this level, Frost 1 acts as a true frost where it softens the edges of the image. Figure 14 shows the same for Frost 2, the heavy frost, as it is inserted. This frost doesn't soften the image edges until it is fully inserted; instead, it acts as an overall contrast reducer: The edges are still visible, but the background gets increasingly lighter.

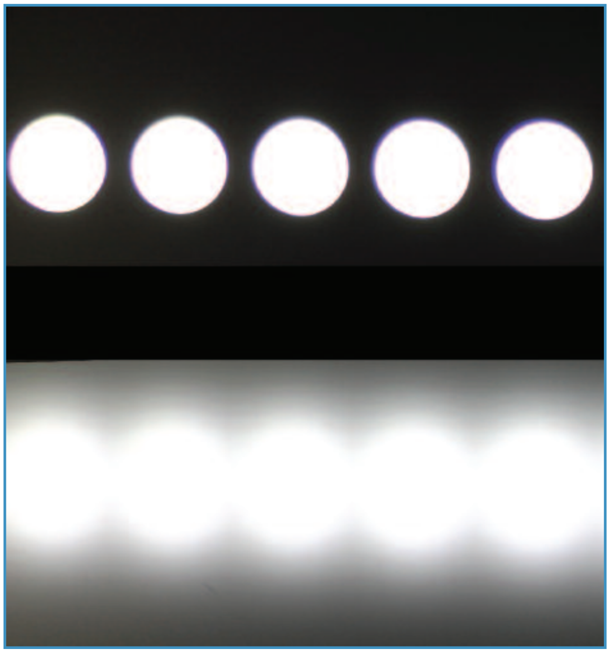

Figure 13: Frost 1.

The time to insert one of the frost flags varies depending on the current positions of the zoom and focus lens groups. In some focus/zoom combinations, the lenses have to move to allow space for the frost flag and then it can take up to a second to add the frost.

Next to the frosts are the two prisms: a circular five-facet prism and one with linear facets. As with the frost, it can take up to a second to insert a prism if the lenses have to move out of the way first. Once in place, either prism can be rotated at speeds varying from 885 sec/rev (0.07rpm) up to 1 sec/rev (60rpm).

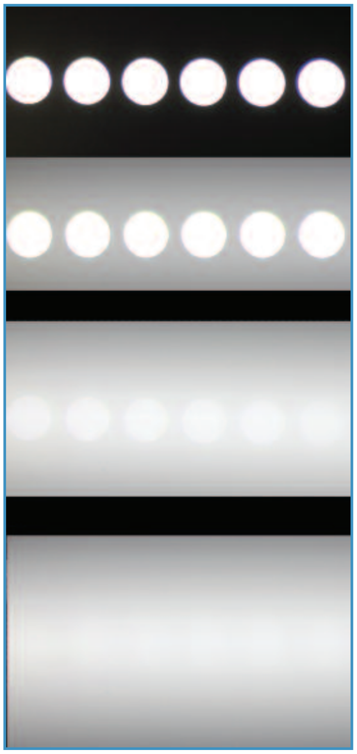

Figure 14: Frost 2.

Lenses and output

The Perseo-S uses the typical three-lens-group zoom, with the front group fixed as the output lens and the other two moving to provide zoom and focus control. Zoom took 0.7 second to run from maximum to minimum while focus took 0.6 second from end to end.

I measured the output of the Perseo-S when on open aperture without the CTB filter at 21,800 lumens at 48.5° at the wide-angle end of zoom, ramping down to 13,200 lumens at a narrow angle of 7°. The field flatness varies with zoom angle and can be seen in the beam profiles shown in Figures 15 and 16. These measurements were taken after running the unit at full power for at least 30 minutes to account for any warm-up droop. Droop on the Perseo-S was fairly low; over the first 15 minutes, after turning on at full power, the output dropped to 91% of its initial value as everything heated up.

Note: To be totally consistent with my reviews, I always measure light output at the full maximum and minimum zoom angles. That may not be—in fact, likely isn't—where the output is maximum. The maximum output for many fixtures using a three-group optical system will probably be somewhere close to maximum zoom, but not necessarily exactly at maximum zoom. I also—as I try to make clear—always measure field lumens, which is the total output where the light intensity is greater than 10% of the maximum. These figures won't, therefore, agree with manufacturer's figures if they use some other metric, such as cut-off lumens or sphere lumens, which measure all the light output no matter how low the intensity is. I can say that I've always measured output in exactly the same way for every review I've written, so they are comparable with each other. Secondly, I've been asked why luminaires often have lower light outputs at narrow angles, compared to wide. There are a number of reasons, but the primary cause is that the lenses are just not large enough to capture all the light at the narrow angle. Thus, light is wasted as it falls outside and misses the front lens. The effect is called vignetting, a term that will be familiar to photographers where the outside of an image is masked off. To get full output at these extreme narrow angles would require front lenses that are perhaps 50% or more larger than they are now. This is obviously impractical, as it would make the fixture enormous. As is common in all engineering, a compromise is made, and the light output so allowed to reduce so as to keep the front lens a reasonable size. This isn't Ayrton's (or any other manufacturer's) fault. It's just physics…

Perseo-S' dimming was very smooth and followed a default square law well. No jerkiness and no artifacts at low dim levels (Figure 17). I measured the PWM rate at 1.2kHz. Electronic strobe of the LEDs is variable up to 24Hz.

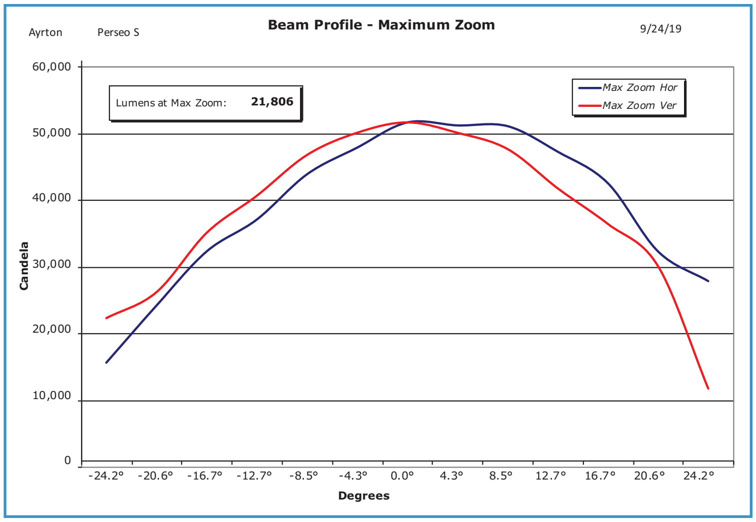

Figure 15: Maximum zoom.

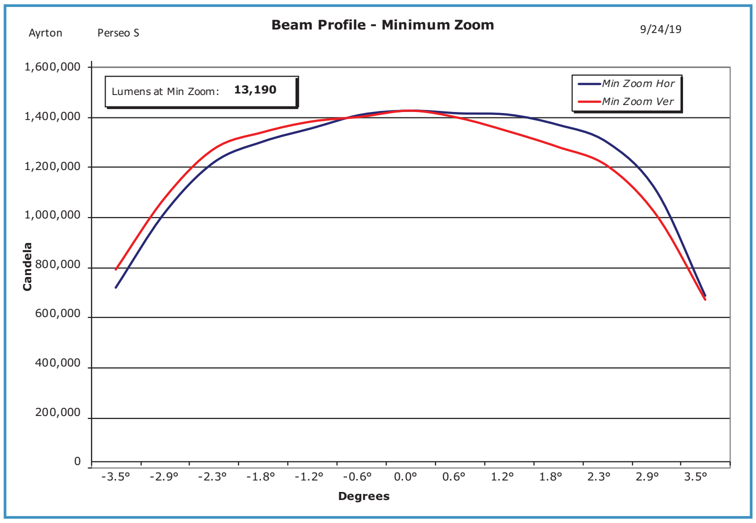

Figure 16: Minimum zoom.

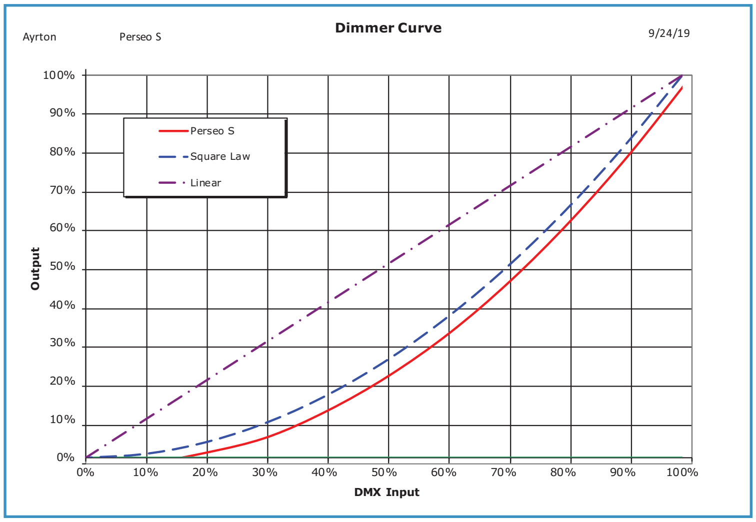

Figure 17: Dimmer curve.

Pan and tilt

The Perseo-S has 540° of pan and 266° of tilt movement. I measured pan speed over the full travel at 3.9 seconds and 1.8 seconds for 180°. In tilt, the figures were 2.3 seconds for the full 266° and, again, 1.8 seconds for 180°. Movement on both axes was very smooth, with a noticeable amount of hysteresis and a little bounce when coming to rest. Because of the sealed outer casing, the Perseo-S is a heavy fixture. Pan exhibited 0.27° of hysteresis, which is 1.1" at a throw of 20'. Tilt was slightly worse at 0.36°, 2.5" at 20'.

Again because of the sealed systems that get the Perseo-S an IP65 rating, the tilt mechanism is all internal to the head, rather than in a yoke, as is more usual. The consequent reduced size for the tilt mechanism and the weight of the head probably accounts for the increased hysteresis on tilt.

Noise

Shutter rotation beat out the usual zoom and focus as the noisiest mechanism. However, overall, the Perseo-S is a quiet fixture. This is one area were the heavy sealed outer casing helps! All sound measurements were taken with the unit at full power, the fans in auto mode, and in thermal equilibrium. The Perseo-S also offers studio and silent fan modes where the fan speed is tightly controlled.

SOUND LEVELS

Ambient	<35dBA at 1m
Stationary	41.5dBA at 1m
Homing/Initialization	55.5dBA at 1m
Pan	45.2dBA at 1m
Tilt	48.2dBA at 1m
Color	41.8dBA at 1m
Zoom	46.9dBA at 1m
Focus	44.0dBA at 1m
Frost	41.5dBA at 1m
Gobo	41.5dBA at 1m
Gobo Rotate	44.3dBA at 1m
Prism	42.2dBA at 1m
Animation Wheel	42.0dBA at 1m
Framing Shutters	41.5dBA at 1m
Framing Rotate	48.0dBA at 1m

Homing/initialization time

I measured the time for a full initialization of the Perseo-S to be 120 seconds from power up and 110 seconds from a DMX reset command. These times are slow for an automated light. Watching the process with the covers off, it looks like the unit homes the indexing of every gobo on the rotating wheel separately, and it is this process that takes the time. The reset is well-behaved in that the LEDs are dimmed out before reset starts and fade up again after final positioning.

Power, electronics, control, and construction

Running on a 115V 60Hz supply, the Perseo-S consumed 5.8A when running at full output and allowed to warm up. This equates to 678W with a power factor of 0.98. The quiescent load, with the unit powered up but no LEDs on, was 1.13A, 136W, power factor 1.0.

Figure 18: Yoke arm.

The construction within the head is conventional, with distributed electronics and motor drive boards connected through a data bus back to the man processor in the top box. However, the construction outside those mechanisms is driven by the need to make the unit weather-resistant. The head chassis is enclosed by aluminum die-cast clamshell moldings with a central rubber sealing ring around the chassis edge. Everything, other than the heat sink and fans, are inside that sealed area. The head is allowed to breathe through a Gore-Tex vent hidden behind the plastic front lens bezel. It is critical in this kind of construction to allow the free movement of air in and out of the water-sealed housing. If you don't, then, as the unit heats up and cools down in normal use, the air pressure inside will rise and fall, forcing air leaks out of the unit and sucking air and moisture in again. A controlled air vent allows the free movement of air, thus equalizing pressures at all times, but prevents water coming in. One yoke arm of the Perseo-S, where you might usually see the tilt motor and belt, is completely empty, while the other contains a single rubber tube carrying the power and data down to the top box. Figure 18 shows that yoke arm with tube and sealed connector box.

The top box has a similar construction for the power supplies and main electronics: a sealed enclosure with a Gore-Tex breathing vent, this time hidden next to the menu and display panel under a plastic cover.

Figures 19 and 20 show the color LCD display and menu system and the set of connectors. A rubber membrane protects the five operating buttons. The menu system is comprehensive, providing access to the usual fixture setup and maintenance functions. The Perseo-S uses the IP-rated version of the True1 connector for power in and provides five-pin XLR connectors for DMX512 data along with RJ45 in and out for sACN and Art-Net (untested). There is also a built-in Wireless DMX system from LumenRadio, with the antenna hidden in one of the plastic carrying handles.

The Perseo-S is sold as IP65-rated. This is an area I am not able to test. The tests are long and, frankly, not that

Figure 19: Display.

Figure 20: Connectors.

well-defined. The problem with testing to the IP65 rating is that IP65 doesn't mean the unit is completely watertight. Instead, it states that the unit is protected against low-pressure jets of directed water from any angle. Water is allowed to enter, but it must have no harmful effects. The definition of a "harmful effect" is left up to the tester. What one manufacturer may call harmful, another may not. I assume that most manufacturers in our industry define it as "the unit keeps working and is never dangerous," but that's only my assumption. This, again, isn't Ayrton's fault; it's just a strangely worded standard. I would comment in the same manner about anybody's IP65 rating. I have no reason to doubt Ayrton's rating for the Perseo-S.

An interesting caveat to the IP rating system is that they are not necessarily cumulative. For example, an item that is rated to IP67 for complete immersion may not actually pass IP66, which requires protection against high-pressure water jets. The two are separate ratings and IP67 does not include IP66. If a product was rated for both immersion and high-pressure jets, it might be rated to both IP66 and IP67.

Conclusion

That just about covers everything for the Ayrton Perseo-S. I'm sorry I can't reliably report on IP65 performance, as it is becoming a more common option. Does the Perseo-S look as if it might work for you? I suggest, as I always do, that if it looks interesting, you try it out in your own venue and conditions. The final decision should be yours.

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