The Rosco Cube Family

By: Mike Wood

Figure 1: Fixtures as tested.

Here's a name you haven't seen in this column before: Rosco. One of the best-respected and well-known companies in our industry, Rosco has been providing products for theatres since 1910. It started out with colored filters and is still, I would think, the best-known name for gel in the world. Now, 106 years and four Academy Awards later, Rosco is manufacturing LED-based luminaires. Although it might seem surprising, it's really a natural progression: Rosco is color is Rosco, and if the world moves towards using additive mixing from LEDs to make those colors, then so must Rosco. I don't see gel disappearing just yet, but clearly Rosco has to have an eye to the future.

The company's first products in this arena are deliberately simple—no automation, no flashy effects, just simple lights intended as workhorse products for the area Rosco knows best: the stage and the studio. This month, I'm taking a look at the Cube range of products, which were developed for Rosco in partnership with the R&D company The Black Tank. The Cube range is available in three sizes: Pica, Miro, and Braq, with a number of variants within each size. For this review, I've tested at least one variant from each size and will present my measurements as usual (Figure 1).

All tests were run with Cube models operating on a nominal 115V 60Hz supply. However, the Miro and Braq are capable of running on any supply between 90VAC – 240VAC, 50Hz/60Hz with automatic voltage selection on the switched mode power supplies. (Pica uses a low-voltage adapter—more on that later.)

All three Cube models are variations on a theme: Each uses a circular arrangement of LED emitters either in RGBW, variable white, or UV (black light) configurations. The largest product, the Braq Cube, has seven LED arrays, each of three or four emitters; the Miro Cube has four; and the Pica has a single array. I'll start with the Braq, and work my way down in size.

Light source

I tested both the RGBW Braq Cube 4C, and tunable white Braq Cube WNC models. The 4C model uses seven Osram Ostar Stage quad-chip RGBW LEDs, with each of the RGBW groups mounted behind a single homogenizing TIR optic. Figure 2 shows the arrangement on the main circuit board. Figure 3 shows the view from behind the circuit board. The cooling system is interesting! The rear of the circuit board has an array of copper tubes (actually, copper pipe-coupling joints) soldered to the board. There are holes in the board itself, which allows air to be drawn through, over the LEDs and through the copper tubes, via an axial fan mounted behind all the tubes (Figure 3). The fan is speed-controlled and very quiet. Rosco tells me that it tries to avoid any speed changes in the fan, as they are often more noticeable than a constant level of noise. That's true; it's the changes in noise that get your attention.

Figure 2: Braq LEDs and lenses.

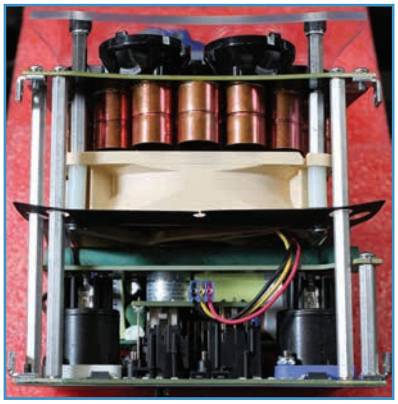

Figure 3: Braq chassis.

Another novel design feature: The electrical connections to the board from the LED drivers are through the stand-offs that support the board. The RGBW 4C model uses five stand-offs, one each for the four LED colors, and one for the common rail. You can see these clearly in Figure 3, leading from the LED board at the top to the power supply and electronics at the bottom. This makes for a compact and neat assembly with the only visible wiring being to the fan.

The tunable white model, Braq WNC, uses a similar layout; however, it uses Cree emitters and each of the three color temperatures of white has its own portion of the TIR optic with no internal mixing. Figure 4 shows the triads, each one of which has a warm, a neutral, and a

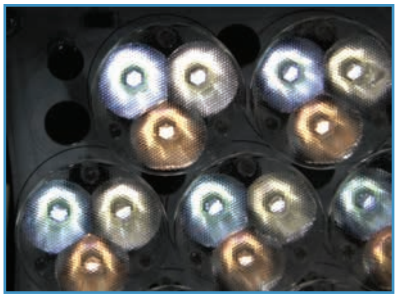

Figure 4: Three whites.

Figure 5: Miro UV LEDs.

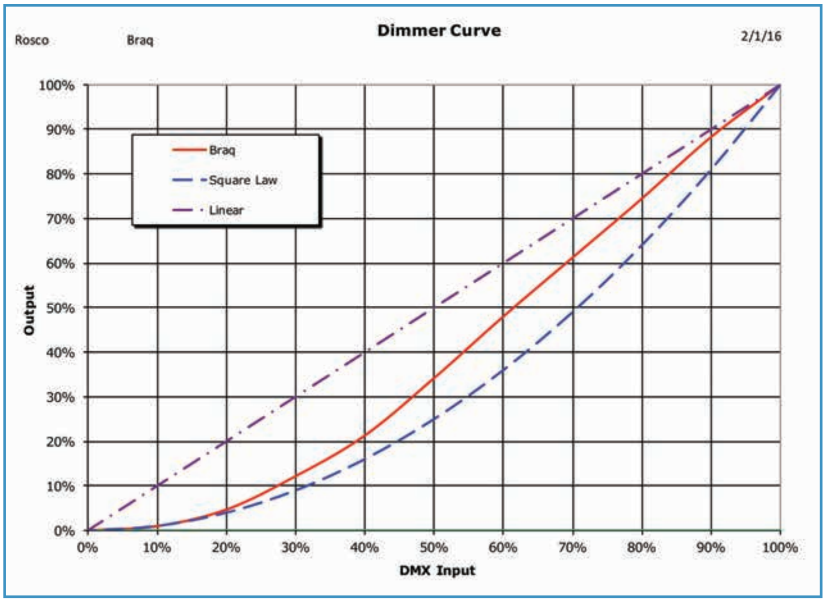

Figure 6: Braq dimmer curve.

cool white LED—thus WNC. The same cooling and electrical system is used.

The Miro and Pica follow this same design model, using the same LEDs and very similar layout and cooling. The Pica uses different, slightly larger, TIR optics. The primary difference between the models is in the number of LED arrays: Braq has seven, Miro four, and Pica a single array. Figure 7 shows the WNC's three-whites array in the small Pica unit. Pica has another difference: It remotes the power to a separate box—either the Pica Portal, which drives up to four Pica units, or other remote 24VDC or 12VAC supply.

Finally, the UV models (of Miro and Pica) replace the LED arrays with single UV LEDs in dedicated optics in a different array layout than the white and RGBW models. Figure 5 shows the arrangement in the Miro model. This array is then capped with a dichroic glass filter to reduce the visible light (shown in Figure 8). Rosco also offers an optional narrow cut-off glass dichroic filter that completely removes all visible light, for a true black light.

Control and dimmer

The control offered is very simple—effectively, one control channel (either eight-bit or 16-bit) for each color or white. In 16-bit mode, the dimming is smooth and follows a curve somewhere in between a linear and square law (Figure 6). I did see some stepping in 16-bit mode at fade levels below 10%. The RGBW model also has a visible fade towards pink in its color mixing at levels below 60; it doesn't look as if relative color mix levels are closely held throughout the fade. PWM rate was a very healthy 3.91kHz with all channels out of phase with each other, which can also help with video banding and rolling shutters.

Figure 7: Pica LEDs.

The Cube models also provide a setting for introducing simulated filament lag. Three levels are offered, which slow transitions down to emulate the warm-up and cool-down of an incandescent lamp. This works well with step changes of DMX control, but less well when driven by a slow cross-fade. That produces some visible stepping caused by aliasing between the control cross-fade and fixture emulated lag.

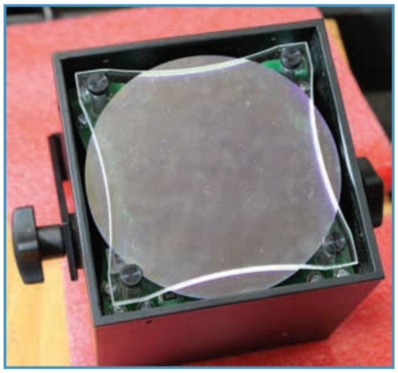

Figure 8: Black light filter.

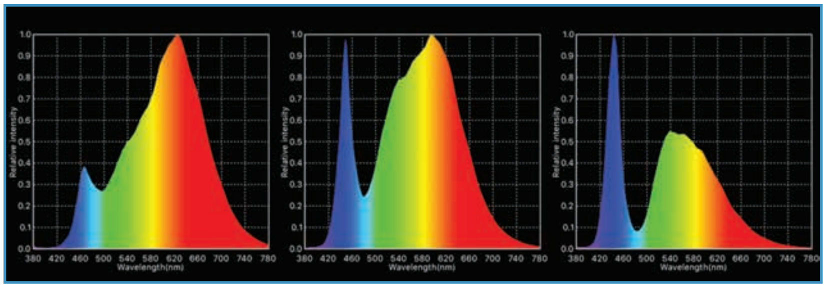

Figure 9: White spectra.

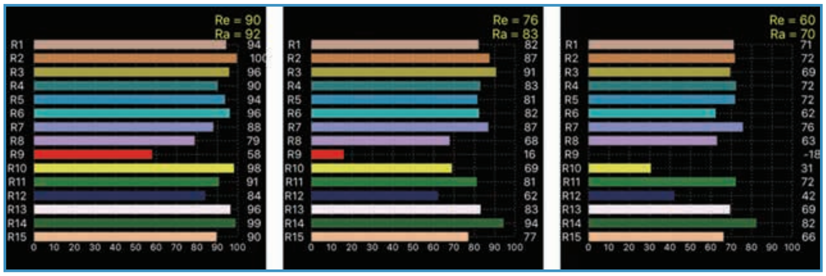

Figure 10: White rendering.

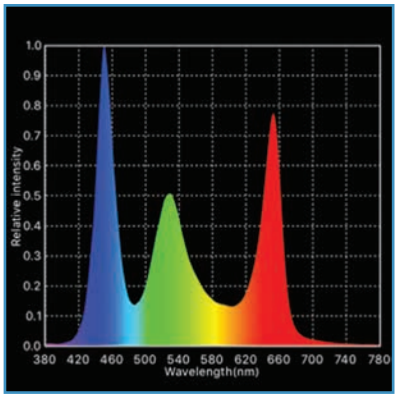

Figure 11: RGBW spectra.

Color mixing

Again, simplicity is the word. You have either four-channel additive RGBW control or three-channel cool, neutral, and warm white. The four-color TIR homogenizers in the RGBW models do a reasonable job of combining the colors into a single beam. There is some visible colored shadowing, but it can be removed by using the provided Luminit diffusion filters in the magnetically attached holder. However, there is still some slight visible shadowing from the multiple groups of LEDs, albeit all in one color.

COLOR MIXING

Color	Cyan	Magenta	Yellow	Red	Green	Blue	White	RGB
Transmission	56%	22%	66%	19%	53%	4.1%	58%	68%

You can see from the results obtained from measurements in each color that the Cube range utilizes a power budgeting system in its LED control. The four emitters run on their own, providing higher outputs than is attainable when they are all on at the same time. This is a common technique used by manufacturers for heat and power management.

Color mixing with the RGBW unit was as expected. RGB is always a little limiting, but the addition of white helps enormously with mixing pastel shades.

Figure 9 shows the spectra of the three white LEDs in the WNC models: warm on the left, neutral in the center, and cool on the right (as evidenced by the large spike in the blue). I measured the color temperatures of these as 2,690K, 3,848K, and 6,206K respectively. Figure 10 shows the color rendering for each of the whites with, as expected, the warm white having the best rendering. CQS values were 91, 81, and 68. Figure 11 shows the spectra of the RGBW emitters.

Output

The WNC variants of the three models gave outputs with all emitters at full and no diffusion fitted as follows:

Model	Field Lumens	Field Angle
Braq	5,400 lm	37º
Miro	3,300 lm	37º
Pica	700 lm	24º

The warm white LEDs provided 23% of this output, the neutral white 36%, and the cool white 41%. The output of the RGBW units is, as expected, significantly less. I measured Braq RGBW at 1,300lm and 24º (Figures 11 – 15).

These outputs were measured after running at full power for 30 minutes. The initial output drooped by around 19% over 10 minutes as the unit warmed up.

Noise

Each Cube has a fan, so some noise is produced; however, it was below my noise floor of 35dBA so I was unable to measure it. That means they are pretty quiet!

Electrical parameters and homing/initialization time

POWER CONSUMPTION AT 115V, 60HZ

	Current, RMS	Power, W	VAR, VA	Power Factor
Braq - Quiescent (LEDs off)	0.12A	7W	14VA	0.49
Braq - LEDs at full	1.47A	98W	176VA	0.56
Miro - Quiescent (LEDs off)	0.06A	3W	7VA	0.49
Miro - LEDs at full	0.65A	49W	78VA	0.56
Pica - LEDs at full	0.26A	28W	31VA	0.92

(Note: Pica tests were done using the Pica Portal power supply.)

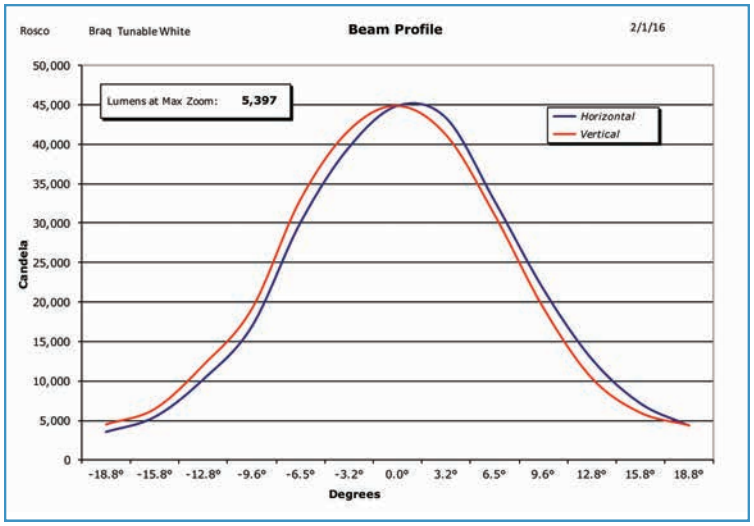

Figure 12: Braq tunable white output.

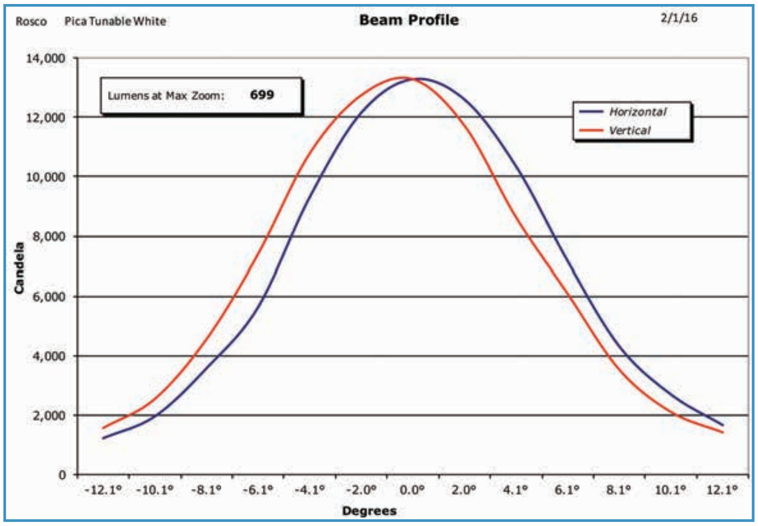

Figure 14: Pica tunable white output.

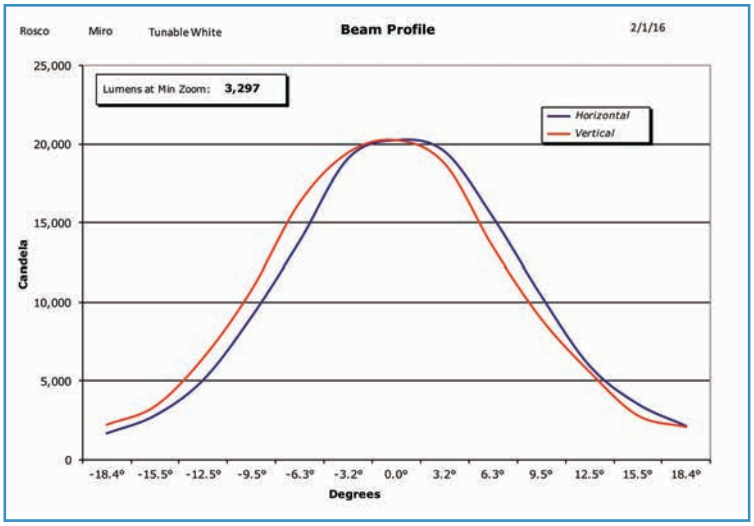

Figure 13: Miro tunable white output.

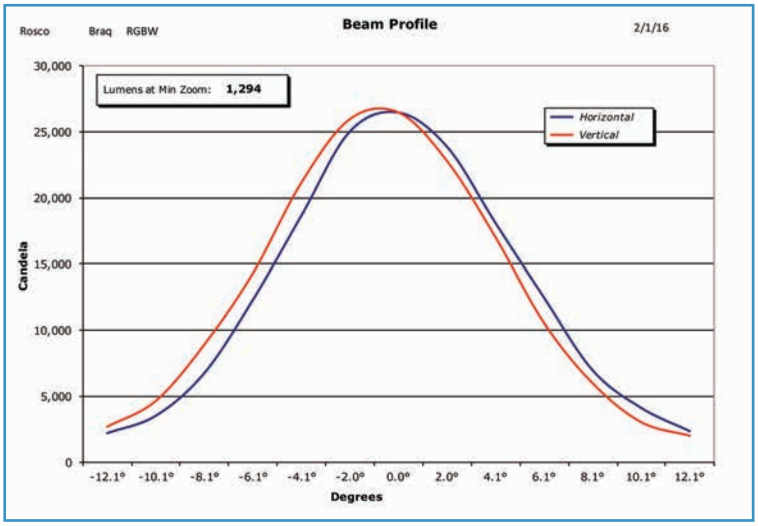

Figure 15: Braq RGBW output.

The Braq and Miro do not have power factor correction, so the current consumed will be higher than you would expect. You only pay the power company for 100W for the Braq, but each unit will need to be cabled at nearly twice that. This is of particular importance if you are going to daisy-chain a lot of Braq Cubes together using the powerCON connectors. The Pica Portal does have power factor correction. Initialization took around three seconds from a cold start (Figure 16).

Figure 16: Pica portal.

Construction, electronics, and control

I've already discussed the construction details. It's clear that compact size was a major design point for Rosco and The Black Tank. All the units are designed with size in mind. Disassembly is very simple: Remove the chassis screws and the outer case slides off, revealing all components. I would imagine maintenance, if necessary, would be straightforward. Figure 17 shows the rear panel of the Braq; the Miro is almost identical with the exception of removing the

Figure 17: Braq rear panel.

powerCON output, powerCON connectors for AC power in and out, and standard DMX-512 five-pin XLRs. The units offer a simple menuing system with a two-line LCD display and control buttons, providing the ability to set the DMX address, choose operating mode, and so on. The Cube range offers stand-alone and master-slave operation as well as normal DMX control (Figure 17).

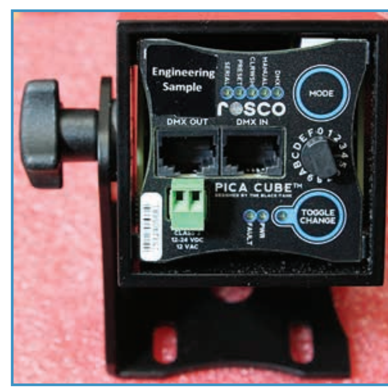

Figure 18: Pica rear panel.

The Pica is a little different, as it uses an external power supply of some kind, either a wall wart or the Pica Portal. The Portal can also be used for DMX distribution to a number of Picas. When using the Portal, a single RJ45 connector is used for DMX and power distribution and daisy-chaining. There is also the option to feed power separately through a pair of terminals on the rear panel. The Pica provides a configuration system, offering the same features as its larger siblings; however, there is no display, and setup is accessed through two buttons, a rotary selector, and a row of LEDS. I have to admit I found this a bit fiddly to operate. I understand the problem; there's a lot crammed on a very small panel (Figure 18).

There you have it, my first review of a Rosco product, although I'm sure it won't be the last. Rosco has taken an interesting step with the Cube range: They are clearly designed to be as small, quiet, and compact as possible so that they can be hidden on set, but also unobtrusive enough that they can be used for architectural applications. By doing this, Rosco doesn't try to compete head-on with some of the more established luminaire manufacturers. Instead it establishes a niche for itself in the area it knows best: the stage floor. Has the company succeeded? I hope I've given you enough information to determine if you should try a Cube out for yourself.

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