



## BEYOND Projector Settings Menus

How to Use the Projector Settings Menus within BEYOND

<b>BEYOND Version</b>	2.0, build 620 and higher
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# BEYOND Projector Settings Menus

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## Projector Settings

The BEYOND software controls a Laser projector through the use of Pangolin hardware such as a QM2000 or FlashBack controller. BEYOND uses a hardware serial number for the identification of a Laser Projector when BEYOND loads or saves the projector settings. Positioning of a projector's hardware controller in the list is not important, because BEYOND uses the serial number from within the BEYOND configuration file.

BEYOND loads and saves Projector settings automatically.

If you need to **change the order of projectors** in the list then use the "Laser and EmuLaser controllers" menu.

The Order of projectors is important for Projection Zone settings. Projection zones do not use the serial number for ordering, it uses the number of Projectors in the list. Such as Projector 1, Projector 2 and so on. Such a model allows quick and easily ordering of the connected hardware controllers.

### Toolbar

**Open** - opens Projector settings from a previously saved file.

**Save** - saves Projector settings to a file.

**Copy** - copies Projector settings to the clipboard.

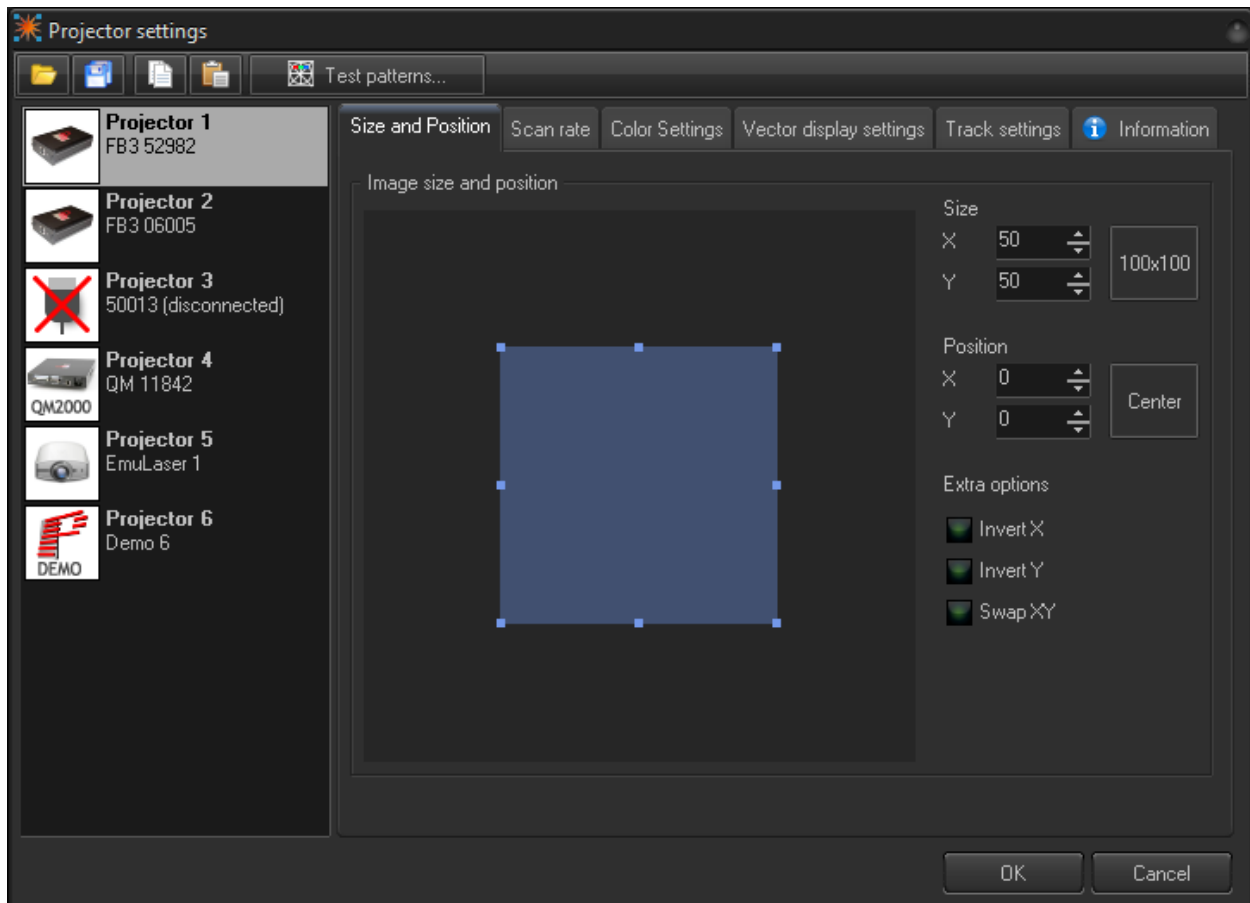
**Paste** - pastes Projector settings from the clipboard.

**Test pattern** - calls a Test Pattern dialog box that may be required to set the scan area size, scan rate, color shift, and other projector settings.



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## Size and Position



Size and Position are “global” settings of the Projector. “Global” means all Projection zones that go to this Projector will be influenced by this setting. The Projection Zone menu has Geometric correction settings which can appear to create some redundancy.

Some clients will set the Size to 100%, Position to center, and do XY corrections by means of the Geometric Correction settings in the Projection Zones Menu. Other clients will set the Size and Position, sample rate, and color shift by test patterns here, and then allocate all Projection Zones geometry within this tuned area. Each method has positive aspects.

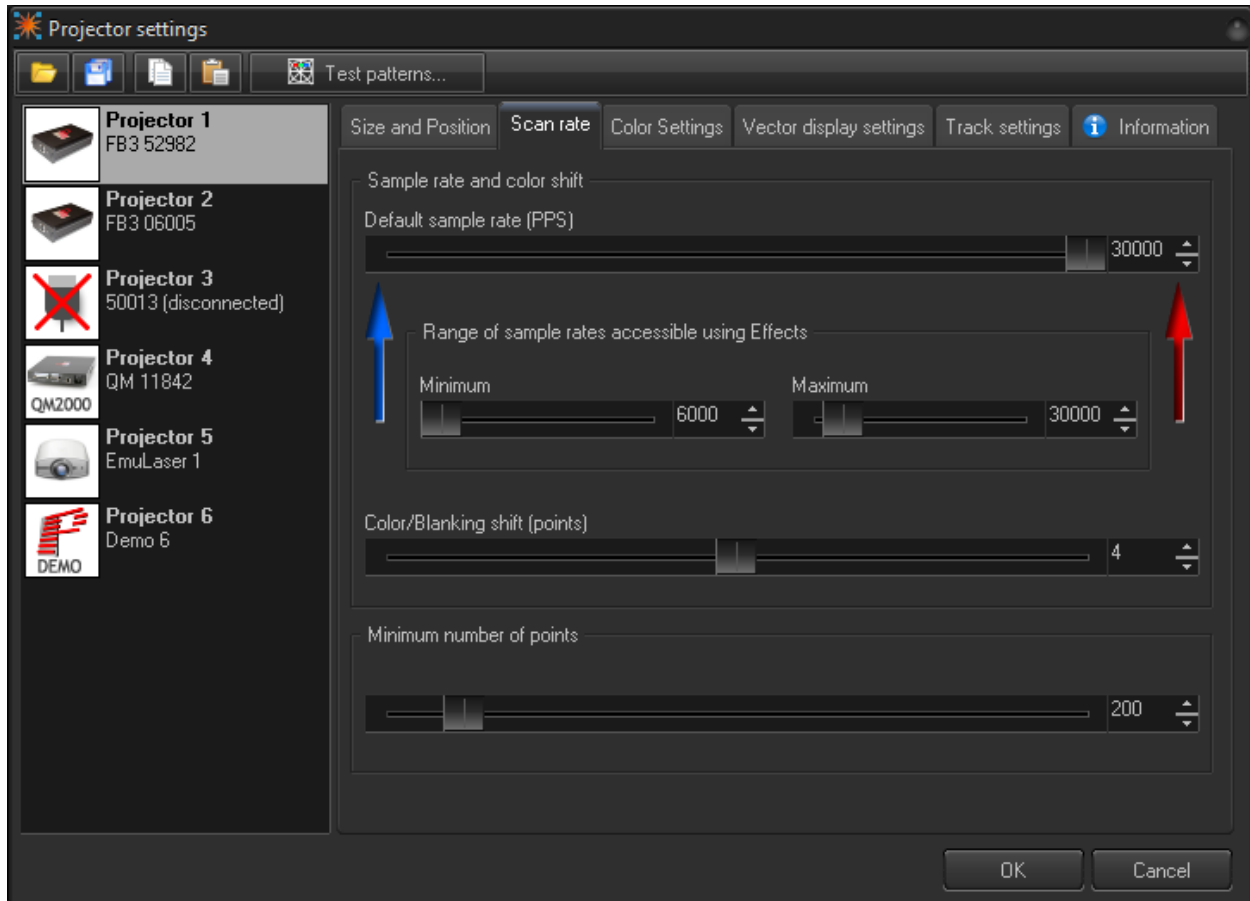
There are 3 simple additional settings:

- Invert X - inverts X coordinate.
- Invert Y - inverts Y coordinate.
- Swap XZ - swap X and Y coordinates.



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## Scan rate



**Default sample rate** values should be tuned using Test patterns. There is direct relation between default sample rate, color shift, Sample rate, Size, and Position. Bigger size means a larger angle and as a result more time is required for motion; your Sample rate should be lower. Conversely, for smaller angles, the sample rate can be higher.

Pay attention to the sliders below the Default sample rate, **Minimum** and **Maximum**. These sliders set the limit for the Default sample rate. This is a final limiter that works on the final preparation of the frames before they go to the hardware controllers for display. A high sample rate may damage the scanners in your projector. That is why there is a limiter. The sliders also control the Default sample rate slider. On the screenshot above, the maximum is set to 30K, but this is not the real maximum.

**Color/Blanking shift** controls the delay of Color signals relative to the XY values. This setting only has positive values.

**Minimum number of points.** This is a very important parameter. It may have effects for laser output power; it is important for CPU/USB/Network loads which can cause system overloading resulting in jittering, jerky laser output. Additionally there is a problem of “over power” for vector frames.



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**Overall system load.** As an example situation, say you want a bottle of beer for a dinner. You get in your car, drive to the store, buy a bottle, and drive back. The next day, you have a party and you need a case of beer for dinner. Again, you get into your car, drive to the store, buy the case of beer, and drive back. The purpose of this example is to show, whether it is one bottle or a case, there is a specific amount of time being spent on the process of getting the beer. What is common to both situations? In both situations there was a time (calculation/resource) cost to get to the store and back where the number of beers purchased is irrelevant. The system load situation with computer data computation is similar to this example.

It is a common misconception for people to think making a frame with only a few frame points will help their control computer work more efficiently and therefore faster when actually the opposite is true. For example, if a frame is created that has only 10 points, and you have your projector scan rate set to 30K.  $30K/10 = 3000$  times per second that BEYOND will need to calculate this low point count frame, while also performing all its other related computations. If a frame has 100 points, then the computer will only need to calculate the frame 300 times. If the frame has 300 points then it will be calculated 100 times per second. There will be an obvious difference between calculating 3000 times and 100 times. High FPS values, as a rule, mean higher loads on a computer's CPU because each calculation has a resource cost.

**Jitter.** High FPS is not always possible to provide. For example, if you want 3000 FPS from a system, but the system is also trying to do some additional job (multiple resource intensive applications running at one time), or simply the system is not robust enough. What will occur is the Software will be unable to supply the calculated frames in the correct amount of time, and you will see problems with the laser output not being smooth and linear. The problem will cause poor visible output displayed from the laser projector.

One more example for consideration, just using arbitrary numbers, you send 10 points, what approximately takes 100 bytes. The Ethernet packet will be at least 500 bytes. You are only sending 100 bytes, but the Ethernet communication layer is going to send 500, meaning you are only using 1/5 of your network's speed, and 80% of that communication speed is lost. The main thing to keep in mind is that there are details related to buffering that should be considered when creating frames.

Minimum number of points in a frame for the FB3 hardware is 128 points; we recommend to set this value to 200 although sometimes it is helpful to have the value set to 500 or 700.



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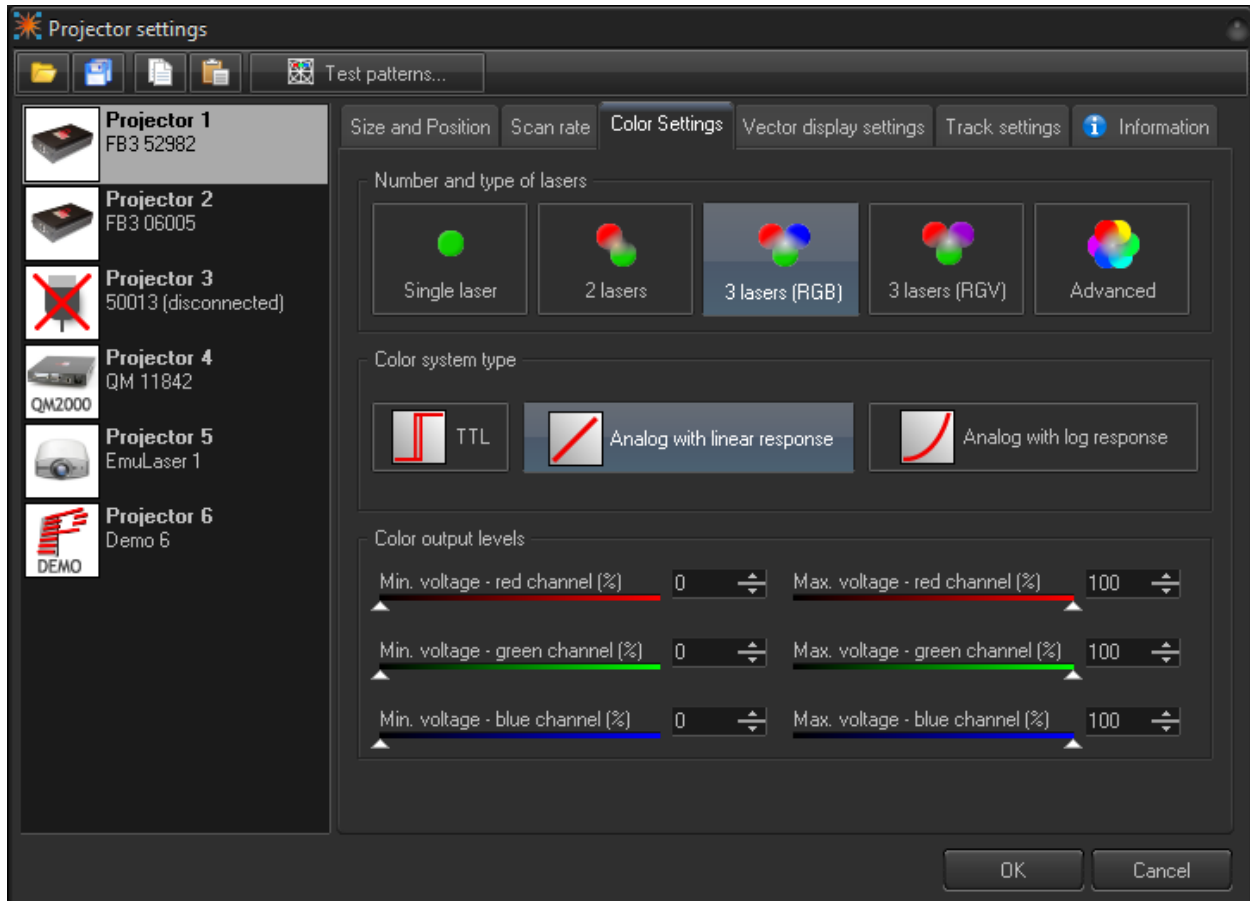
**Minimum point number and Laser Power.** Now that we understand why low point count frames can be a problem (system overload, inability to deliver data on time, etc); this is why we default the minimum point count to 200. What occurs if we need to display a frame that has only 100 points? The Software adds an additional 100 blanked points to the frame. This means that for half of time it takes to draw the frame, the laser will be off, and half the energy will be emitted. What we be done about this? Decreasing the number of minimum points may cause unwanted consequences; a much better solution is to increase number of points within the laser content frame.

Vector frames and minimum point number. For vectors, BEYOND calculates the number of points dynamically, based on spacing. This allows BEYOND to keep the brightness of a line (vector) at a constant level when the line is calculated. If we have some minimum point number defined, then BEYOND will be able to compensate the for any brightness issues.



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## Color Settings



When configuring BEYOND, be sure to indicate the number of and type of lasers in your projector, along with the color modulation scheme (color system type) used with your projector. BEYOND offers a few standard modes for quick setup and an Advanced mode that provides more flexible options.

**Number and type of lasers** - choose the number of lasers in your projector. **Advanced** options can be used with up to 6 lasers.

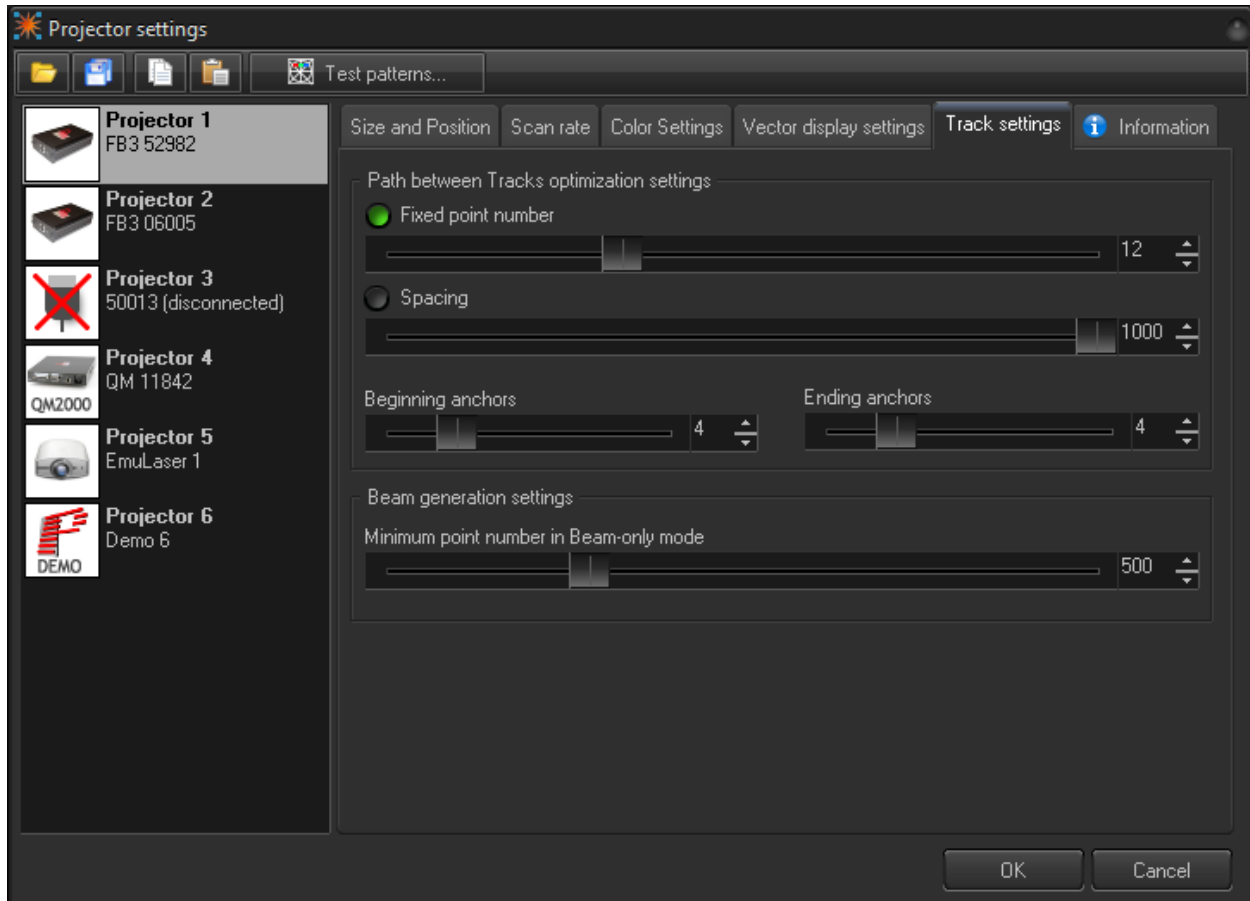
**Color system type** - choose the modulation type that corresponds with the lasers within your projector. **Advanced** options provide a customizable diagram for each laser.

**Color output levels** - sets the minimum and maximum voltage levels for color outputs.



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## Track settings



BEYOND generates special transitional (short) frames between the tracks/frames as well as between display updates. For example, if you display two cues, then BEYOND will inject a transitional path between them. The path is a blank line with a few anchor points in beginning and ending of the line.

**Fixed point number** - the path always has the same number of points distributed between the start and end points of the path.

**Spacing** - the number of points in the path is calculated dynamically according to the distance between the starting and ending points. **If distance is less than one space, then BEYOND does not generate the transitional path.**

**Beginning anchors** - number of blanked points (anchors) in the line beginning.

**Ending anchors** - number of blanked points (anchors) in the line ending.

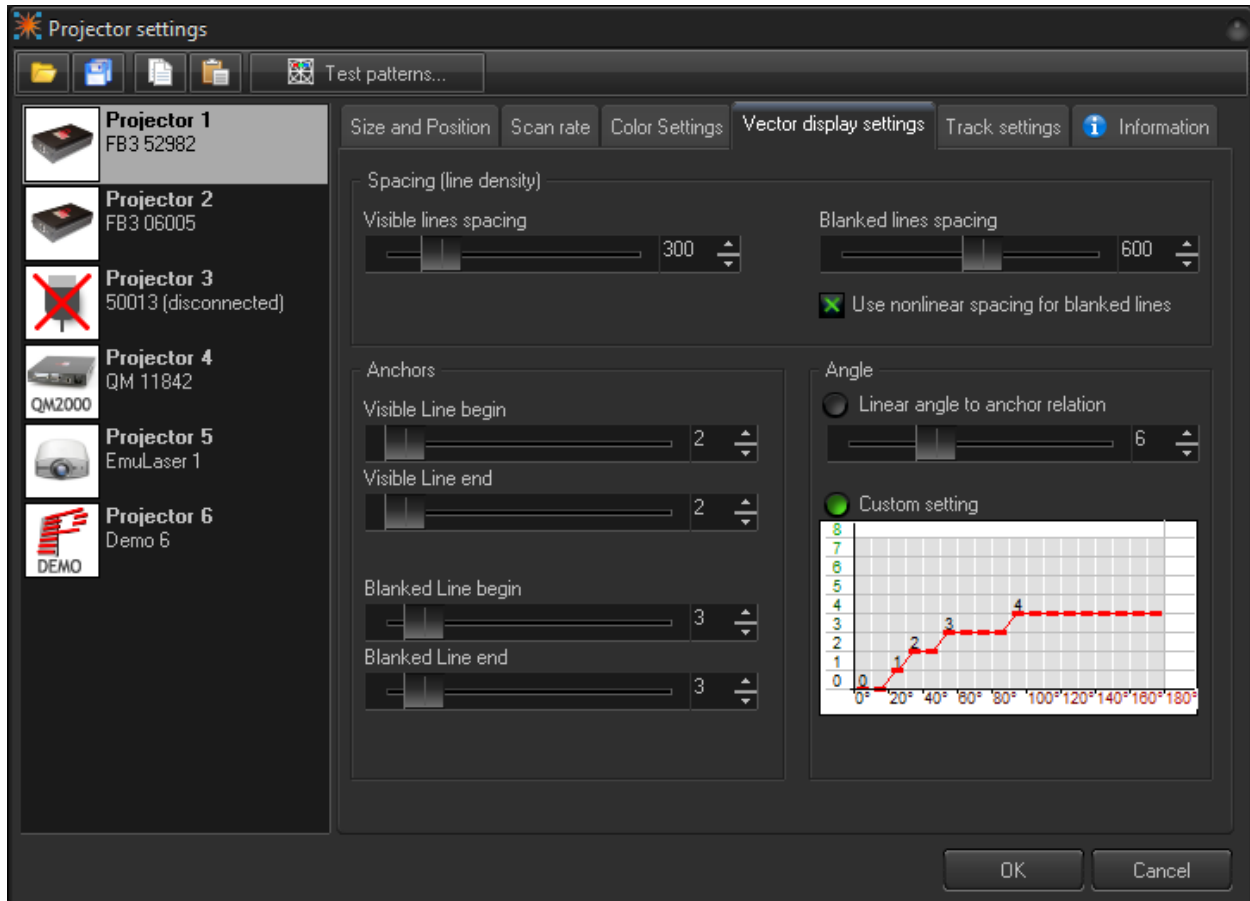
**Beam Generation Settings** - minimum point number. BEYOND has a specially designed, power optimized system for beam generation used for Target Beam Sequences. The system is most effective when Target Beams is using static beams. BEYOND takes the minimum points as a basis and distributes them between the beams dynamically. The Number of points may be bigger than the minimum.





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## Vector display settings.



## Spacing

**Visible lines spacing** - the spacing (distance) between visible points. BEYOND measures spacing between two neighboring points and if the distance is 1.5 (or more) spaces, then BEYOND will add extra points in between. Number of points is a rounded value of  $(A-B)/\text{Spacing}$ .

**Blanked lines spacing** - the spacing (distance) between blanked points. As a rule, the spacing for blanked lines can be several times more than that of visible lines. Too big of spacing can be dangerous for your scanners because of peak voltage and consequential overheating issues caused by this.

**Use nonlinear spacing for blanked lines** - nonlinear spacing places more points near the beginning and ending of a line and a bigger distance between points in the center of a blanked line. As a rule, this option works better for blanked lines.



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## **Anchors**

As a rule, a frame is a sequence of multiple visible vectors/points and blank line(s) in between. The place where a blanked line becomes visible, or a visible line turns to a blanked line requires additional anchor points for vectors.

When a visible line turns to a blanked line (end of visible line), BEYOND adds a few visible anchor points and a few blanked anchors after the line gets blanked. A similar process happens when a blanked line ends and starts a visible line. Here a few blanked and visible anchors should be added. Such points are never added between visible lines or between blanked lines (for this we have Angle optimization.).

**Visible line begin** - anchors at the visible line beginning.

**Visible line end** - anchors at the visible line ending.

**Blanked line begin** - anchors at the blanked line beginning, works together with “Visible line end”.

**Blanked line end** - anchors at the blanked line ending, works together with “Visible line begin”.

## **Angle**

Angle optimization works for visible lines only and between visible lines only. If there is transition between a visible and blanked line, BEYOND adds anchors according to the Anchors section.

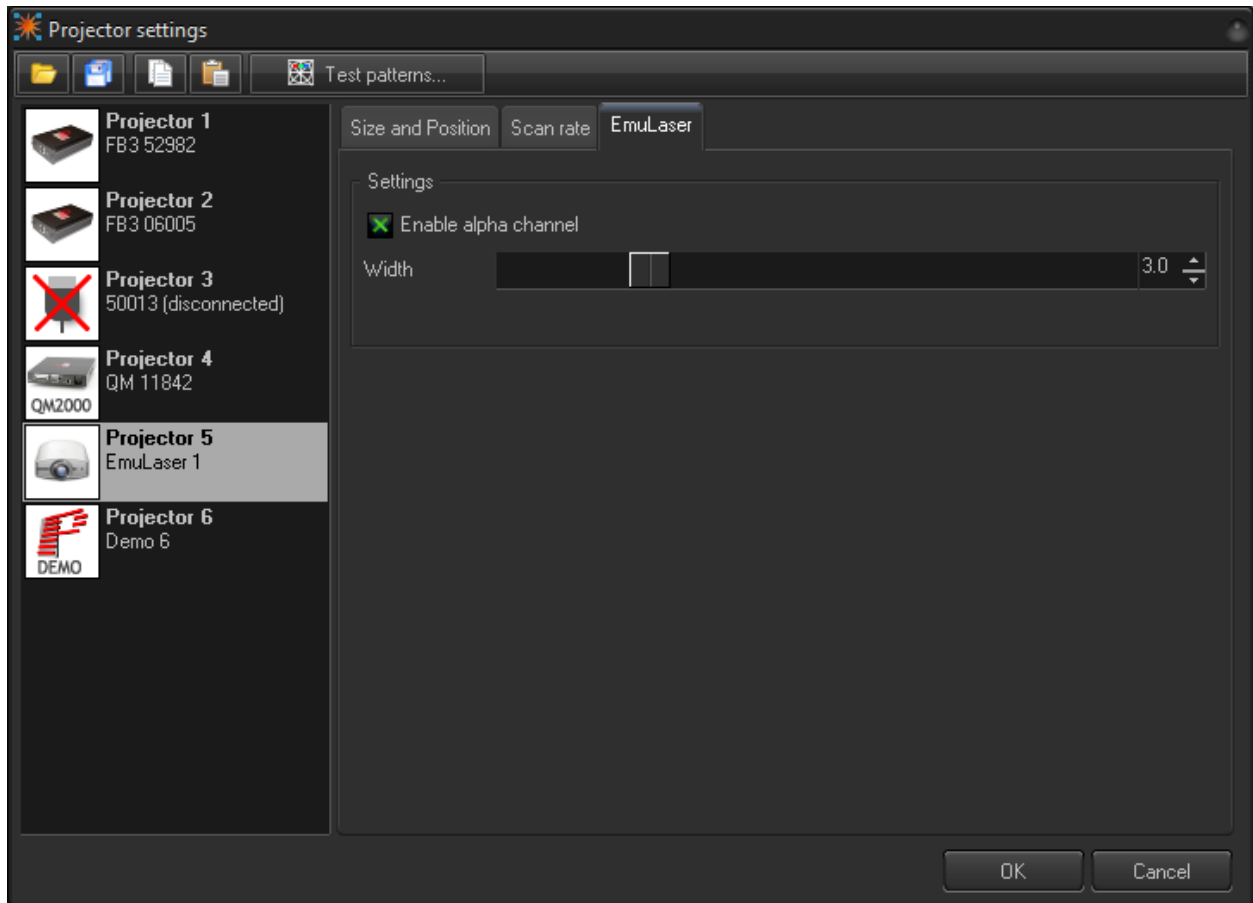
**Linear angle to anchor relation** - number of anchor points in a 180 degree turn.

**Custom Setting** - a diagram that allows setting the number of anchor points for turns of 100, 40, 60... 180 degrees.



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## EmuLaser



EmuLaser has very simple configuration settings.

**Enable alpha channel** - enables or disables alpha channel during painting the output lines. The line that uses alpha channel as a rule is a bit less bright.

**Width** - line width.

