

# Goodbye Black Wrap, Hello "BAMs"

## Create Beam Masks of All Shapes and Sizes Using New Pangolin Feature

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In 1997, I participated in the production of a show for the 850<sup>th</sup> anniversary of Moscow. Some of the most influential members of Russian government were present, including Russian President Boris Yeltsin. During the show setup, the KGB insisted we place special masks on the projectors to ensure that no laser light entered the area where Yeltsin was seated. It was easy to understand why they did not want stray light to enter this area, but it was not an easy task to accommodate the KGB's wishes.

Since that time, I have seen other show setups that required the placement of odd-shaped masks and attenuating films. In some cases, the masks were made out of heavy gauge aluminum "black wrap." In other cases, they were made out of crude materials like foam core. And in some cases, the masks were omitted entirely because of a lack of time or materials.

The latest version of LD2000 software includes a unique feature that can largely solve the problem of making last-minute masks. The new feature is called Beam Attenuation Maps, or BAMs. BAMs are analogous to pieces of glass placed in front of a laser projector. Everywhere that the glass is transparent, all of the laser light will pass through. If there is a spot of black paint on the glass, the light will be completely blocked. If the glass is semitransparent, a reduced level of light will pass through.

### Paint It Black, Digitally

The BAMs within LD2000 are better than glass for several obvious reasons. Using BAMs, it is relatively easy to setup the areas and amounts of attenuation using tools similar to what you find in digital paint programs. And you can create up to 20 different BAMs and switch among them whenever you want to within the show.

So let's look at a few simple examples of how BAMs might be used on certain show sites. The first example is the easiest to comprehend—an audience scanning show using a high-power laser. In this example, the top half of the scan field is above the audience's heads, and the bottom half is below the audience's heads (and potentially in their eyes). In this situation, it is desirable to use the laser's full power for beams and fan effects projected over the audience's heads and to use lower power in the audience area to maintain eye-safe light levels.

This is accomplished by setting the beam attenuation map so that 100% power is applied to the top half of the scan field, and a lower level (30%) is used within the audience area (see image at right). Using our "piece of glass" analogy, the top portion of the glass is transparent while the bottom is partially transmissive.

### Works for Old and New Shows

What makes the BAM so great for this application? Without BAMs, laserists must painstakingly adjust each frame so that it's dark on the bottom and bright on the top—a very time-consuming procedure. The great thing about BAMs is that once you have one setup, it works like a glass overlay and the attenuation is done automatically, all the time. No matter what frames you throw at it, the system automatically reduces beam power to the prescribed levels. What's more, it is easy to change the horizon of the attenuation, to make a graduated horizon, and to make irregularly shaped attenuation areas.

When doing outdoor shows, BAMs make it possible to fine tune the projection area to account for the main audience area, people watching in nearby buildings, and even aircraft that may fly through the scanfield.

Take the example of an open-air beam show in an urban park flanked by tall buildings. Within the open air around the buildings (and above the heads of the audience), full beam power is allowed. On the buildings themselves, beam power is set at 60% to reduce the glare from beams reflecting off building surfaces. To make

sure no one inside a building is exposed to laser light, beam power is set to 0% for all window areas. Finally, beam power is also set to 0% for the upper left area of the horizon to avoid the air space of a local airport. The upper right area can stay



Using tools similar to a paint program, this BAM was created within LD2000 to allow 100% power for the top half of the projection area and 30% power for the lower half.

at 100% because there are no airspace worries in that direction.

While BAMs are a great new tool in the arsenal of audience and airspace safety, there are some limitations. First, BAMs are similar to bitmaps in that they have a limited number of pixels horizontally and vertically. The current version has 64 vertical and 64 horizontal pixels. This number was chosen as a compromise: it is high enough to allow laserists to create fairly detailed maps while at the same time low enough for the software to perform computations in real time.

When applying BAMs in an audience scanning application, laserists should also be aware that BAMs will not replace scan-fail monitor circuits. Laserists will still need a scan-fail monitor circuit inside the projector to safeguard against malfunctions in the scanners and the connecting cables.

You can be sure that the current BAM feature is only the first of many steps that Pangolin plans to make with this technology. We have applied for multiple patents and are working to provide greater levels of protection in the future.

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