Halide

Granular Smear & Spectral Wash Processor

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Halide is a real-time granular smear and spectral wash effect — it dissolves incoming audio into a diffuse, haunting, analog-flavored fog. A wideband grain cloud reads from a rolling sixteen-second buffer; that cloud is then fed into a Paulstretch-style spectral smear, so the two layers work in series rather than side by side. FREEZE captures a moment and holds it indefinitely. Modeled in spirit on Mutable Instruments Beads and the Paulstretch technique, Halide keeps the source recognizable — melted and softened, never brittle or fizzy. Named for silver halide, the light-sensitive grains of photographic film; the amber L is halation, the warm glow bright light leaves as it bleeds past its edges.

1. Overview & Signal Flow

Halide's window has four regions: a top bar, a live buffer display, the GRAIN CLOUD control row, and two bottom panels — SMEAR on the left and the IO panel on the right.

The Halide interface: top bar, live buffer display, the GRAIN CLOUD row, and the SMEAR and IO panels.

The top bar carries the Halide logo, the preset menu with SAVE and DEL, a live BPM readout, a RESET button (returns every parameter to its default), and the XNULLX brand. There is no MIDI input — Halide is a pure audio effect.

Audio flows through a single wideband engine — no band splitting, because a coherent fog wants wideband grains:

Stage	Description
In / Buffer	Input passes through IN, then is recorded into a rolling 16-second stereo buffer (the feedback return is summed in here). FREEZE stops the writing, capturing the current buffer.
Grain Cloud	Up to 256 overlapping grains read from the buffer at the TIME position — shaped by DENSITY, SIZE, SHAPE, SEED, PITCH, and MOTION.
Smear	The grain cloud's own output is recorded into a second ring and dissolved by a Paulstretch-style spectral layer. This is **serial, not parallel** — the smear melts the actual grain sequence rather than sitting beside it as a second effect.

Stage	Description
Feedback	A portion of the wet output is fed back into the buffer. Because PITCH lives inside this loop, repeats compound — shimmering up or sinking into murk.
Mix / Width / Out	The wet fog is blended with the dry input by a ducked equal-power MIX, given stereo WIDTH, and trimmed by OUT.

Two family touches worth knowing: the MIX is a **ducked** blend (as the wet blooms it gently ducks the dry, so the fog displaces the source rather than stacking on it, and MIX 0 stays bit-perfect dry), and every knob is audible — Halide has roughly half the control count of a single GrainBrain band, by design.

2. The Buffer Display

The large display is a **live, real-time view of the engine** — not decoration. It truthfully mirrors what the DSP is doing moment to moment.

- The **deep-blue waveform** is the rolling 16-second buffer, scrolling as audio is recorded.
- The **white vertical line** is the write head — where new audio enters the buffer.
- The **amber line** is the TIME playhead — where the grain cloud is currently reading from.
- The **amber-to-redscale blooms** are actual grains as they spawn and fade: each bloom's width follows SIZE and its height follows the waveform amplitude at that position, cooling from white-hot through amber to redscale over the grain's life.
- When **FREEZE** is engaged, the scroll halts and the whole view tints redscale; the TIME playhead then scrubs across the frozen picture.
- Grain blooms are **gated on signal** — over silence the display goes quiet even though the engine keeps free-running, so you never see phantom activity over a silent buffer.

3. Grain Cloud

The GRAIN CLOUD row is the heart of Halide: eight controls (plus the MUSICAL cluster) that shape the grain cloud reading from the buffer.

Control	Range	Description
TIME	1 ms – 16 s	The read position behind the write head — effectively a delay time. With FEEDBACK up, Halide becomes a granular delay. When frozen, TIME is a scrub head over the captured buffer. TIME can be locked to host tempo (see SYNC/DIV in section 4).
DENSITY	0.5 – 500 grains/s	How many grains spawn per second, fully decoupled from SIZE. Low values are pointillist and stuttering; high values build a continuous wall of sound. Overlap gain compensation keeps the level honest as density rises.
SIZE	20 ms – 6 s	Grain length. Short grains are granular and textural; long grains overlap into a smooth, sustained wash.
SHAPE	−1 … +1	The grain window shape. At 0 it is a soft Gaussian (the default smear). Toward +1 it becomes expodec — fast attack, exponential decay, a percussive forward-tape feel. Toward −1 it becomes rexpodec — a swell in with a quick release, a reverse-tape feel with no reverse button needed. Windows are never rectangular, so grains never click.
SEED	0 – 1	A single randomization macro that scales the spread of grain timing, pitch, and pan together. At 0 the cloud is perfectly periodic (metronomic granulation); turn it up for a progressively more stochastic, diffuse texture.
PITCH	−24 … +24 st	Per-grain pitch shift, with soft detents at ±7 and ±12 (fifth- and octave-shimmer — the money settings with feedback). Because pitch lives inside the feedback loop, each repeat shifts again.
FEEDBACK	0 – 1.1	How much of the wet output is fed back into the buffer. Low values thicken and sustain; the top of the range crosses unity for slow, bounded self-regeneration (a soft limiter keeps it civilized). With PITCH, feedback compounds into infinite shimmer (up) or descending murk (down).
MOTION	0 – 1	A slow, random-rate drift that sweeps TIME on its own. Freeze + MOTION auto-scrubs the captured moment — a hands-off way to keep a frozen texture alive and evolving.

3.1 Musical Pitch

By default PITCH is a free semitone shift. Engage **MUSICAL** and PITCH is replaced by a musical interval/chord selector: every grain randomly picks one tone of the chosen interval or chord, so the cloud sings that harmony around the source. The source itself is the root — no key entry needed, it tracks whatever you feed it.

- The list runs from single intervals (UNISON, OCTAVE, 5TH, 4TH, MAJ / MIN 3RD, 6TH, 7TH) through chords (MAJ / MIN TRIAD, SUS4, MAJ7, MIN7) to **SHIMMER**, a bright octave-and-fifth stack.
- The **+ / − direction** toggle flips the harmony below the source instead of above — SHIMMER "down" becomes a descending murk stack.
- With MUSICAL active the PITCH knob greys out, but its readout swaps to show the selection's defining interval (e.g. "+7 st") so the number-to-interval relationship stays learnable.

4. Smear & Freeze

The SMEAR panel adds a Paulstretch-style spectral layer that dissolves the grain cloud, and houses the FREEZE capture control.

Control	Range	Description
SMEAR	0 – 100%	How much of the grain cloud is dissolved into the spectral fog. The smear engine records the cloud's own output and resynthesizes it with fully randomized phases, so it melts the actual grain sequence rather than adding a separate effect. At 0 you hear the raw cloud; turn it up to dissolve the grains into a diffuse wash.
STRETCH	1 – 100×	The Paulstretch time-stretch factor. Higher values smear further, blurring transients into a continuous cloud.
FFT WINDOW	1024 – 16384	The spectral analysis window, a character control: small windows sound watery and immediate; large windows sound choir-like and glassy.
FREEZE	On/Off	The hero button. Stops writing new audio into the buffer, capturing the current ~16 seconds; the display tints redscale. TIME then scrubs across the frozen capture and the grain cloud keeps playing from it — freeze + feedback + pitch spirals into an infinite, evolving shimmer or murk.
SYNC / DIV	1/1 – 1/16T	Time Sync. Locks TIME to the host tempo — when SYNC is on, TIME snaps to the selected musical division instead of a free millisecond value.

5. Output

The IO panel handles levels, stereo width, the dry/wet balance, and metering.

Control	Range	Description
IN	−24 … +24 dB	Input trim into the plugin.
WIDTH	0 – 100%	Stereo width of the wet signal — it scales both the per-grain pan spread and the overall wet Mid/Side width. Higher values open the fog wider across the stereo field.
MIX	0 – 100%	Ducked equal-power dry/wet. As the wet fog blooms it gently ducks the dry, so the fog displaces the source rather than stacking on it. At 0% the output is bit-perfect dry; at 100% fully wet. The default 50% is the "instant smear" starting point.
OUT	−24 … +24 dB	Output trim.
BYPASS	On/Off	Hard bypass of the entire plugin.

The IN and OUT meters beside the panel show input and output levels with responsive ballistics.

6. Tips & Workflow

- **Instant smear.** Drop Halide on any source at the default 50% MIX and it immediately produces a tasteful wash. That is the starting point — shape from there.
- **Delay vs. cloud.** With FEEDBACK at 0, TIME just sets where grains read from. Bring FEEDBACK up and TIME becomes a granular delay time — turn SYNC on and try a 1/8 or 1/4 division.
- **Freeze as a pad generator.** Play a chord or sustained note, hit FREEZE at the moment you want to keep, then add MOTION (and a little PITCH) for an evolving, infinite pad from that single instant.
- **SEED is the character axis.** SEED 0 is a tight, periodic granulation; SEED high is a diffuse, random cloud — the fastest way to move between "rhythmic" and "atmospheric."
- **Shimmer and murk.** FEEDBACK up with PITCH at +12 builds an octave-up shimmer with each pass; at −12 it descends into murk. The ±7 and ±12 detents make these easy to hit.
- **Choir vs. water.** A large FFT WINDOW with high STRETCH is choir-like and glassy; a small window is watery and close. Use SMEAR to set how much of the cloud dissolves.
- **Sing a harmony.** MUSICAL with a TRIAD or SHIMMER turns the cloud into a chord around a vocal or lead. Because the source is the root, it follows whatever you play.

7. Quick Reference

Grain Cloud

Control	Range	Default
TIME	1 ms – 16 s	250 ms
TIME SYNC	On/Off	Off
TIME DIV	1/1 – 1/16T	1/4
DENSITY	0.5 – 500 grains/s	12
SIZE	20 ms – 6 s	180 ms
SHAPE	−1 … +1	0
PITCH	−24 … +24 st	0
MUSICAL	On/Off	Off
INTERVAL	14 intervals / chords	UNISON
HARMONY DOWN	On/Off	Off
SEED	0 – 1	0.25
MOTION	0 – 1	0
FEEDBACK	0 – 1.1	0
FREEZE	On/Off	Off

Smear

Control	Range	Default
SMEAR	0 – 100%	0
STRETCH	1 – 100×	4
FFT WINDOW	1024 – 16384	8192

Output

Control	Range	Default
IN	−24 … +24 dB	0 dB
WIDTH	0 – 100%	70%
MIX	0 – 100%	50%
OUT	−24 … +24 dB	0 dB
BYPASS	On/Off	Off

Halide is developed by XNULLX. Built with the JUCE framework. The granular engine uses a 256-voice pool reading a 16-second circular buffer; the smear layer

implements the Paulstretch technique with fully randomized phases and a pitch-locked crossfade on buffer wraps.