# WAVEATOMOS

ELEMENT SYNTHESIZER




## USER MANUAL

Version 1.2 · VST3 · AU · Standalone


TripperMusic
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# 118 ELEMENTS. 118 VOICES.

## Every atom in the universe has a fingerprint made of light. WaveAtomos turns that fingerprint into sound.

Pick an element in the periodic table and play. What you hear is built from that element's real data: its electron shells, its spectral lines, its isotopes, its mass, the hardness of the metal or the speed of sound in the gas. Iron does not sound like gold. Neon does not sound like xenon. Uranium decays while you hold the note.

### WHAT IS REAL

- The spectral lines: energy levels from ionisation energies and electron configurations, then the transitions an atom actually makes.
- Isotopes and their natural abundance, half-lives of radioactive nuclides, the real decay chains of uranium and thorium.
- Melting and boiling points, density, stiffness, speed of sound. A string of copper rings like copper, a bar of lead is dull like lead.
- Star types, absorption of light by a cold gas, redshift.

### WHAT IS MUSICAL

- Light vibrates around $10^{15}$ times a second. WaveAtomos keeps the *ratios* between the lines and moves them down to the note you play.
- Some effects are exaggerated so you can hear them: the Zeeman splitting and the fine structure are magnified, the Doppler motion is scaled.
- Every knob is labelled with what it does physically, so you always know which part is nature and which part is you.

**HONEST BY DESIGN** When something is physically impossible, WaveAtomos says so instead of faking it. You cannot make a tube out of iron or a string out of neon: those buttons are greyed out and the reason is shown when you hover over them.

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# INSTALL & QUICK START

### MACOS

Run `WaveAtomos-macOS-Installer.pkg`. It installs:

- the Audio Unit in `/Library/Audio/Plug-Ins/Components`
- the VST3 in `/Library/Audio/Plug-Ins/VST3`
- the standalone app in `/Applications`

macOS 10.13 High Sierra or later. Universal: Intel and Apple Silicon. Signed and validated with Apple's `auval`.

### WINDOWS

Copy `WaveAtomos.vst3` to `C:\Program Files\Common Files\VST3`. The standalone `WaveAtomos.exe` runs from anywhere.

Windows 10 or 11, 64-bit. The interface uses Microsoft Edge WebView2, which is part of Windows 10 and 11.

Rescan your plug-ins in your DAW and look for **WaveAtomos** by **Eric Tripper** among the instruments. Logic users: it is under *AU Instruments › Eric Tripper*.

## YOUR FIRST FIVE MINUTES

1. **Play a note.** A new instance loads **iron**. Play C3 to C5: you hear 24 spectral lines of iron, tuned to your note.
2. **Click another element** in the table. Try `Ne` neon, `Au` gold, `Hg` mercury. Each one has its own colour of sound. Use `←` `→` to walk through the table.
3. **Give it a body.** Open the `SOURCE` tab, keep `ARC` and choose `STRING` or `BAR`. The atom's light now excites a real object made of that metal.
4. **Heat it up.** Drag the thermometer next to the atom. Gallium melts at 30 °C, tin at 232 °C. Watch the state change and listen to the body soften.
5. **Let it decay.** Pick `U` uranium, open `MOD`, choose `DECAY` and hold a chord. You hear clicks as atoms decay, and the sound slowly turns into thorium.

> `DOUBLE-CLICK` Every knob returns to its default value with a double-click. Hold `Shift` while dragging for fine adjustment. The mouse wheel works too.

## HOW IT MAKES SOUND

`LIGHT` Up to 40 spectral lines, each one a sine partial with its own envelope, isotopes, Doppler drift and stereo position. This is the atom.

`MATTER` Optional body: string, bar, plate or gas tube, with the resonant modes of the real material. This is the object.

`SPACE` A room reverb sized by the atom, or a plate reverb made of the element's own metal. This is where it lives.

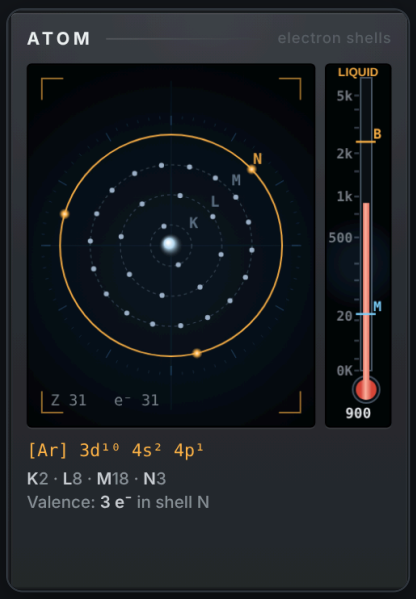
# THE PANEL AT A GLANCE




1. **Periodic table.** Click to load an element. Symbols mark gases ○, liquids ◆ and radioactive elements ☢.
2. **Atom.** Electron shells, configuration and valence of the current element.
3. **Thermometer.** Temperature of the material, from absolute zero to 6000 °C.
4. **Element card.** The data the sound is made from, and the isotopes.
5. **Lab.** Five tabs: Spectrum, Mod, Source, Absorb, Chain. A lit dot means the tab is active.
6. **Physics.** Which lines are lit and how they are spread.
7. **Timbre.** Motion, brightness and character of the lines.
8. **Envelope.** Classic ADSR, with a live curve.
9. **Output.** Room or plate reverb, volume.
10. **Play.** Octave, unison and chord mode.
11. **Keyboard.** Play with the mouse or your computer keyboard (see page 10).
12. **Presets & element.** Preset bar: ‹ › and Save, click the name to browse. Then the element, previous / next.
13. **Alloy, Drone, Panic, Size.** Mixing metals, latching notes, stopping everything, window size.
14. **Lamps & VU meters.** Audio engine, Geiger clicks, MIDI input, output level L/R.

**WINDOW SIZE** The ⤢ button steps through the sizes that fit your screen (60 % to 150 % of 1260 × 780). The size is saved with your project, and a new instance opens at the size you chose last.

# TABLE, ATOM & THERMOMETER




Gallium at 900 °C: liquid. The red column is the temperature, **M** marks the melting point and **B** the boiling point.

## THE PERIODIC TABLE

All 118 elements are playable. The colour of each cell is its family: alkali metals, transition metals, noble gases, lanthanides and so on. Families sound related, because their outer electrons behave alike. Alkali metals are simple and bright, noble gases pure and glassy, transition metals dense and metallic, lanthanides crowded with thousands of close lines.

## THE ATOM

The shells K, L, M, N... with their electrons, the configuration (for example `[Ar] 3d⁶ 4s²`) and the valence electrons in the outer shell. The outer electrons decide which lines the atom emits, which is why two neighbours in the table can sound very different.

## THE THERMOMETER

Drag the column, use the wheel, or double-click to return to 20 °C. It sets the temperature of the **material**, not of the light, and it changes things you can hear:

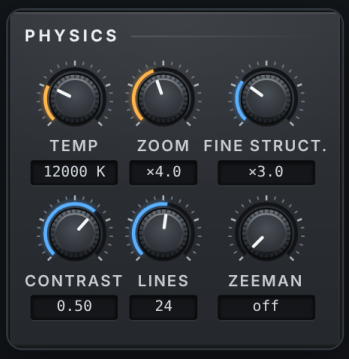
- **Melting and boiling.** A molten metal loses its solid body: STRING, BAR and PLATE switch off. Boil it and it becomes a gas, so the TUBE becomes available.
- **Softening.** A hot solid gets softer, so its body tunes down. Near the melting point the drop is clearly audible.
- **Motion.** Hot atoms move faster: the lines drift. Cold: purer and longer.
- **Glow.** Above about 525 °C the material glows red, then white. You hear it as a hiss of thermal noise under the note.
- **Gases.** A hot gas carries sound faster, so the tube formants rise.

## THE ELEMENT CARD




| | |
|---|---|
| **COLOUR CHIP** | The colour of the element's brightest line, and its wavelength. |
| **IONIZATION** | Energy to tear off an electron. It sets the energy scale of all the lines. |
| **ELECTRONEG.** | How strongly the atom pulls electrons. It sets the resonance of the filter: high values sound sharper. |
| **VALENCE N*** | Effective size of the outer orbit. Bigger atoms get a bigger room reverb. |
| **MULTIPLICITY** | Unpaired electrons split each line into close components: shimmer and beating. |
| **STABILITY** | Magnetic, radioactive or stable. Radioactive elements click like a Geiger counter. |
| **ISOTOPES** | Natural isotopes with their abundance. Each one plays slightly detuned, for a natural chorus. |

# PHYSICS & TIMBRE




The **Physics** section decides *which* lines the atom emits and how they sit against each other. It is the harmonic content of the sound.

Physics changes recompute the spectrum: they apply to the next notes you play.

| KNOB | WHAT IT IS | WHAT YOU HEAR |
|---|---|---|
| **TEMP** | Temperature of the light source, 2000 to 40 000 K. | Cold: only the strongest, lowest lines, sound is simple and dark. Hot: high lines light up, sound gets rich and bright. |
| **ZOOM** | How energy ratios become pitch ratios. | ×1 squeezes the lines into a narrow cluster. Higher values spread them over more octaves. ×4 is a good musical middle. |
| **FINE STRUCT.** | Spin-orbit splitting of the lines, magnified. | 0 gives single clean lines. Higher values split them into close pairs that beat slowly. |
| **CONTRAST** | Balance between strong and weak lines. | Low: a few dominant partials. High: everything at a similar level, dense and noisy. |
| **LINES** | Number of lines played, 6 to 40. | Fewer lines are clearer and lighter on the CPU; more lines are denser. |
| **ZEEMAN** | A magnetic field in tesla. Each line splits into a triplet (magnified ×20). | A slow, glassy chorus that comes from the atom itself. Off at 0. |




The **Timbre** section acts on the lines while they play: motion, colour and filter.

| KNOB | WHAT IT IS | WHAT YOU HEAR |
|---|---|---|
| **DOPPLER** | Thermal motion of the atoms: light atoms move fast, heavy atoms slowly. | Random pitch drift on each line. Hydrogen wobbles, lead barely moves. |
| **MAGNET** | Frequency modulation by the note's own fundamental. | From a gentle growl to metallic FM edges. |
| **LINE LIFE** | How long the excited lines last. | Short: plucked, percussive light. Long: the lines hold and sustain. |
| **DETUNE** | Spread of the unison voices, in cents. | Only active with UNISON above 1. 35 cents is wide and lush. |
| **TILT** | Tilts the spectrum around the middle. | Negative: darker, the low lines lead. Positive: brighter, the high lines lead. Level stays constant. |
| **CUTOFF** | 24 dB low-pass filter that follows the note. Its resonance comes from the electronegativity. | Open at full turn. Velocity opens it briefly at the start of each note. |

# SPECTRUM, MOD & SOURCE




## SPECTRUM

The lines being played, on a scale of ratios to your note (×1 = the note). Height is level; the bars move as the notes play. The header shows the temperature, the number of lines and the zoom.

The colour of the bars is the colour of the element's light.




## MOD: AN ELEMENT AS A MODULATOR

Instead of an LFO, the sound moves between two real spectra.

`DECAY` For each note, 24 atoms of the element decay at random with the **Half-life** you set. Every decay is a click, and the sound moves from the parent towards the daughter element (uranium → thorium). `NOTE` restarts the atoms on every note; `FREE` keeps one shared population that refills after it is spent.

`IONIZE` The atom loses an electron and becomes an ion, with a different spectrum, then takes it back. **Rate** is the speed, **Chaos** mixes in random jumps, and each recombination fires a flash of lines.

**Depth** sets how far the sound travels towards the second spectrum.




## SOURCE: HOW THE LIGHT IS MADE

| | |
|---|---|
| **FLAME** | About 3000 K: only resonance lines. Soft attack. |
| **ARC** | Steady hot plasma. The default all-rounder. |
| **SPARK** | A flash: noise and ion lines first, then the atom's lines. |
| **LASER** | A short ablation pulse: hard, percussive attack. |
| **LAMP** | Hollow-cathode lamp: pure, narrow lines. Slow and clean. |

Choosing a source also loads a matching envelope. Change it afterwards as you like.

## SOURCE: THE BODY

Below the light sources, choose an object made of the element: `STRING`, `BAR`, `PLATE` for solids, `TUBE` for gases. Its modes come from the real stiffness, density and internal damping of the material. The screen shows the material data and the modes. **Matter** balances light and body, **Position** is where you strike, **Damping** shortens or lengthens the ring, **Hardness** brightens the high modes.

# ABSORB & CHAIN







## ABSORB: LIGHT THROUGH MATTER

Light that crosses a cold gas loses exactly the colours that gas would emit. That is how astronomers know what stars are made of. In WaveAtomos it works like a filter with real notches.

`CELL` A cell of cold vapour in front of the source. Choose any element (or SELF). **Density** is how much it absorbs, **Width** how wide each notch is, **Cell T** the temperature of the vapour. Sodium in front of iron carves its own notches into iron's sound.

`STAR` The light of a star, through its own atmosphere. Eight real stars, from red Proxima Centauri (3042 K) to blue Spica (22 400 K). Hot stars sound bright and airy, cool stars dark and full of metal lines.

**Redshift** moves the whole sound down, the way light from a receding galaxy is stretched. `z 1.000` is exactly one octave down.

## CHAIN: REAL RADIOACTIVE DECAY




The three natural decay chains, step by step, with the real half-lives: `U-238` (15 steps to lead), `U-235`, `Th-232`. Each step plays the nuclide's element; α and β mark the type of decay.

Short-lived nuclides pass quickly, long-lived ones stay longer. The real times span from microseconds to billions of years, so they are compressed onto a musical scale.

| | |
|---|---|
| **PLAY / STOP** | Starts the chain from the parent. In a DAW it is armed and starts with the transport (below). |
| **NOTES** | On: every step plays a note (the last note you played). Off: the chain only changes the sound of the notes you hold. |
| **LOOP** | On: back to the parent after the stable end. Off: stops on the stable lead. |
| **SPEED** | Makes the whole chain faster or slower. |
| **QUANTUM** | Decay is random. At 0 every step has its average length; at 100 % the lengths vary like real decays. |
| **GATE** | Length of each step's note, as a share of the step. |

**IN YOUR DAW** The chain follows the host tempo. Press PLAY to arm it, the screen shows *ARMED*; it starts when the transport starts and stops with it. Step lengths snap to musical values from a sixteenth to eight bars. The random draws restart identically each time, so your song plays the same chain on every playback and on every bounce. In the standalone app the chain runs on its own clock at 120 BPM.

# ALLOYS




Press `Alloy` and the atom view becomes a crystal **lattice**. Mix up to three elements, with their real proportions in weight percent.

- Click a slot, then an element in the table to put it in the slot.
- Turn the knob under each element to set its share. The bar shows the composition.
- The `×` on a slot removes that element.
- The preset menu holds 15 classic alloys: bronze, bell metal, brass, carbon steel, stainless 18/8, invar, sterling silver, 18k gold, electrum, pewter, solder, nitinol and more.

## WHAT CHANGES

Each metal keeps its own lines, at a level set by its share, so the alloy really is a blend you can hear. Changing the proportions moves smoothly between the sounds.

The alloy also has its own mechanics: bronze is not the average of copper and tin. Strings, bars, plates and the plate reverb use the real stiffness and damping of the alloy. Bell metal rings for a long time, which is why bells are made of it.

The card shows the mean mass, electronegativity, state at the current temperature and magnetism. Stainless 18/8 is non-magnetic because of its nickel, and the sound follows.

> **TRY** Bell metal + BAR + LAMP, a long release and the PLATE reverb: a church bell made of its own metal.

# ENVELOPE, OUTPUT, PLAYING




## ENVELOPE

A classic ADSR: **Attack** 1 ms to 4 s, **Decay** up to 6 s, **Sustain** level, **Release** up to 8 s. The curve shows the shape live.

On top of it, each line has its own life (Timbre › Line life) and high lines start a little later than low ones, the way an atom fills its upper levels.




## OUTPUT

`ROOM` A convolution reverb. Its length follows the size of the atom: heavy atoms with big outer orbits get a bigger room. **Reverb** sets the amount.

`PLATE` A plate reverb made of the element itself, built on the TripperPlate engine. Its decay, size and damping come from the metal: lead is short and dark, steel long and bright. **Decay** scales the tail, **Pre-dly** delays it. PLATE needs a solid with known mechanical data; otherwise it is greyed out.

**Volume** is the output level. The output is gently saturated, so it never clips hard.

# PLAYING

## OCTAVE & COMPUTER KEYS

`-` `+` shift the on-screen keyboard, C1 to C6. Your computer keyboard plays too: `A` to `'` are the white keys, `W E T Y U O P` the black keys, `Z` `X` change octave and `Esc` is Panic. AZERTY: Q to ù, Z…P, W X.

## UNISON

1, 2, 3, 5 or 7 voices per note, spread by **Detune** and across the stereo field. The copies start in phase, so they beat like real unison.

## CHORD MODE

One key plays a whole chord: `MAJ` `MIN` `SUS4` `MAJ7` `MIN7` `5TH` `OCT`. It works on MIDI from your DAW too.

## DRONE

Latches notes: play a key once to start it, again to stop it. Turn Drone off to release everything.

## PANIC

Fades out every voice in a few milliseconds. MIDI *All Notes Off* does the same.

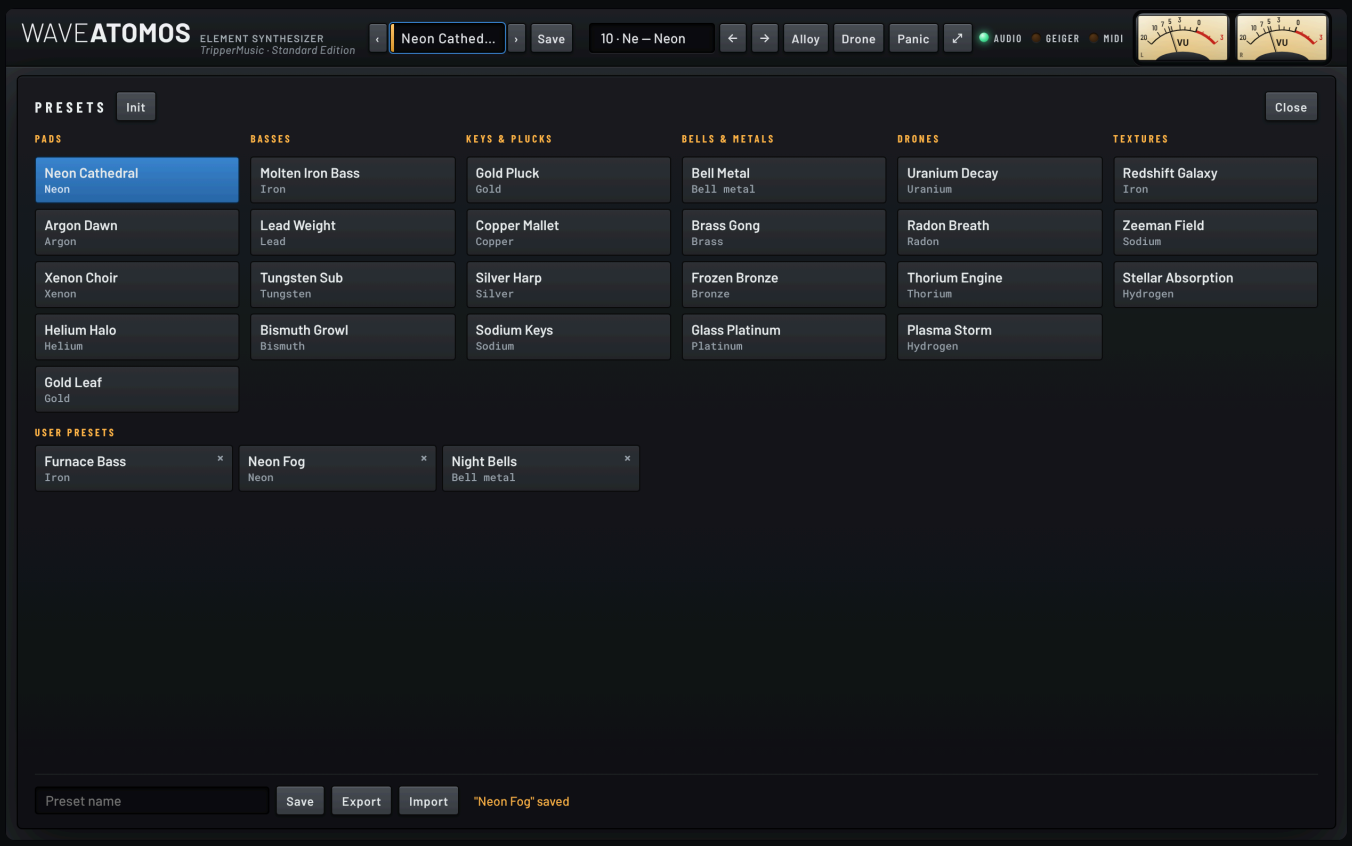
## LAMPS

**AUDIO** engine running, **GEIGER** flashes on each decay click, **MIDI** a MIDI input is connected (standalone). The VU meters show the output level, left and right.

## POLYPHONY

24 voices. A 7-voice unison chord of four notes uses 28: the oldest voice is stolen.

# PRESETS




## BROWSING

The preset bar sits next to the logo: ‹ › step through every preset, factory first, then yours. Click the name to open the panel. A ***** after the name means the sound has changed since you loaded it.

## SAVING

Click `Save`, type a name, press **Enter**. Using one of your names again replaces that preset; factory presets are never overwritten.

## WHAT A PRESET HOLDS

The whole sound: the element or the alloy, every knob, the source and the body, the lab, chord mode and unison. The **volume** stays yours, so a preset never jumps in level.

## YOUR PRESETS & FILES

The plug-in keeps your presets in one file, shared by every project:

```
Mac     Library/Application Support/TripperMusic
Windows %APPDATA%\TripperMusic
```

`Export` saves the sound as a **.waveatomos** file, `Import` adds one. The **×** on a card deletes it.

## FACTORY PRESETS

### PADS

- Neon Cathedral `Ne`
- Argon Dawn `Ar`
- Xenon Choir `Xe`
- Helium Halo `He`
- Gold Leaf `Au`

### BASSES

- Molten Iron Bass `Fe`
- Lead Weight `Pb`
- Tungsten Sub `W`
- Bismuth Growl `Bi`

### KEYS & PLUCKS

- Gold Pluck `Au`
- Copper Mallet `Cu`
- Silver Harp `Ag`
- Sodium Keys `Na`

### BELLS & METALS

- Bell Metal `alloy`
- Brass Gong `alloy`
- Frozen Bronze `alloy`
- Glass Platinum `Pt`

### DRONES

- Uranium Decay `U`
- Radon Breath `Rn`
- Thorium Engine `Th`
- Plasma Storm `H`

### TEXTURES

- Redshift Galaxy `Fe`
- Zeeman Field `Na`
- Stellar Absorption `H`

# SOUND RECIPES

Starting points. Each recipe uses only what the element allows, so the result still belongs to that element.

### DEEP BASS — Au · Gold

SOURCE ARC · BAR · Matter 80 %
Temp 6000 K · Lines 12 · Cutoff 1.0× f
Octave C1 · Release 300 ms

Heavy, soft gold has low, dense body modes. Few lines and a closed filter keep the bottom solid.

### METAL PLUCK — Cu · Copper

SOURCE SPARK · STRING · Position 0.12
Line life ×0.4 · Sustain 0 % · Decay 600 ms
PLATE · Decay ×0.8

The spark gives the snap, the copper string the pitch, the copper plate the space.

### CHURCH BELL — Bell metal

ALLOY Bell metal · LAMP · PLATE (body)
Hardness 80 % · Release 6 s
Output PLATE · Decay ×2

High-tin bronze rings for a long time. Inharmonic plate modes do the rest.

### MOLTEN TEXTURE — Ga · Gallium

Thermometer 25 → 35 °C · BAR
Doppler 1.5 · Line life ×3
Attack 400 ms

Gallium melts at 30 °C. Ride the thermometer across the melting point: the bar disappears and the liquid takes over.

### GLASS PAD — Ne · Neon

SOURCE LAMP · TUBE · Matter 50 %
Zeeman 8 T · Unison 5 · Detune 35 ct
Attack 1.2 s · Release 4 s · ROOM 50 %

The pure lines of a neon lamp, a gas tube that breathes, and the Zeeman chorus for slow movement.

### LIVING DRONE — U · Uranium

MOD DECAY · FREE · Half-life 12 s
Drone ON · Chord 5TH · Lines 40
ROOM 60 %

Hold one key with Drone. The atoms decay one by one, the clicks fall on the lines, and the chord slowly becomes thorium.

### STARLIGHT KEYS — Fe + Betelgeuse

ABSORB STAR Betelgeuse · Density 1.8
Redshift z 0.10 · Tilt -0.4
Unison 3 · ROOM 40 %

The cool red supergiant digs dark notches into iron. A touch of redshift makes it sound far away.

### DECAY SEQUENCE — U-238 chain

CHAIN U-238 · Notes ON · Loop ON
Quantum 60 % · Gate 50 % · Speed ×2
SOURCE LASER

A sequence from nature: fifteen elements, rhythm from real half-lives, locked to your DAW's tempo.

# TIPS, FAQ & SPECS

### WHY IS A BUTTON GREYED OUT?

Because the physics does not allow it. A gas has no solid body; a tube needs a gas; a plate reverb needs a solid whose mechanics are known. For many synthetic and very rare elements there is no reliable mechanical data, because no one has ever held a piece of them, so there is no body to build. Hover over the button to read the reason.

### SOME ELEMENTS SOUND ALIKE.

Neighbours in the same family share their outer electrons, so they are related, like instruments of the same family. Raise **Temp** and **Lines** to bring out the differences, or give them a body: the mechanics separate them clearly.

### THE SOUND HAS CLICKS.

Radioactive elements click like a Geiger counter, and so does Mod › DECAY. This is intended. The GEIGER lamp lights on each click. Choose a stable element if you do not want them.

### THE CHAIN DOES NOT START IN MY DAW.

It waits for the transport: press play in your DAW. If Loop is off and the chain has reached lead, press PLAY again.

### MY PROJECT SOUNDS RIGHT EVEN WITH THE WINDOW CLOSED?

Yes. The element, all settings, the alloy and the chain are saved inside your project. WaveAtomos plays them without the editor being opened.

### CPU USE.

Each voice can run up to 160 oscillators plus the body. If your computer struggles, lower **Lines**, use fewer unison voices, or freeze the track.

## SPECIFICATIONS

| | |
|---|---|
| **FORMATS** | macOS: AU, VST3, Standalone (Intel + Apple Silicon)<br>Windows: VST3, Standalone (x64) |
| **SYSTEMS** | macOS 10.13 or later · Windows 10/11 64-bit |
| **ELEMENTS** | 118, plus 15 alloy presets and free alloys of up to 3 elements |
| **ENGINE** | Up to 40 spectral lines × 4 isotopes per voice, 24-mode bodies, 24 voices |
| **BODIES** | String, bar, plate, gas tube |
| **LAB** | Decay and ionisation modulators, 5 light sources, absorption cell, 8 stars, redshift, 3 decay chains synced to the host |
| **EFFECTS** | Room convolution reverb, TripperPlate plate reverb, 24 dB filter, soft saturation |
| **INTERFACE** | 1260 × 780, scalable 60–150 % |

### CREDITS

Concept, sound design and plate reverb: **Eric Tripper** · TripperMusic. Physical data from public sources of atomic, nuclear and material constants. Fonts: Barlow and Roboto Mono (SIL Open Font License). VST is a trademark of Steinberg Media Technologies GmbH. Audio Units is a trademark of Apple Inc.