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Claypaky Arolla Profile MP

By: Mike Wood

Figure 1: Fixture as tested.

I've reviewed other Claypaky units, including the laser LED-based Xtylos, but never an LED profile. As we know, the "white LED with dichroic color-mixing" profile has become the industry-standard product. I continue to believe it will be replaced by full additive color mixing units, but it hasn't happened yet, and my prediction is looking rather old!

This month's unit is the Arolla Profile MP. Claypaky is part of the Osram group. The Arolla was designed at the Claypaky facility in Bergamo with manufacturing outsourced to a factory in China. Claypaky calls the Arolla Profile MP an evolutionary product, based on the Axcor range with updated LED technology and in the smallest, lightest possible package.

Everything in this review is based on the tests on a single Arolla Profile MP unit supplied to me from Claypaky in North America. All tests were run on a nominal 115V 60Hz supply (tests run at 118V); however, the unit is rated to run on voltages from 100–240V 50/60Hz (Figure 1). The tests reported step through the unit, from light source to output lens, measuring as much as I can as I go. With the Arolla, we are back to smaller units; I had no problems in getting this light out of its road case and onto the test rig by myself.

Light source

The Arolla Profile MP uses an in-house white LED light engine. This is a familiar design with white LEDs and tandem fly-eye lens arrays. Figure 2 shows the rear view of the unit. The LED array is attached to the large copper plate visible in the center on the picture, which, in turn, is thermally coupled to a large fan-cooled heat sink through four liquid-filled phase-converting heat pipes, transferring the heat to a large fan-cooled heat sink. Four thermostatically controlled fans pull air across this to keep the LEDs at their safe operating point. The Arolla offers several operating modes for these fans to either minimize noise from the fans or maximize output (Figure 2).

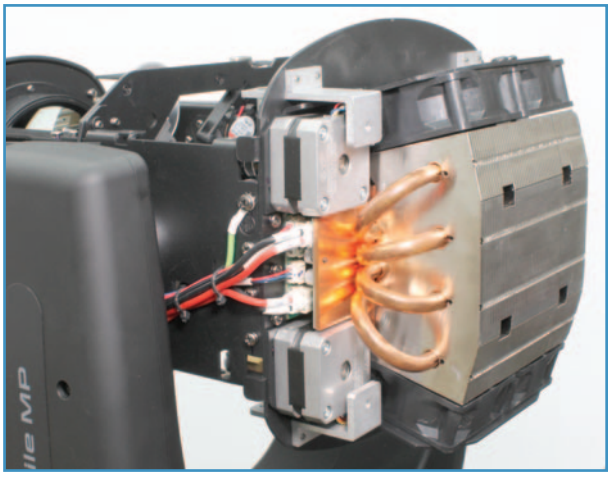

Figure 2: LED array and cooling.

Color

Mounted immediately after the light engine, and before a homogenizing field lens, are four pairs of flags forming the CMY and CTO color-mixing system. Each color (cyan, magenta, yellow, and CTO) has two flags coming in from opposite sides of the beam. Figure 3 shows these flags and the fly eye lenses with their hexagonal pattern on the output of the light engine. The color mixing was very smooth and even with clean transitions and even coverage across the beam—some slight artefacts on soft focused gobos, but nothing out of the ordinary.

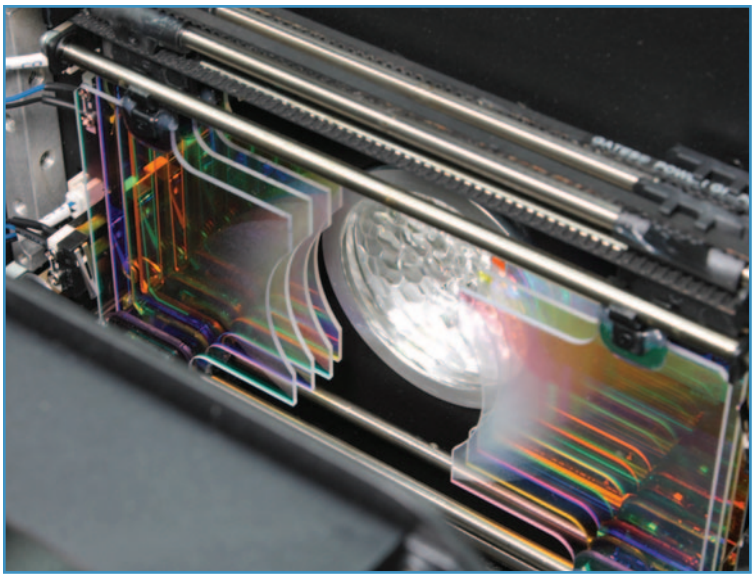

Figure 3: Color mixing flags.

I measured the light transmission through the color-mixing system as follows.

COLOR MIXING

Color	Cyan	Magenta	Yellow	Red	Green	Blue	CTO
Transmission	24%	0.8%	38%	0.6%	2.8%	0.1%	40%

Note that the magenta is a very saturated mixing color, leading to a deep red and blue. When inserted fully, the CTO flags reduced color temperature from a native 7,140K down to a CCT of 3,270K while reducing output to 40% of the unfiltered beam. Looking at color rendering, the native open 7,140K beam had a TM-30 Rf of 74 and Rg of 94 (CRI Ra 74). With the color-rendering enhancer inserted, the color temperature dropped slightly to 7,061K while the TM-30 Rf improved to 88 and Rg went up to 97 (CRI Ra 92), reducing the output to 64%. Figures 4 and 5 show the spectral distribution and TM-30 graphic at these two points.

As mentioned, immediately after the color-mixing flags is a homogenizing field lens, mounted on the rear of the color and gobo wheel module and just before the fixed color wheel. The color wheel itself has seven fixed dichroic colors and open hole, as can be seen in Figure 6.

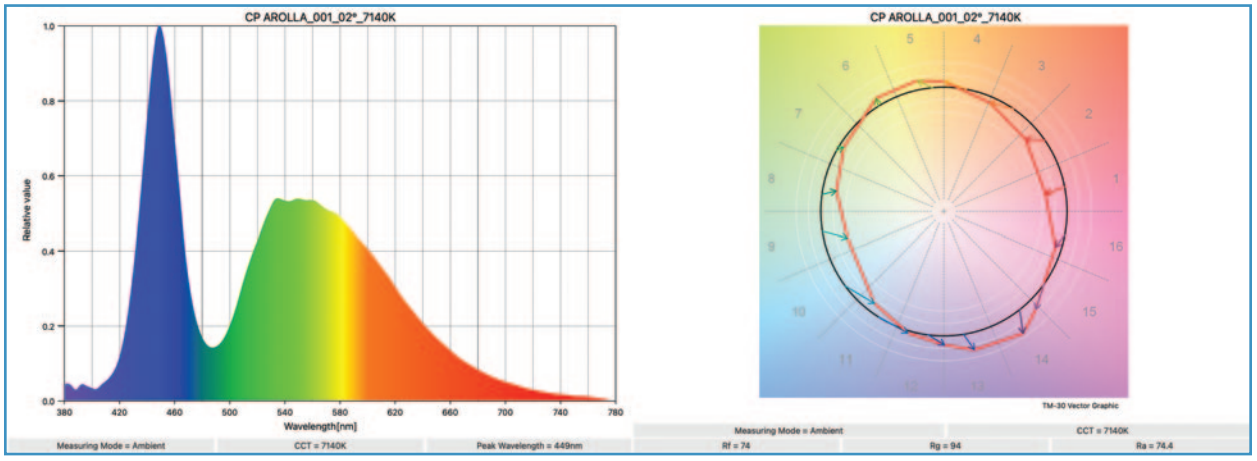

Figure 4: Open light output.

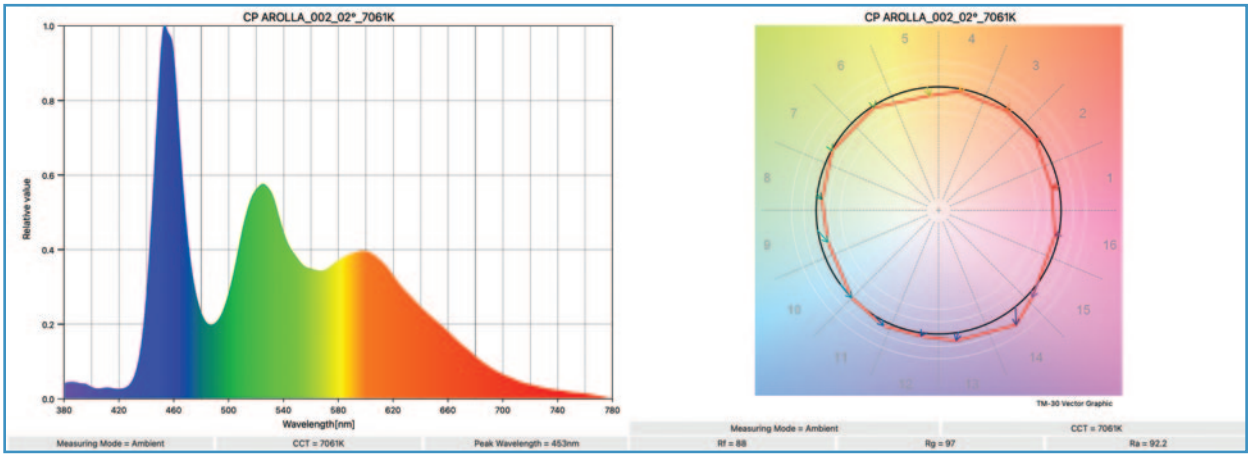

Figure 5: Color rendering enhancer output.

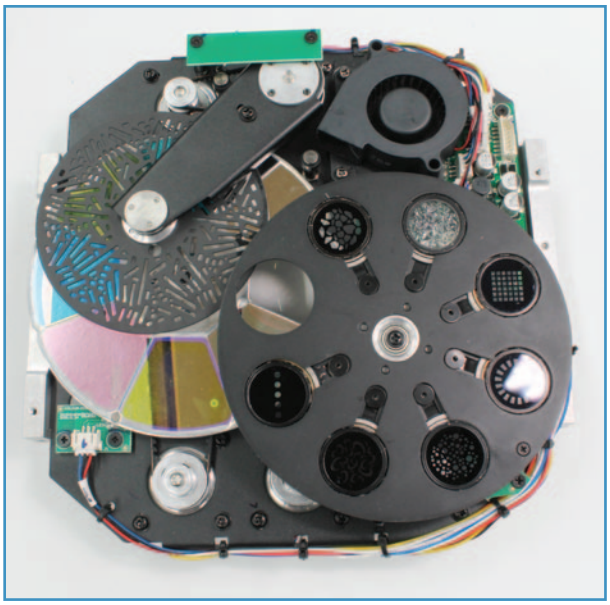

Figure 6: Color, gobo, and animation wheels.

FIXED COLOR WHEEL

Color	Red	Blue	Green	Amber	Color Rendering	Dark Orange	Navy Blue
Transmission	1.2%	1.8%	23%	64%	61%	25%	0.2%

The colors are trapezoidal dichroics glued on a frame with a narrow separator between them; they can make good half colors (Figure 7). Color-change speed was reasonable, with smooth transitions and the ability to make slow wheel rotations.

COLOR SYSTEMS

Color wheel speed – adjacent	0.4 sec
Color wheel speed – worst case	0.75 sec
Color wheel spin – maximum speed	0.79 sec/rev = 76 rpm
Color wheel spin – maximum speed	278 sec/rev = 0.22 rpm

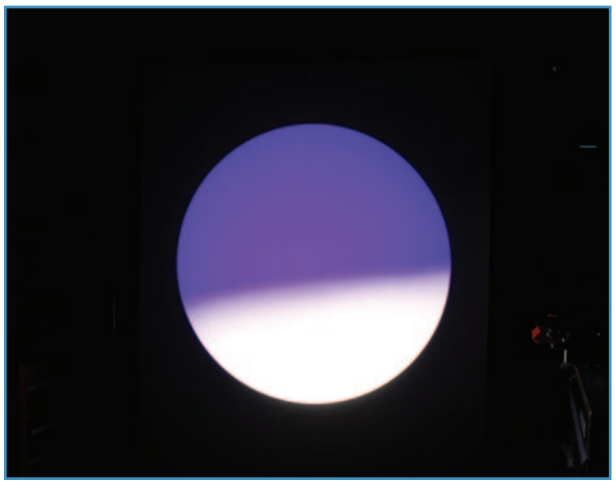

Figure 7: Half colors.

Animation and gobo wheels

Next in line is an arm-mounted animation wheel that can be swung into position at varying angles across the light path immediately behind the gobo. Here, physics rears its inevitable head. The Arolla Profile MP has a large zoom range. (Zoom is one of those features that seems to go through phases with automated lighting. Some years, everyone wants big zoom ranges; a year later, nobody cares. Right now, we are in a big zoom phase.) With a small unit like this, creating such a zoom and maximizing output means using a very "fast" optical system. As you likely know from taking photographs, when a lens is fast (that is, operating at its maximum aperture), the depth of field is small. The same happens with projection optics and the Arolla is running with a very fast lens system, meaning the depth of focus on the imaging planes, such as the gobos and framing, is correspondingly tiny. The result is that, even though (as seen in Figure 6) the animation wheel is physically very close to the gobo wheel, it's still a long way out of focus and you have to pull focus back a long way before you see the effect from the animation wheel. Figure 8 shows what I mean; both halves show a gobo with the animation wheel in place; however, in the left image it's so far out of focus that you can't tell it's there. The right image shows the same but with focus pulled back so that the animation wheel creates an effect, by which point the gobo is very soft. This may be what you want, but whether you do or not, you need to be aware. The animation wheel can be inserted or removed from the beam in about two seconds, and then rotated at a wide range of speeds up to a maximum 38rpm.

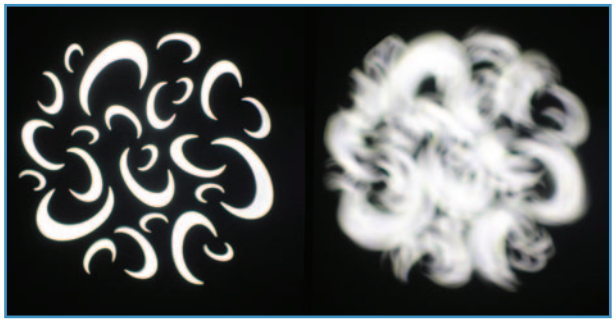

Figure 8: Animation wheel.

Next in line is the single rotating gobo wheel which has seven rotating, indexing

Figure 9: Gobo.

gobos plus an open hole. All gobos are glass and easily replaceable. Figure 9 shows a gobo removed from the unit. Claypaky has a technology called Go-Bright for its glass gobos. This is a very high transmission blue coating, which reduces the yellowing optical systems tend to add to gobo images.

ROTATING GOBO	
Gobo change speed – adjacent	0.4 sec
Gobo change speed – worst case	1.0 sec
Maximum gobo spin speed	0.38 sec/rev = 158 rpm
Minimum gobo spin speed	372 sec/rev = 0.16 rpm
Maximum wheel spin speed	1.3 sec/rev = 46 rpm
Minimum wheel spin speed	664 sec/rev = 0.1 rpm

Indexing and rotation of gobos was smooth with a good range of rotation speeds and no steppiness in motion. As can be seen in Figure 8, the focus quality was very good. Careful adjustment is required because of the fast optics but, once achieved, the results are excellent. Some spherical aberration but almost no color fringing.

Framing and iris

The Arolla Profile MP has a second removable optical module containing the framing system and iris. Figures 10 and 11 show the framing shutters with the iris mounted at the rear. This module can be optionally replaced with a second gobo module as used in the unit, giving the user two rotatable gobo wheels.

I've mentioned previously that the current crop of framing systems falls into two main varieties: those that can cover the entire beam with each blade but have restricted angular movement, and those that have improved angular control but restricted coverage. It's almost impossible to get both at the same time in the limited space available. The Arolla

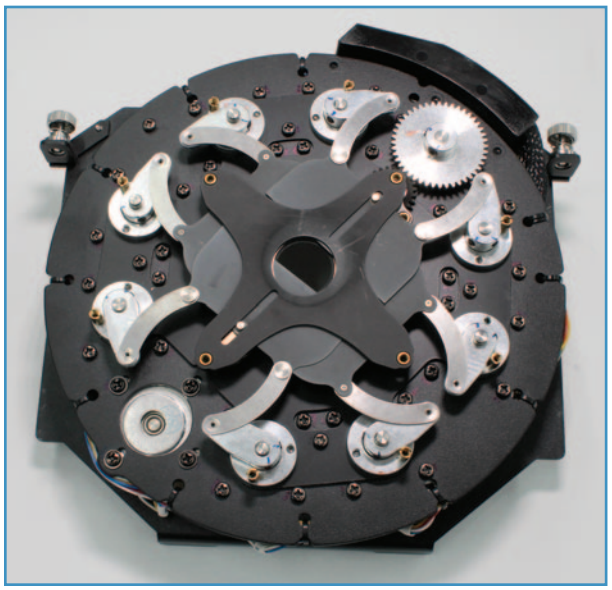

Figure 10: Framing shutters.

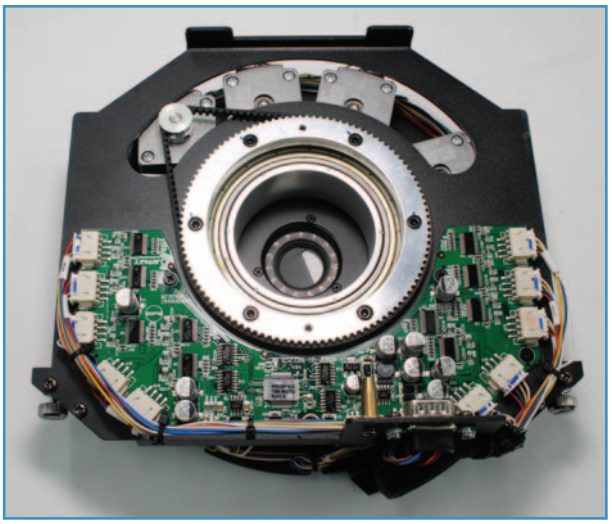

Figure 11: Iris and shutter rotation.

Profile MP is one of the first type: Each blade can cover the entire beam, but with limited tilt angle. It has zero tilt angle adjustment at the edge of the beam, increasing as the blade is inserted. Again, it's all a matter of opinion and how you use shutters as to which of these two conflicting motions is more important to you. From an engineering point of view, they are equivalent, with the trade-offs inevitable from the geometry and the restricted space.

Each blade can be tilted approximately 22.5° in each direction at the center of the beam (45° in total) and can travel fully across the beam in about 0.5 seconds; additionally, the entire framing system can be rotated through a total of 130° in 1.8 seconds. Figure 12 shows an image of the shutters adjusted to make a square with hard focus on the

Figure 12: Shutter focus.

right-side blade to show focus difference between blades. Figure 13 shows the blades adjusted to form a triangle and then rotated using the shutter rotate system.

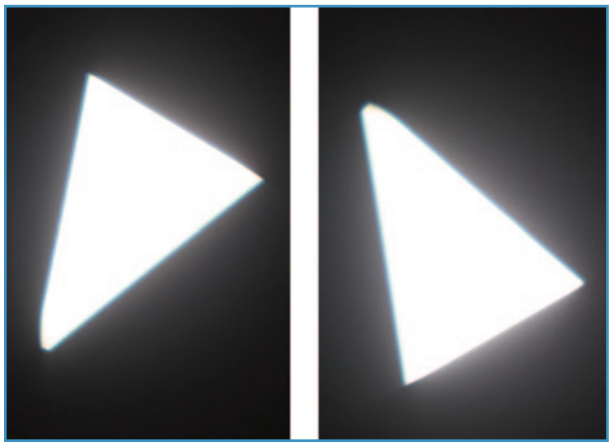

Figure 13: Shutter rotation.

Right behind the framing blades, and visible in Figure 11, is the iris. I measured the opening/closing time of this at 0.5 seconds. The fully closed iris reduces the aperture size to 25% of its full size, which gives equivalent field angles of 2.4° at minimum zoom and 10.8° at maximum zoom.

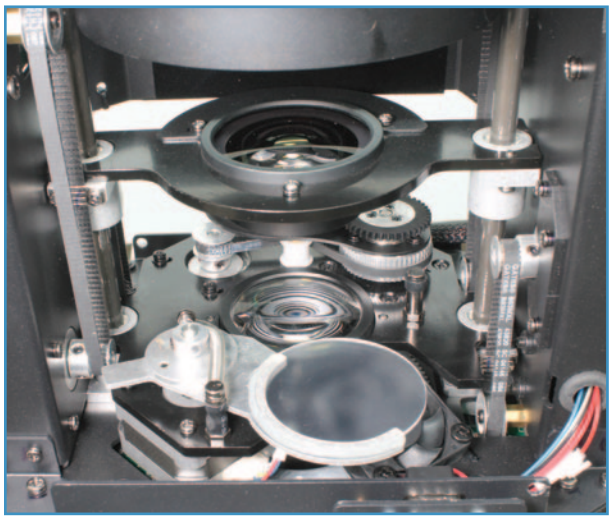

Figure 14: Frost and prism.

Prism and frost systems

The Arolla Profile MP has a single four-facet prism and one variable frost flag. These are both on the rear of the first, focus, lens group, between that lens and the zoom lens, and travel back and forward with it as it moves. Figure 14 shows the arrangement.

Some lens juggling must go on when either effect is inserted, depending on where the user has positioned the lenses. I measured typical insertion time at 0.4 seconds for the frost and one second for the prism. Once inserted, the prism can be rotated at speeds up to 0.6 sec/rev (100 rpm).

Figure 15 shows the effect of the frost filter on a hard focused gobo as it is inserted. It acts as a contrast reducer for about 90% of its travel, only softening image edges in the last 10% of travel.

Lenses and output

I've already talked about the optical system. The Arolla Profile MP uses the usual three-lens group zoom, with the front group fixed as the 120mm diameter output lens and the other two groups moving to provide zoom and focus control. Zoom took two seconds to run from maximum to minimum while focus took 0.8 seconds from end to end.

I measured the output of the unit after allowing the unit to reach thermal equilibrium at 15,320 lumens at 42.7° field angle at the wide-angle end of zoom, ramping down slightly to 13,993 lumens at a narrow angle of 9.1°.

Note 1: The demo unit I tested had slightly limited lens movement at the narrow end; Claypaky tells me that production units are able to get down to 6.2°.

Note 2: As I've discussed in this column before, I measure flat wall field lumens, while some manufacturers, like Claypaky here, report lumens measured in an integrating sphere. This likely explains the difference between my measurements and those reported by Claypaky. Their readings are correct, I'm sure, but are measured differently.

The beam profiles in Figures 16 and 17 show the beam flatness. I measured a low 8% droop on the Arolla Profile MP from cold turn-on until thermal equilibrium was reached after 10–15 minutes.

Dimming was smooth and accurate with an excellent PWM speed of 20kHz. Slower PWM rates are available through the menu. Figure 18 shows the default dimmer curve. Again, other curves are available through the menu and control channel. Finally, I measured the maximum strobe speed of the LEDs at 22kHz.

Figure 15: Frost.

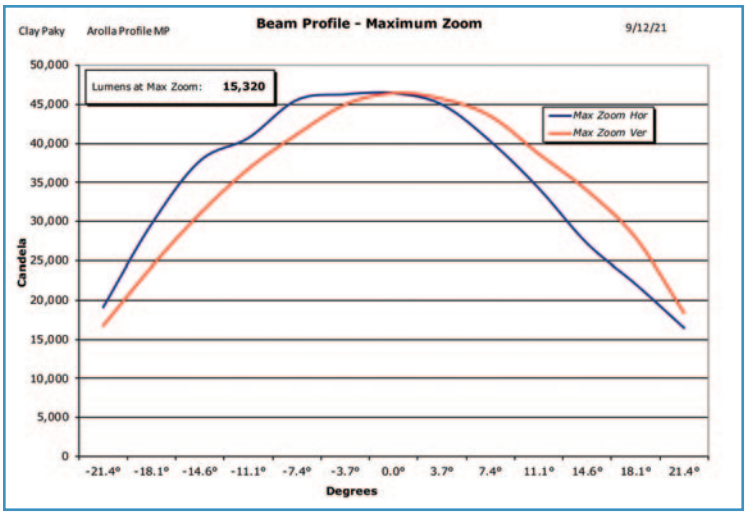

Figure 16: Output at maximum zoom.

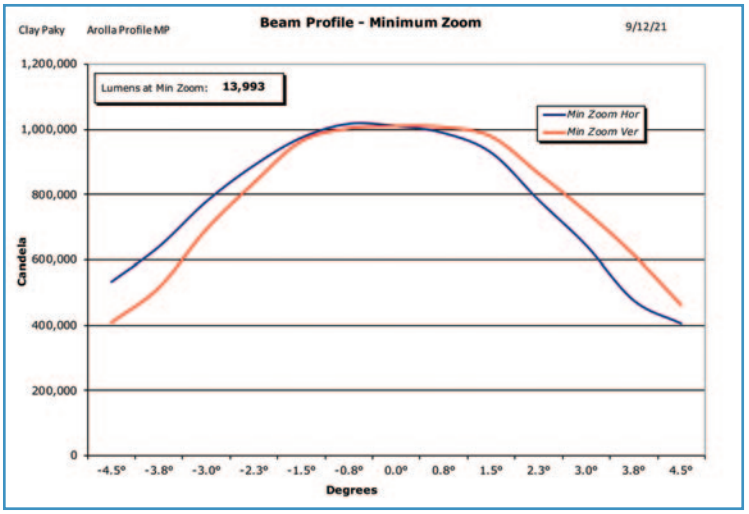

Figure 17: Output at minimum zoom.

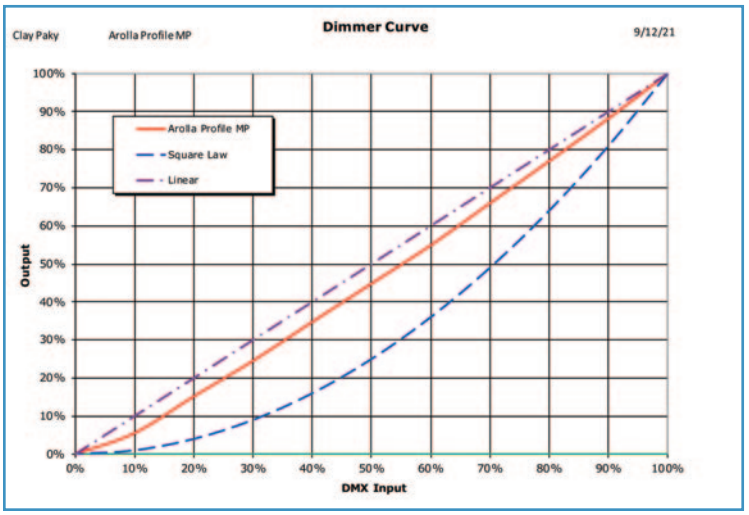

Figure 18: Dimmer curve.

Pan and tilt

The Arolla Profile MP has 540° of pan and 270° of tilt movement. I measured pan speed over the full travel at 3.2 seconds and 1.8 seconds for 180°. In tilt, the figures were 2.1 seconds for the full 270° and 1.9 seconds for 180°. Movement on both axes was very smooth and tight, with minimal hysteresis and almost no bounce. Pan exhibited 0.12° of hysteresis, which is 0.5" at a throw of 20' (21mm at 10m). Tilt was less, at 0.05°, 0.2" at 20' (8mm at 10m). Figure 19 shows the construction details of both yoke arms.

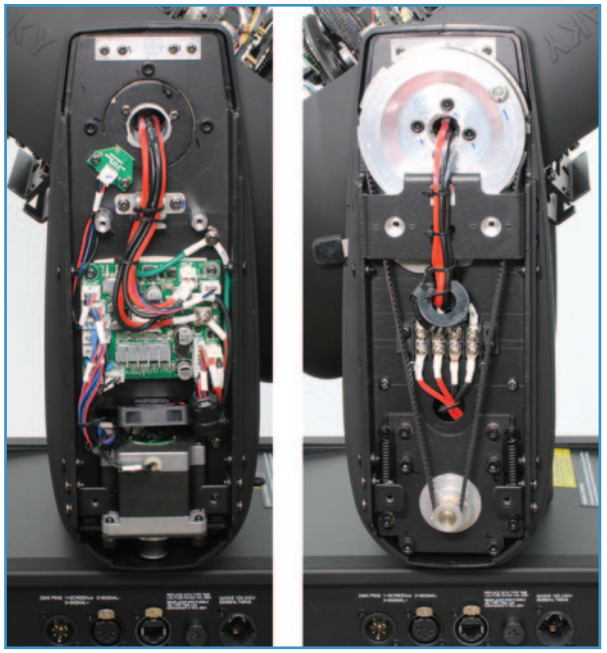

Figure 19: Yoke arms.

Noise

I tested for noise with the fans in auto mode. In this mode, the fans are pretty loud and not many functions top them. Zoom and focus just beat them, with shutter rotate next in line, and will be the noisiest functions when the fans are in one of the quieter modes. For example, in “theatre fan” mode, with the fans turning very slowly, their noise reduces by around 8dBA, which is significant, while the fixture output reduces to about 50%.

SOUND LEVELS

Ambient	<35 dBA at 1m
Stationary	53.7 dBA at 1m
Homing/Initialization	56.1 dBA at 1m
Pan	54.4 dBA at 1m
Tilt	54.0 dBA at 1m
Color	53.7 dBA at 1m
Zoom	54.8 dBA at 1m
Focus	55.6 dBA at 1m

Frost	53.7 dBA at 1m
Gobo	53.7 dBA at 1m
Gobo Rotate	53.8 dBA at 1m
Prism	53.7 dBA at 1m
Animation Wheel	53.7 dBA at 1m
Framing	54.6 dBA at 1m

Homing/initialization time

I measured the time for a full initialization of the Arolla Profile MP from power up to be 59 seconds and 56 seconds from a DMX reset command. The reset is semi-well behaved in that the LEDs are dimmed out before reset starts but fade up again before final positioning is finished.

Power and construction

Running on a nominal 115V 60Hz supply, the Arolla Profile MP consumed 6A when running at full output and allowed to warm up. I measured power at 697W with a power factor of 0.98. Quiescent load with the unit powered up but no LEDs on was 0.93A, 108W, power factor 0.96.

Construction of the head is very familiar, with two easily removable optical modules giving access to all major components. Figure 20 shows the layout. The lenses are exposed for cleaning as soon as you have removed the two main covers. As previously mentioned, the optical system is deliberately compact, with everything as close as possible to maximize the limited depth of focus.

Figure 21 shows the LCD and control panel. All the usual functionality is provided. The connector panel on the other side has power input and fuse, five-pin DMX512 input and output, and EtherCON RJ-45 network input. I tested and confirmed RDM functionality using a DMXcat.

Conclusion

I'm delighted to see a small unit on my bench again and the Claypaky Arolla Profile MP certainly squeezes a lot into that package. Is the Arolla Profile MP for you? As always, I encourage you to take a look and decide for yourself.

Mike Wood provides technical, design, and intellectual property consulting services to the entertainment technology industry. He can be contacted at mike@mikewoodconsulting.com.

Figure 20: Head layout.

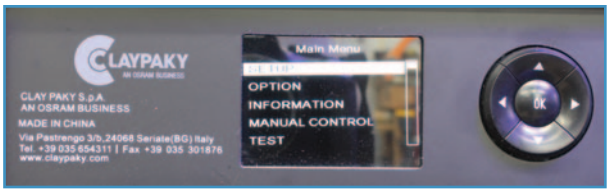

Figure 21: Menu.