The Ayrton MAGICDOT-R

By: Mike Wood

Figure 1: Fixture as tested.

The move to LED light sources in entertainment luminaires has led to the development of products that increasingly blur the distinction between lighting and video. We are seeing increasing numbers of smaller, lighter lighting devices designed to be used in multiples and mounted in arrays. The French manufacturer Ayrton has clearly seen this as an opportunity and developed a number of products specifically designed for the purpose. This review examines one of the company's newer entries; the Ayrton MAGICDOT-R is essentially a single automated beam projector or pixel that can be pointed in any direction. RGBW LED emitters provide a single narrow beam and a yoke provides movement with continuous rotation on both pan and tilt.

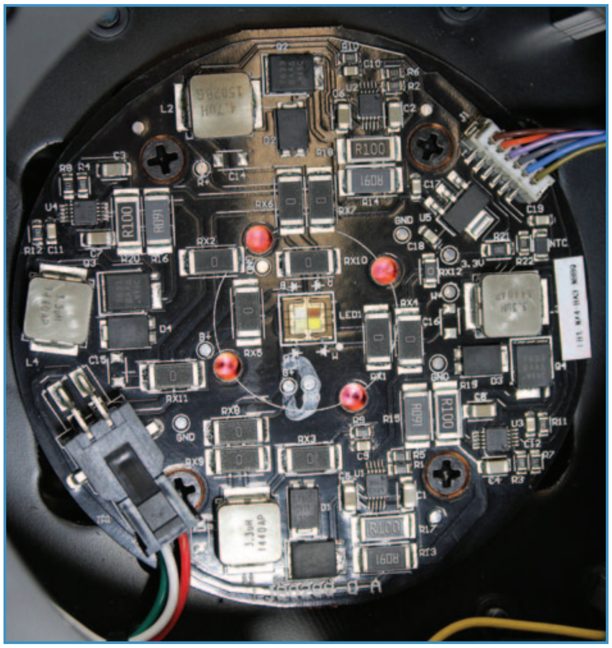

Figure 2: LED board.

Writing a review of such a product is a little tricky, I'm reviewing and testing a single unit but this isn't a fixture you use in isolation. It was designed by Ayrton to be used in large numbers and for close packing into arrays. Nevertheless, providing data on an individual unit will help with envisaging what an array could be capable of and how it might look on your show. The results presented here are based on the testing, with the fixture operating on a nominal 115V 60Hz supply, of a MagicDot-R supplied to me by Ayrton through Morpheus Lights (Figure 1).

Light source and optics

This is designed to be a single beam or pixel, so the Ayrton MagicDot-R uses a single Osram Ostar RGBW LED package containing four dies and running at 60W. Figure 2 shows the main LED circuit board with the single LED package dead center. This thermally conductive board is mounted to a large block of aluminum which, in turn, connects via four heat pipes to two finned heat sinks mounted on either side of a central fan (Figure 3).

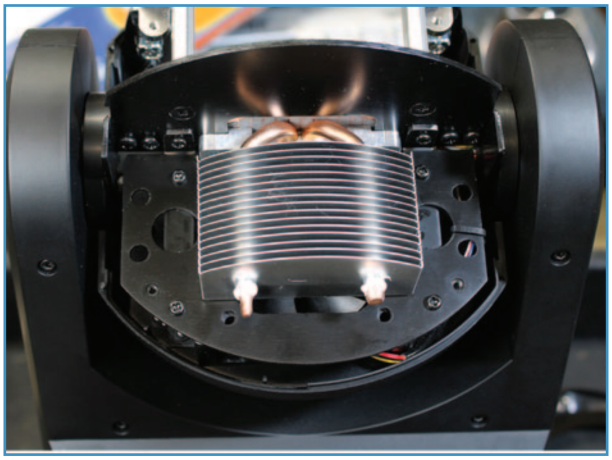

Figure 3: Heat sink.

The four dies on the LED package feed into a single, very large, solid TIR molded optic that serves to homogenize and collimate the outputs into a single narrow beam. Figure 4 shows this lens along with a rule for scale. It's a large, solid lump of plastic! The four pins at the apex of the optic (Figure 4) locate in four holes on the circuit board (red dots on Figure 2) for accurate alignment. This optic is complex and contains a number of different regions, along with various diffusion patterns on the front face to improve homogenization (Figure 5).

Figure 4: TIR optic.

Figure 5: Front lens.

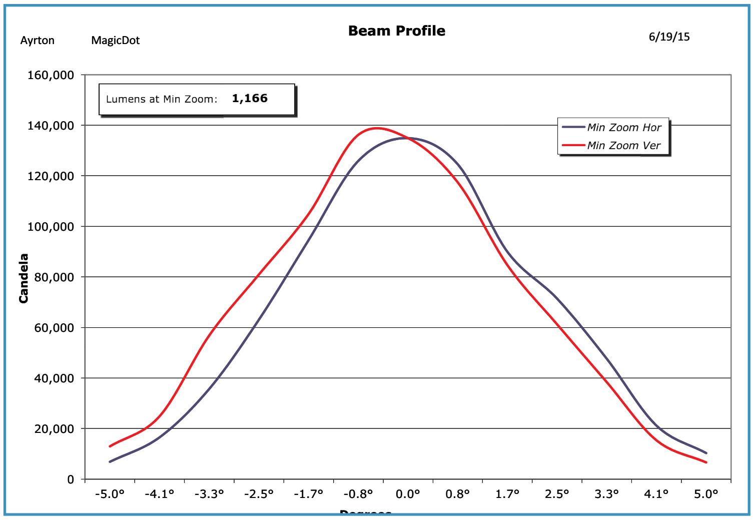

Figure 6: Beam profile.

I measured this system as producing around 1,200 lumens at a field angle of 10° (beam angle 5°) when all four emitters were at full power (Figure 6). This may not sound huge; however, a lumen measurement is not necessarily the best metric for a unit like this. More important is beam definition in atmospheric haze and edge contrast. I suggest the only way to be sure if the output is sufficient for your need is to try it. It's undoubtedly bright for a small tight beam.

The four emitters are well-homogenized into a single output when viewed as an aerial beam. They are less so when looked at on a projected surface when four color areas can be seen, but that isn't the intended use.

Dimming and strobe

The MagicDot-R provides smooth, clean dimming that follows the square law extremely closely (Figure 7). Dimming is eight-bit, so there is, inevitably, visible steppiness below 20%. I measured PWM frequency at 1.2kHz. That should be fast enough to be acceptable with most video cameras. Ayrton claims flicker-free operation and that may be true for many cameras, but, as we've discussed before in these

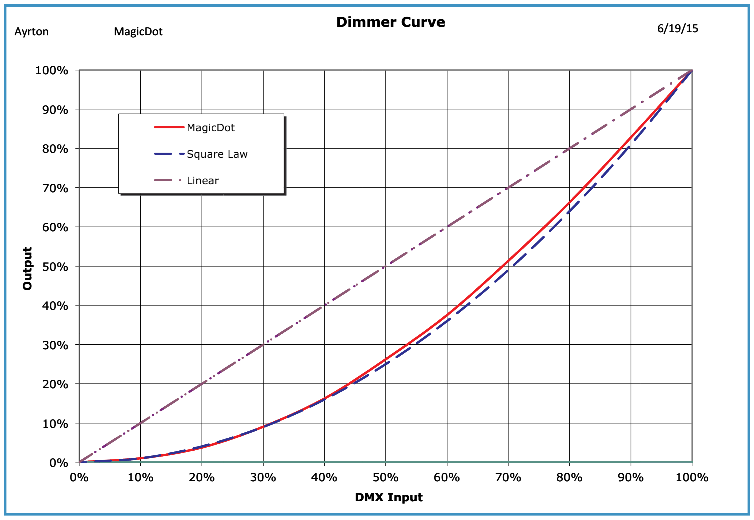

Figure 7: Dimmer law.

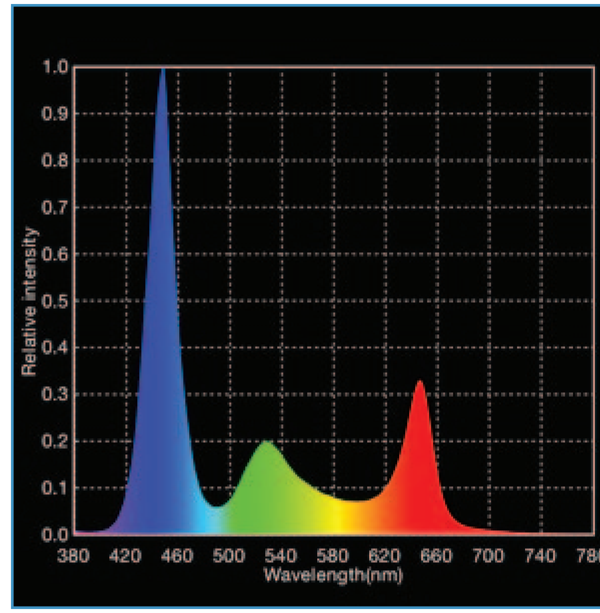

Figure 8: Spectrum.

columns, even very high PWM rates can cause issues with the increasingly popular progressive-scan CMOS cameras. As with PWM-dimmed LED sources from any manufacturer, you must test with the specific camera you are going to use. Electronic strobe is offered, and I measured the speed range from 3.3Hz – 24Hz.

Color

The additive color mixing for RGBW is familiar and produced expected results. These are narrow-band emitters designed for saturated colors. (Figure 8 shows the spectrum with all emitters at full.) This output breaks down by color as follows:

Red	Green	Blue	White
13%	35%	3.7%	59%

The MagicDot-R offers a number of ways to control the color mixing through DMX-512: either simple color mixing through four direct channels or via a virtual color wheel channel offering 20 pre-programmed colors. There is also a color macro channel that provides a continuous fade around the hue wheel. These modes interact and can override each other, so I would suggest picking one color mode for a show or scene.

Movement

Movement is where the Ayrton MagicDot-R offers something a little unusual, in that both pan and tilt axes are capable of continuous rotation and spins. You control this a little like you would a rotating gobo wheel in a more conventional moving light: through a separate rotation channel. This requires rotating connections for electrical wiring and is achieved through two sets of pancake-style concentric slip rings, one on each axis. Figure 9 shows the tilt slip ring, but pan is very similar. There are ten or so individual conductors passing through each joint.

In normal mode, the MagicDot-R has standard pan-and-tilt ranges of 540° and 270°, respectively. A full-range pan

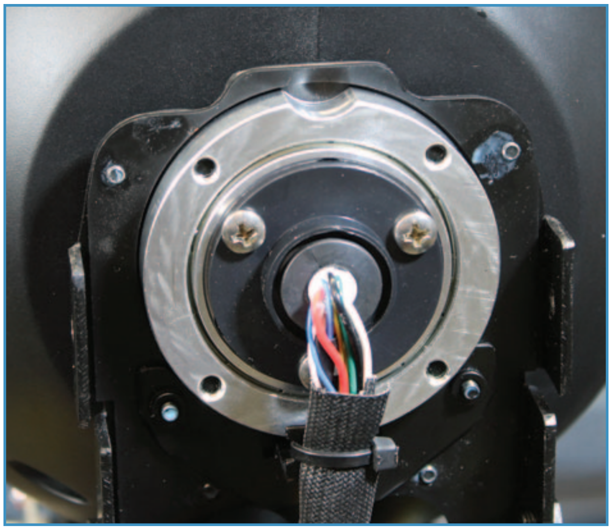

Figure 9: Slip rings.

move took 1.4 seconds and a more typical 180° move took 0.8 seconds. Tilt took 0.9 seconds for a full 270° move and 0.7 seconds for 180°. These are very quick times, taking advantage of the unit's small size. I measured positional hysteresis at 0.15° on both axes; this equates to a potential error of 0.6" at 20' (26mm at 10m).

In spin mode, the pan axis can rotate at speeds varying from 3rpm — 94 rpm while, tilt is slightly faster at 3.75rpm — 118rpm.

Noise

When not moving, the thermostatically controlled cooling fan is really the only noise producer. Not surprisingly, the unit gets much noisier when spinning the head. There are a couple of resonances on pan-and-tilt spin at medium speeds that produce the noise levels listed below. If you avoid those resonant speeds, you can get results a few dB lower.

When homing	45 dBA at 1m
Pan	46.4 dBA at 1m
Tilt	50.3 dBA at 1m
Spin Pan	51.8 dBA at 1m
Spin Tilt	65.4 dBA at 1m
Stationary	38.5 dBA at 1m
Ambient	<35 dBA at 1m

Electrical parameters

I measured power consumption with the LEDs at full power at 0.83A from a nominal 115V 60Hz supply. Power was 98W, with a power factor of 0.97. Quiescent consumption with the LEDs off was 0.13A, 9W at a power factor of 0.6.

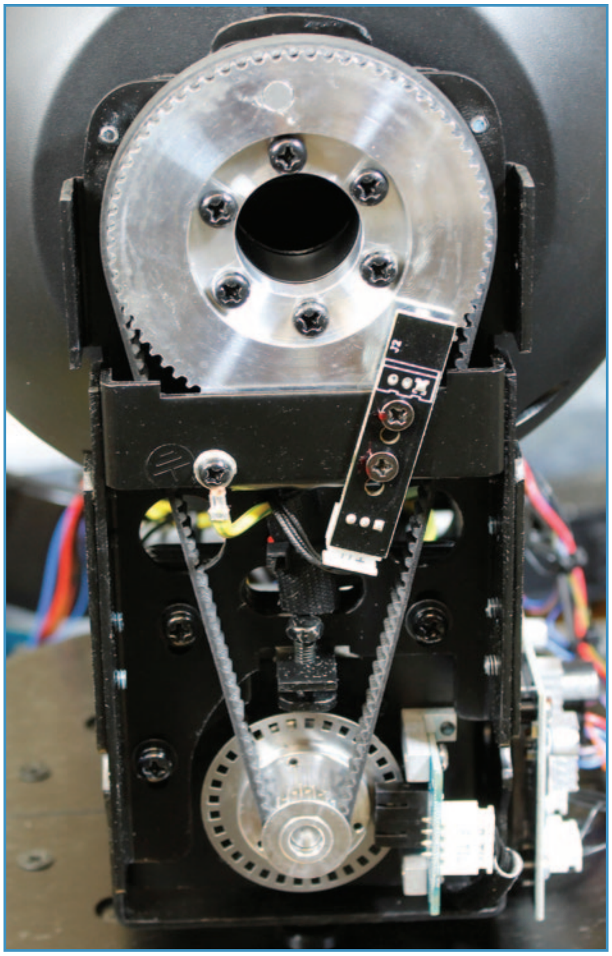

Figure 10: Yoke arm.

Figure 11: Display.

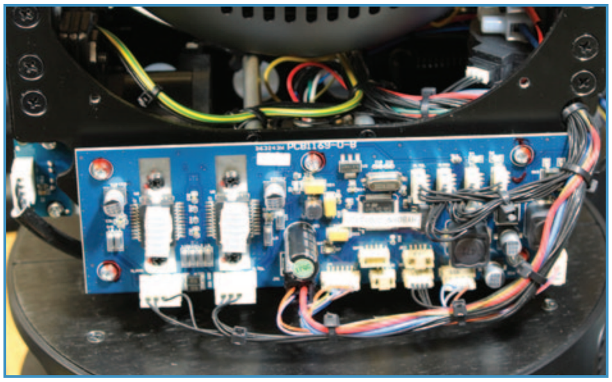

Figure 12: Main control.

Figure 13: Connectors.

Construction and electronics

The MagicDot-R has an interesting shape. Ayrton has chosen to carry the same cylindrical cross section through the top box and head/yoke so the unit presents a uniform cross section. This means there is no overhang by the head from the base area. You can physically mount the units as close as the top box allows and know they won't collide. Figure 10 shows the tilt motor and positional sensors in one yoke arm. Electronics is in two main positions on either side of the base; one side has the menu and color LCD display (Figure 11), while the other contains the motor drivers (Figure 12). The connector panel shown in Figure 12 has five-pin XLR DMX connectors as well as powerCOM True-1 in and out to allow daisy-chaining units. The DMX-512 connection offers RDM capabilities that passed basic testing.

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