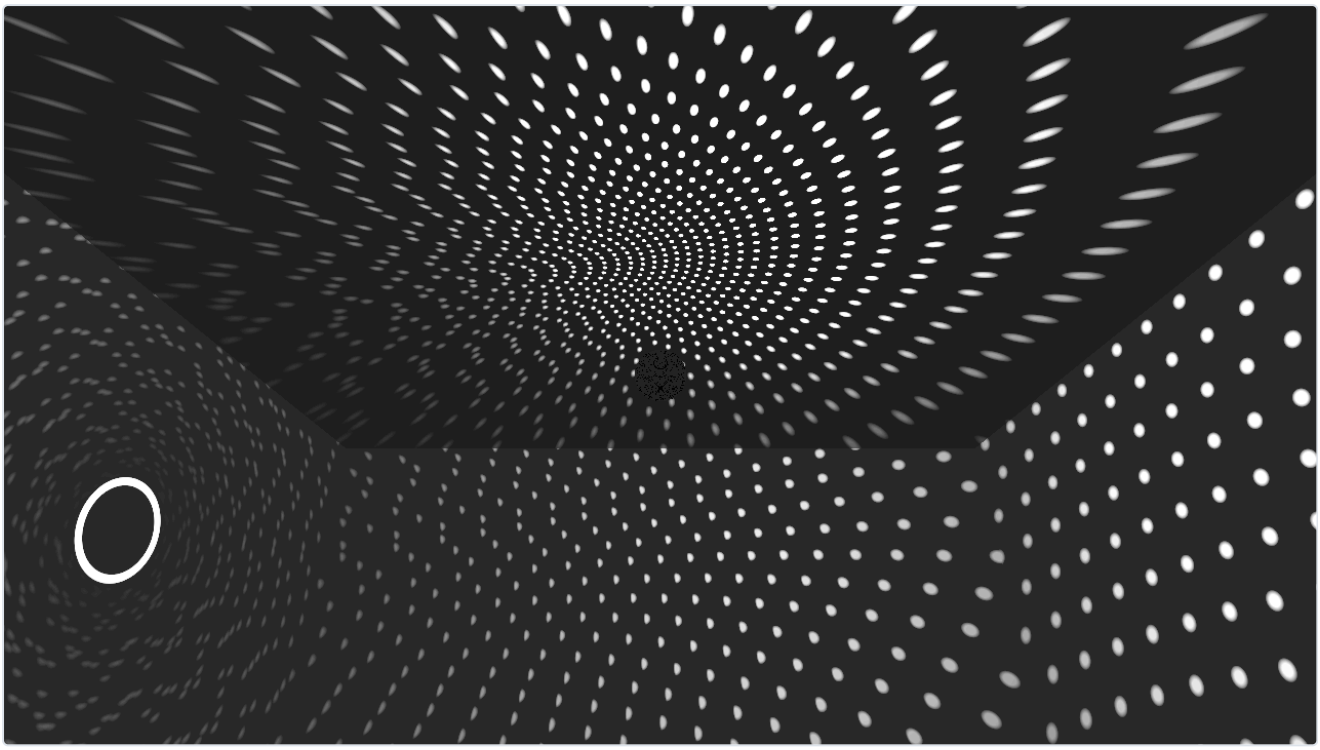
Mirrorball user guide

> **Photosensitivity note.** On their defaults neither plugin flashes. But with a small ball, the pin spot in close and the ball turning fast, the spots are big patches of light sweeping across the picture, and each one passing is a flash: measured at up to **16 flashes' worth of rises and falls in a second** in a third of the picture, where the guidance draws the line at six (**three flashes a second**). Sync can turn the ball much faster than Free's 5 rpm. Flashing light can trigger seizures in people with photosensitive epilepsy. See Flashing, and keeping it safe before you put a fast, close setting in front of an audience.

Mirrorball is **a mirror ball and its pin spot, for Resolume Arena and Avenue**, as two FFGL plugins in one download: **SW Mirrorball**, a source that is a turning mirror ball in a dark hall full of its spots, and **SW Mirror Over**, an effect in which the same spots land on your clip, printed on the back wall, or carry your clip as the pin spot's gobo.

Nothing in it is drawn as a spot. The ball is rings of small flat square mirrors, and one narrow pin spot is aimed at it. A flat mirror reflects by the law of reflection and doesn't change the beam's spread, so each spot is the pin spot seen through a small square window. For every pixel on the walls, the floor and the ceiling, the plugin finds the few facets that could send it light, traces each ray back through its facet to the lamp's lens and its gate, reads the gobo for that ray, and adds them up. So close to the lamp every spot is a whole, mirrored copy of the gobo, and further off each one carries only a piece of it; spots stretch where they land at a slant, crowd and dim behind the ball, crawl near the axis and race toward the horizon; and a missing facet is a hole in the pattern that turns with the ball.



One frame of SW Mirrorball on its defaults, from the offline harness, not captured from Resolume: a 50 cm ball of 6,452 10 mm facets, the pin spot 5 m off to the right. The ring on the left wall is the pin spot's own light passing the ball, with the ball's shadow in it.

> **Before you rely on this:** it's at **v0.1.0**, the first release, and early days. Everything below was compiled, rendered and measured offline on an Apple Silicon Mac (macOS 26), by a harness that drives the plugins' own classes in a headless GL context, at two rasters (1280×720 and 320×180) and partly on Apple's software renderer, reading linear lux straight off the plugins' output. It checks the optics, not screenshots. A facet's spot, caught on two planes, leaves at the angle it arrived to 5.6×10^{-5} rad; one facet's light summed over a plane is what it intercepted from the pin spot, at any distance and slant, to 2.8×10^{-4} of it; near the lamp each spot is the gate cone's ellipse to 7.3×10^{-4} of its area; spots on a ceiling run round circles at the ball's own rate to 1×10^{-4}; which facets are missing is the same on the CPU and the GPU, spot for spot; and Sync steps start on the host's beat to 3.4×10^{-8} s. Eighteen models that are wrong on purpose and twenty-seven one-character changes to the shipped code are all caught, and every control that has pixels changes the picture. In Resolume it has run only on one layer over a still: in Arena 7.29.0 on a Mac, and in Arena 7.27.1 on Windows on software rendering. There both plugins register, show their controls with the declared defaults and render, and every control the checks could move changes the picture. It has **never been in a show**. The facets' layout, the pin spot's lens and its brightness are assumptions (see Known limits). Try it on a spare layer before you put it in a show.
>
> This codebase was created with AI assistance, directed and reviewed by a human author.

Installing

Every download carries both plugins: **SW Mirrorball**, a source (`Mirrorball.bundle` on macOS, `Mirrorball.dll` on Windows), and **SW Mirror Over**, an effect (`Mirror Over.bundle`, `Mirror Over.dll`). Drop them into Resolume's effects folder and restart Resolume:

```
macOS    ~/Documents/Resolume Arena/Extra Effects/
Windows  %USERPROFILE%\Documents\Resolume Arena\Extra Effects\
```

Avenue uses the same layout under its own folder name. SW Mirrorball appears among the sources and SW Mirror Over in the effects browser.

The macOS download is a universal build (Apple silicon and Intel), as a `.dmg` or a `.zip`. It's **Developer ID-signed and notarised**, so the bundles just load. The Windows download is an x64 installer or a `.zip`. The installer offers Arena's folder above, or Avenue's on a machine that only has Avenue; change it on the folder page if you use the other one. It isn't code-signed, so it trips SmartScreen once: **More info** → **Run anyway**. Or skip the installer and copy the two `.dll` files out of the `.zip` into the folder by hand.

Start here

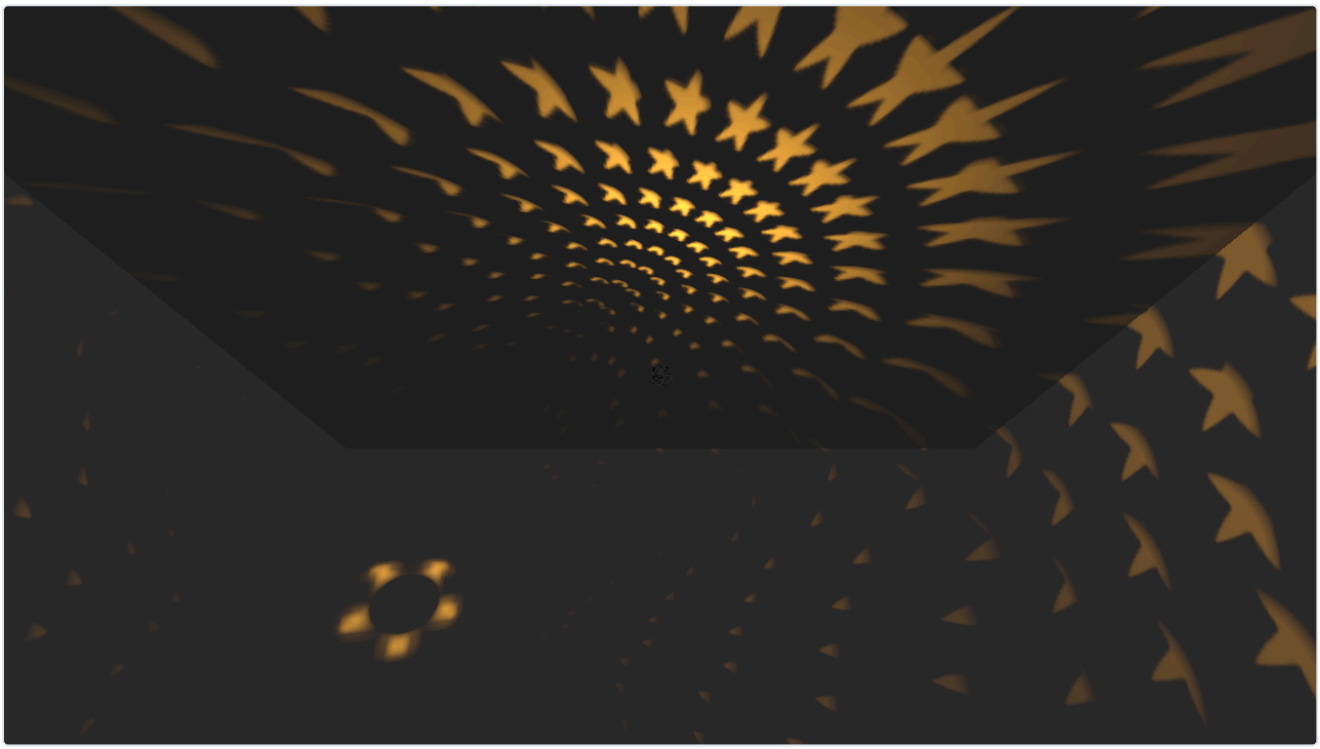
1. Put **SW Mirrorball** in a clip slot and play it. The defaults are a 50 cm ball of 10 mm glass turning at 1 rpm, lit by a 5° pin spot 5 m away, 10° up and 75° round to the right, in a 12 m hall at 3% room light, seen from the front of the room.
2. Watch the spots: near the ball's axis, on the ceiling, they crawl round in circles; out toward the walls' far edges they streak. That's the ball's one angular rate seen at different distances from its axis.
3. Turn **Throw** down toward 0.5 m and the spots change kind: with the lamp in close each spot is a whole, mirrored copy of the gate, and with **Gobo** on **Star** every spot is a star.
4. Set **Motor** to **Sync** and the ball stops turning steadily and steps 15° on every beat of Resolume's tempo, gliding over half of each beat. When the transport isn't running it keeps its own clock at the last tempo Resolume sent (120 BPM if it never sent one).
5. For your own footage, put **SW Mirror Over** on a clip. The spots land on your clip, printed on the back wall; between them it's nearly dark (see Room Light below). **Clip As Gobo** puts your clip in the pin spot instead, so every spot carries a piece of it.

The defaults: Diameter 0.5 m, Facet Size 10 mm, Missing 0%, Seed 1, Motor Free, Speed 1 rpm, Step On Beat, Step Angle 15°, Glide 0.5, Beam 5°, Throw 5 m, Elevation 10°, Bearing 75°, Gobo Open, Colour White, Room 12 m, View Room, Room Light 0.03, Exposure 0. SW Mirror Over has no View (it always looks at the back wall), sets Exposure +5/6 stop, and adds Clip As Surface and Mix 100%.

Recipes

The classic. The defaults, on a dark layer. 1 rpm is the one speed of the Eurolite MD-2010, the motor most mirror balls hang from.

A star in every spot. Throw near **0.5 m**, Beam **12°**, Gobo **Star**, Colour **Amber**, Diameter **0.2 m**, Bearing **36°**. With the lamp nearer than about 1.3 m, each facet sees the whole gate, so every spot is a complete star, mirrored. The large star on the left wall is the lamp's own light passing the ball, with the ball's shadow in it.



The pin spot in close: a 20 cm ball, a 12° beam 0.5 m away, the Star gobo, Amber, Bearing 36°.

Your clip in pieces round the room. SW Mirror Over, Clip As **Gobo**, the lamp at the default 5 m. Far from the lamp each facet sees only part of the gobo, about a quarter of its width at the defaults, centred on where that facet sits in the beam: your clip arrives in mirrored pieces scattered over the wall. Bring Throw down to under about 1.3 m and every spot carries the whole clip, but the spots then gather round the lamp, and at the default Bearing of 75° they miss the back wall: the Over shows only the dark room. Swing Bearing round to **150–180°**, so the lamp is behind the ball, and they land on the wall the Over shows.

Spots on the beat. Motor **Sync**, Step On **Beat**, Step Angle **15°**, Glide **0.5**: the ball turns 15° on each beat, gliding there over the first half of the beat. Glide **0** jumps; Glide **1** moves for the whole beat. A negative Speed steps the other way. Keep Glide at 0 or the angle small if the lamp is in close (see the next section).

A worn ball. Missing **20–30%**, and Seed to pick which ones. The gaps turn with the ball and are the same in every instance and every frame, so two layers with the same Seed agree.

Looking at the back wall. View **Wall** (the source only) looks straight at the back wall, the one SW Mirror Over prints your clip on, so the spots cross the frame instead of swirling.

Flashing, and keeping it safe

On its defaults neither plugin flashes. Measured from the plugins' own output over the whole picture and over every third-of-the-picture patch, the brightness never swings by the amounts the guidance counts: not at the defaults, not at any Speed up to ±5 rpm with the default ball and lamp, and not with Sync at any Step On, Step Angle and Glide tried with the default ball and lamp, up to 90° steps on every half beat at 240 BPM, at +4 stops, on the Wall view. SW Mirror Over at its defaults didn't flash over any of Resolume's 33 demo clips, and made the two busiest of them calmer (6 and 5 rises and falls a second on their own, 0 through it).

It can flash when the spots are few and big, and move fast. A small ball (20 cm) with the pin spot in close (about a metre or nearer) makes each spot a large patch of light, a few of them to a third of the picture, and when they sweep past fast each one passing is a rise and a fall in brightness. People with photosensitive epilepsy can have a seizure from flashing light, and the line that broadcast guidance (Ofcom) and web guidance (WCAG 2.x) draw is **no more than three flashes in any second** over a large area of the picture. A flash here is a rise and a fall in brightness of at least a tenth of white; two make a flash, so the line is six.

Measured from SW Mirrorball's own output, rises and falls in the worst second in the worst third of the picture, with a 20 cm ball, a 12° beam, a 6 m room, no Room Light and the Wall view (the whole picture never went over the line in any of these):

Motor	ball and lamp	Exposure	rises and falls
Free, 5 rpm	10 mm facets, lamp 1.1 m	+4	10, **over**
Free, 3 rpm	10 mm facets, lamp 1.1 m	+4	6, at the line
Free, 5 rpm	10 mm facets, lamp 1.1 m	0	0
Free, 5 rpm	14 mm facets, lamp 1.1 m	+1	7, **over**
Sync, Half Beat, Glide 0, 120 BPM, any angle 15–60°	20 mm facets, lamp 0.5 m below	+4	4 at most
Sync, Half Beat, Glide 0, 90°, at 180 / 200 / 240 BPM	20 mm facets, lamp 0.5 m below	+4	6 / 7 / 8, **over above 180**
Sync, Half Beat, Glide 1, 120 BPM, 15° / 20° / 90°	20 mm facets, lamp 0.5 m below	+4	6 / 9 / 16, **over from 20°**
Sync, Half Beat, Glide 1, 90°, 120 BPM	20 mm facets, lamp 0.5 m below	0	16, **over**
Sync, Bar, Glide 1, 90°, 120 BPM	20 mm facets, lamp 0.5 m below	+4	7, **over**

SW Mirror Over measured the same way over Resolume's 33 demo clips: at 5 rpm with the 20 cm ball, 10 mm facets and the lamp at 1.1 m at +4 stops, 2 of the 33 went over the line (8); at its own Exposure, +5/6 stop, those two measured 0. With the lamp 0.5 m below a 20 cm ball of 20 mm facets, Sync on the half beat at 240 BPM, 90° steps and Glide 1 at +4 stops, 7 of the 33 went over (up to 18).

What keeps it within the guidance, in everything measured:

- **A bigger ball or the lamp further back.** With the default 50 cm ball and the lamp at 5 m, nothing went over the line at any setting tried.
- **In Free, Speed at 3 rpm or slower**, or **Exposure at 0 or below**.
- **In Sync, Glide 0 and no more than six steps a second.** With no glide the picture only changes on a step, so it can't flash faster than it steps: Half Beat up to 180 BPM, Beat up to 360. With any glide the ball turns between steps, and Sync can turn it far faster than Free's 5 rpm: 90° every half beat at 120 BPM is 60 rpm on average, and even 15° every half beat is 10 rpm. With the lamp in close, keep Glide at 0, or the Step Angle small and the Step On slow.

None of this is a substitute for warning your audience. The browser demo opens on the defaults, which don't flash.

The Ball group

Control	Range	Default	What it does
Diameter	0.2–1 m	0.5 m	The ball's size; the slider is linear, its middle 0.6 m.
Facet Size	5–20 mm	10 mm	Each square mirror's side. The slider is geometric: its middle is 10 mm. Eurolite's sheets list 5 and 10 mm; 20 mm is past them on purpose.
Missing	0–50%	0%	Facets taken out, chosen by a hash of Seed. Each gap is a hole in the pattern that turns with the ball.
Seed	0–999	1	Which facets are missing. The same Seed gives the same gaps in every instance and every frame.

The ball is rings of equal latitude, each with as many facets as fit, with 10% grout between them, every facet reflecting 86% (EN 1036's floor for silvered float glass). The default ball has 6,452 facets; the 1 m ball of 5 mm glass has 103,702.

The Motor group

Control	Range	Default	What it does
Motor	Free, Sync	Free	Free turns at a steady Speed; Sync steps on Resolume's beat.
Speed	−5 to 5 rpm	1 rpm	Free's rate, either way (the Stairville MBM40D runs 0.5–5 rpm). In Sync only its sign counts: the step's direction. The slider's middle is 0.
Step On	Half Beat, Beat, 2 Beats, Bar	Beat	How often Sync steps.
Step Angle	1–90°	15°	How far each Sync step turns the ball. The slider is geometric: its middle is about 9.5°.
Glide	0–1	0.5	How much of the step interval the move takes, on a raised cosine. 0 jumps; 1 moves for the whole interval.

The motor runs on the plugin's own clock in double precision, so Free's phase is the same at any frame rate, and a Sync step's instant is found inside the frame it falls in: it starts on the beat, not on the next frame after it. The harness checks it against a host clock of 499,000,000 ms, about six days of Arena running, to 10^{-12} of a turn.

At 1 rpm a spot 10 m from the ball moves at about 1 m/s. Every spot keeps the ball's angular rate, so its speed is $\omega\rho$, its distance from the axis: near the axis they crawl, toward the horizon they streak.

The Spot group

Control	Range	Default	What it does
Beam	3–12°	5°	The pin spot's beam angle (ADJ's narrow lens to its wide one; Eurolite's PST-5 is 5°). The brightness stays the same as the beam widens, so the light per facet drops.
Throw	0.5–10 m	5 m	The lamp's distance from the ball. The slider is geometric: its middle is about 2.2 m.
Elevation	−90° to 90°	10°	How far above (or below) the ball's level the lamp is. −90° is straight below.
Bearing	−180° to 180°	75°	How far round the ball the lamp is; 0 is toward the camera, positive to the right.
Gobo	Open, Dots, Ring, Star, Bars	Open	The pattern in the pin spot's gate. In SW Mirror Over, Clip As Gobo replaces it with your clip.
Colour	White, Red, Amber, Green, Cyan, Blue, Magenta	White	The lamp's colour.

Two kinds of spot, and Throw decides which. The lamp is a 114 mm lens (a PAR36's) with its gobo focused at infinity. Nearer than about 1.3 m at the default 5° beam (it's the lens width over twice the tangent of the half-beam), each facet sees the whole gate, and every spot is a whole, mirrored copy of the gobo. Further away a facet sees only the lens, and its spot is a window onto the gobo, about a quarter of the gobo's width across at the defaults, centred on where that facet sits in the beam.

Spots stretch where they land at a slant. A spot is a cone cut by a wall: round square-on, an ellipse twice as long as it is wide at 60°, long thin streaks across the ceiling's far edge.

The spill. The part of the beam that misses the ball lands on the room with the ball's shadow in it. A beam that just fills the ball, as the default one does, leaves a thin ring, lit only by the edge of the lens.

The Room group

Control	Range	Default	What it does
Room	6–30 m	12 m	How wide the hall is; it's half as high. The ball hangs at three quarters of its height.
View	Room, Wall	Room	SW Mirrorball only. Room looks into the hall from the front; Wall looks straight at the back wall.
Room Light	0–1	0.03	Light on every surface besides the spots, as a fraction of white.
Exposure	±4 stops	0 (+5/6 in the Over)	The camera's exposure. The spots are lux off a real lamp's flux; Exposure scales them.

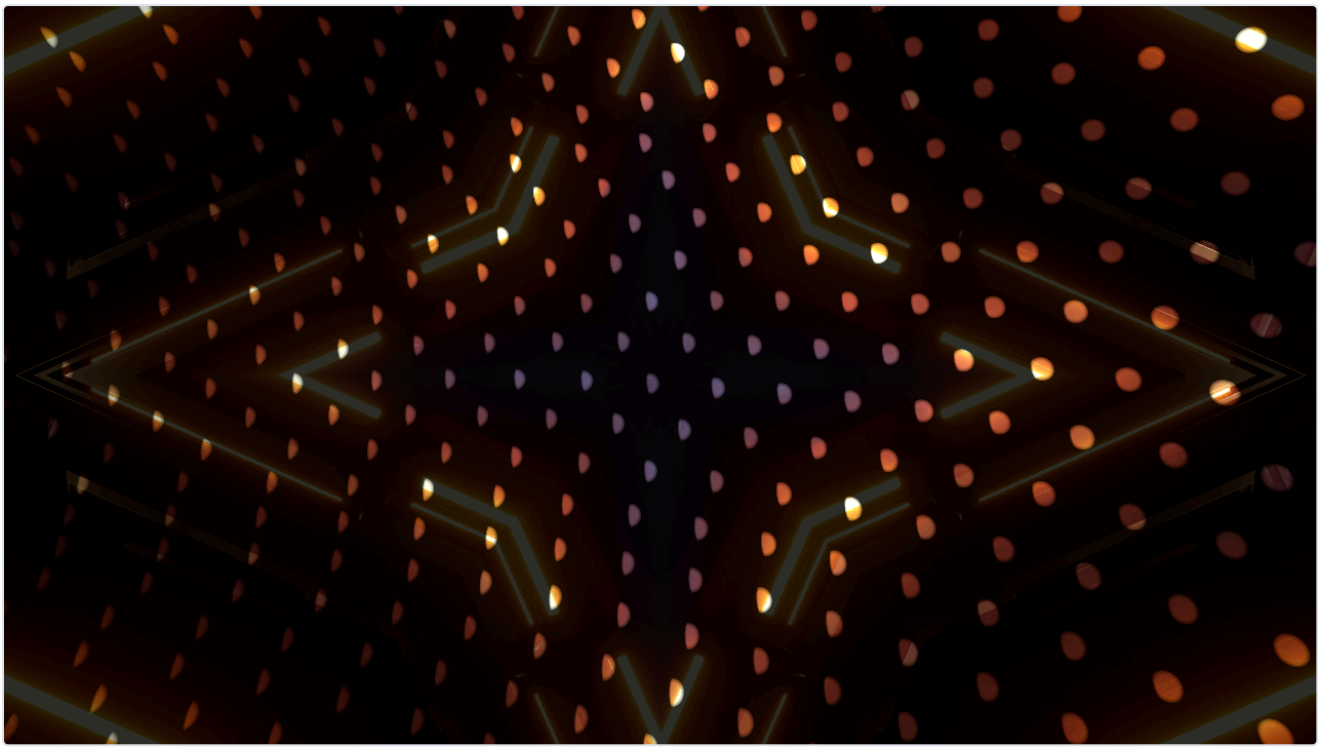
The picture is linear light, clamped at white, with no tone curve: a surface shows its colour × (Room Light + its lux from the spots, scaled by Exposure).

SW Mirror Over: your clip in the room

SW Mirror Over is the same ball and lamp seen on the back wall, with two more controls:

- **Clip As Surface** (the default): your clip is printed on the back wall and lit by the room and the spots. "The spots land on the clip." Where the clip is transparent there is no wall: its alpha comes through, and nothing under a transparent pixel shows.
- **Clip As Gobo**: your clip, cropped square, is the pin spot's gobo, so every spot carries a piece of it, or all of it with the lamp in close. Transparent is no light. The room is opaque wherever Mix shows it.
- **Mix**: 0 hands the clip straight back, untouched.

Its **Exposure default is +5/6 stop**, set from Resolume's 33 demo clips: the largest, in sixth-stop steps, at which the spots blow no more than 1% of the median clip's spot-lit pixels out to white. At it a spot shows the median clip at about three quarters of its own brightness.



SW Mirror Over on its defaults, from the offline harness, with Resolume's bundled `IntoTheGlow_02` *as the clip.*

How it works

For every surface pixel, the plugin works out which facet normal would send the lamp's light there, then visits the rings and facets round it (up to ±6 of each, 169 candidates at most). It traces each candidate's ray back by the law of reflection, asks whether it passes the lens and the gate, reads the gobo for that ray, and adds the light with smooth coverage ramps at the facet's edges so a spot's outline is exact without aliasing. The gobo is a small mipmapped texture drawn first; the gate itself is applied analytically. The brightness is anchored to a real fixture: the flux Chauvet's LED Pinspot 2 measures (4,120 lux at 2 m with its 6° lens).

The harness checks this against optics computed independently in the harness itself: equal angles of incidence and reflection from two planes' centroids, the near-field spot against the cone–plane ellipse, one facet's light over a plane against what it intercepted, spots on a ceiling running round circles at the motor's rate, which piece of the gobo each spot carries and that it is mirrored, and the missing facets against the CPU's hash.

Performance

Measured by the offline harness on an Apple Silicon Mac shared with other builds, GPU time per frame, median of 120 frames after a warm-up:

	720p	1080p
SW Mirrorball, the defaults	0.67 ms	1.21 ms
SW Mirrorball, View Wall	0.53 ms	1.19 ms
SW Mirrorball, 1 m ball of 103,702 facets, lamp in close	3.18 ms	6.84 ms
SW Mirror Over, the defaults (Surface)	0.54 ms	1.21 ms
SW Mirror Over, Gobo	0.62 ms	1.37 ms
SW Mirror Over, 1 m ball of 103,702 facets, lamp in close	3.38 ms	7.79 ms

The cost grows with the number of facets a pixel has to visit: a big ball of small facets with a wide beam in close is the worst case. Nothing was timed inside Resolume, at 4K, or on Windows.

If it looks wrong

The ball doesn't turn. In Free, Speed is at its middle (0 rpm). In Sync, Speed only sets the direction; the steps follow Resolume's tempo, or the plugin's own clock at the last tempo it was sent, and a Step Angle near 1° barely moves it.

The clip is nearly black in SW Mirror Over. That's the room: Room Light is 3% of white, so between the spots there's almost no light. Raise Room Light to see the clip between them.

The spots are blown white. Exposure is up, or the lamp is in close with a narrow beam. Turn Exposure down to see the gobo in them.

My clip isn't in the spots. Clip As is Surface by default: the clip is the wall. Set Clip As to Gobo, and bring Throw down to see the whole clip in each spot.

SW Mirror Over shows no spots at all. They're landing somewhere other than the back wall, which is all the Over shows. The light comes back from the ball toward the lamp, and the smaller the patch of ball the beam lights (the lamp in close, a narrow beam, a big ball), the tighter the spots gather round it. At the default Bearing of 75° the lamp is off to the right, so with Throw under about 1.3 m, or Diameter at 1 m, the back wall goes dark. Swing Bearing round to 150–180° (the lamp behind the ball); for a big ball, widening Beam to 12° also brings them back. SW Mirrorball's Room view shows where they went.

The spots look like smudges, not squares. The lamp is far and the beam narrow, so each facet sees only the lens and the spot is a window onto the gobo; with an Open gobo that's a soft round patch. That's how a real pin spot on a mirror ball looks.

Spots near the top of the frame are long streaks. They're landing on the ceiling at a grazing angle, as they do in a real hall.

The plugin draws nothing. That's what a shader that won't compile looks like. The log has the error:

```
macOS    ~/Library/Logs/mirrorball/mirrorball.YYYY-MM-DD.log
Windows  %LOCALAPPDATA%\mirrorball\logs\mirrorball.YYYY-MM-DD.log
```

Known limits

- **Run in Resolume only briefly**, on one layer over a still, in Arena 7.29.0 on a Mac and 7.27.1 on Windows (software rendering): nothing is known yet about a whole show, whether Sync's steps land on Arena's beat (in Arena they were only seen to step), or how it performs there.
- **SW Mirror Over's default Clip As is Surface**, not Gobo. Under Gobo at the defaults each spot carries a disc of your clip about a quarter of its width, so the picture is lost in tinted dots; with the lamp in close (and Bearing swung round to 150–180° so the spots reach the back wall) every spot carries the whole clip. Which should be the default is open.
- **SW Mirror Over shows only the back wall.** With the lamp in close or a big ball, at the default Bearing the spots land elsewhere and it shows only the dark room (see "SW Mirror Over shows no spots at all" above).
- **Room Light 0.03 leaves your clip nearly black between the spots** in SW Mirror Over. That's a dark hall; raise it if you want the clip to read.
- **The two plugins' Exposure defaults differ**: 0 in SW Mirrorball, +5/6 stop in SW Mirror Over, where it was set from Resolume's demo clips.
- **The grout is an assumption.** The facets have 10% grout between them, which takes 17% of the light, though the manufacturers' sheets describe their balls as gapless. No sheet gives a facet count or arrangement; the rings and their offsets are this project's.
- **The cap.** A pixel visits at most 169 candidate facets. With very wide, grazing spots (the biggest balls with the lamp in close) the far side of each spot is dropped: 0.77% of the light at the worst setting.
- **The pin spot is two fixtures.** Its flux is Chauvet's LED Pinspot 2's, its lens a PAR36's diameter. The lens is uniformly bright, the gate hard and the focus at infinity: a real lamp's falloff toward the beam's edge isn't modelled.
- **Perfect tiles.** Every facet is flat and exactly aligned: no tilt scatter, no chipped or dull tiles, no wobble on the motor.
- **No air and no bounce.** No beams are seen, only spots on surfaces, and walls don't light walls. The room is an empty box with chosen surface colours.
- **It can flash** with a small ball, the lamp in close and a fast spin (see above).
- **The inspector shows slider positions**, not metres or degrees. This guide gives the ranges and where the middle of each slider is.
- **No presets** and no OpenFX version.

About

The last group, **About**, has the plugin's name, version, licence and maker, and buttons that open the project page, this user guide, the source on GitHub and the support page in your browser.

Links

- Project page: stoatworks-labs.com/software/mirrorball
- Source: github.com/stoatworks-labs/mirrorball
- User guide: stoatworks-labs.com/software/mirrorball/guide
- Browser demo: mirrorball-demo.stoatworks-labs.com

Reporting something

If something's wrong, shout at github.com/stoatworks-labs/mirrorball/issues. A screenshot, which plugin, the Motor, Throw and Clip As settings, and the log are usually enough.