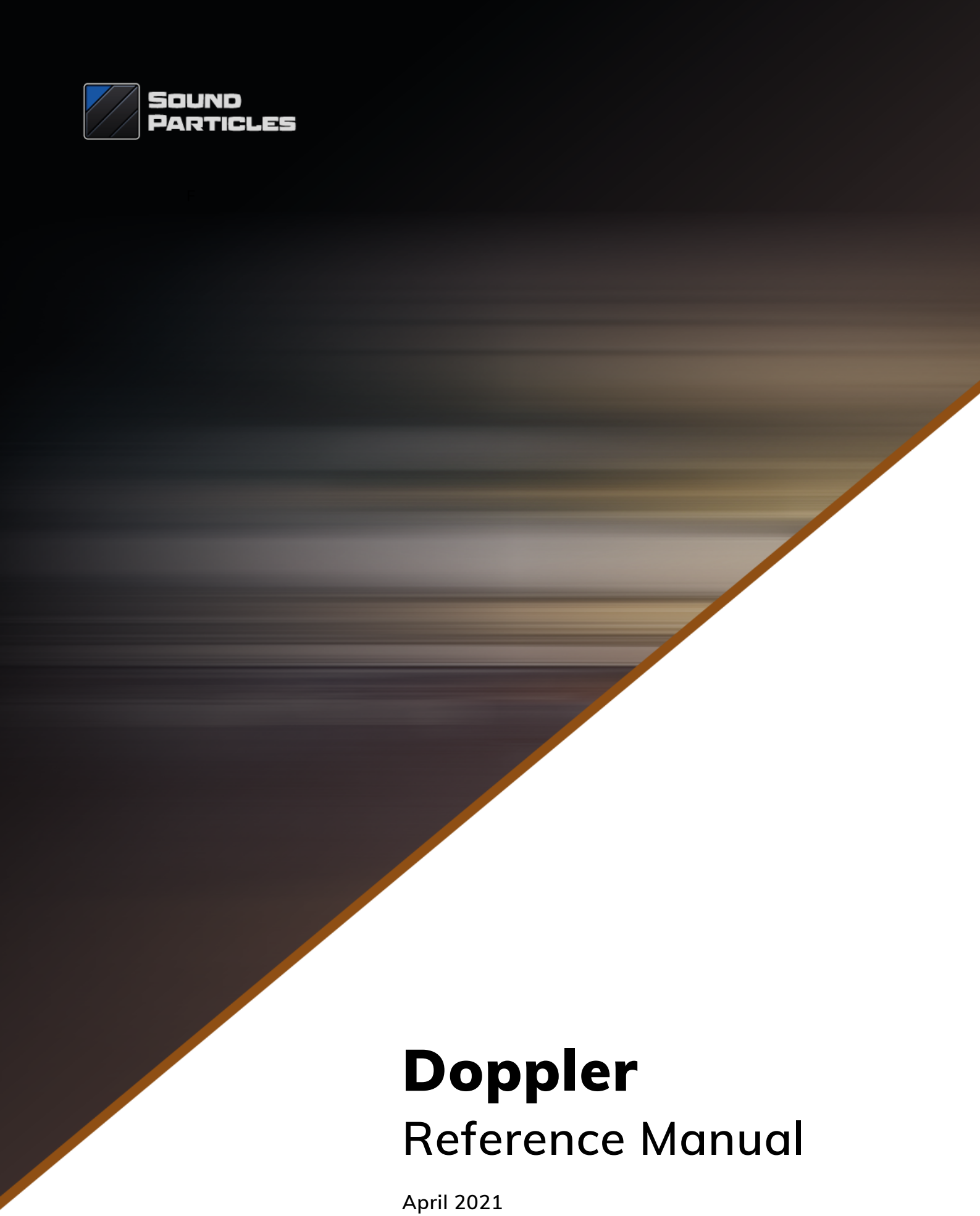

Doppler

Reference Manual

April 2021

v 1.1.4

Welcome Note

Welcome to Doppler!

Initially, *Doppler* was only a small feature of *Sound Particles* software – to simulate moving sounds, you need Doppler. But sound designers really loved the quality of the *Doppler* inside *Sound Particles*, using it on movies like "*Cars 3*", "*Ghost in the Shell*", and many others. I still recall the first time David Farmer ("*Lord of the Rings*", "*The Hobbit*") told me that this was the best software Doppler he had tried, which I replied "Really?!".

Although there are other *Doppler* plug-ins, we have decided to do no compromises, and really model the actual behavior of moving sounds with high accuracy, and that is probably the secret of our approach.

I really hope you enjoy using Sound Particles. And if you have any question or suggestion, don't hesitate to contact us. We REALLY love to receive feedback from our users.

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Doppler

Everyone knows the characteristic sound of a passing-by car, with its change of pitch and volume – that's the Doppler effect, named after the name of the Austrian scientist Christian Doppler.

Having a Doppler plugin is slightly different from having other "regular" audio effects, because of timing – you want that peak at a specific point – and as such, be prepared for a slightly different way of doing things. For instance, you will get an initial delay (a sound located 1 mile away will have a few seconds of delay on start), and you need this delay because you need to compress time later on... but let's leave that on hold for now.

Our plugin simulates the behavior of a moving sound, captured by a virtual microphone, and in a virtual environment – imagine a big anechoic chamber, with a perfect speaker moving around, and a perfect microphone capturing the sound of it. As such, you control real-life parameters, like you would on a field recording.

With Doppler plugin, you will have 4 groups of parameters:

- **Sound Source** – the settings of the moving sound source (e.g. velocity)
- **Environment** – the settings of the environment/air (e.g. distance attenuation)
- **Microphone** - the settings of the microphone (e.g. position of the mic)
- **Time and Gain** – the time info (e.g. when do you want the peak) and gain

The big knobs are the most important parameters: speed of the sound source (higher values give more abrupt sounds); distance attenuation (do you want apply volume changes?); microphone distance (shorter distances create more abrupt sounds), and time-to-peak (how long to get that peak).

All of the parameters can be used for *Automation*.

Automation Warning: "Source Speed", "Acceleration" and "Time to Peak" **SHOULD NOT** be automated. They only appear as automatable to allow their manipulation using control surfaces. By changing these parameters in playback, they will reset the whole doppler motion and induce sound jumps to obey the Time to Peak parameter**.**

1.1 The Sound Source Section

The plugin uses a mono sound source. As such, if you have a stereo or multichannel track, all channels are mixed into a mono signal, which will be used as a sound source.

- **Velocity**: How fast do you want the sound source to move? Higher speed means more abrupt sounds, while lower values make smoother transitions.

- **Acceleration**: If you want a sound moving at constant speed, leave this parameter at mid position. But if you want a changing velocity (accelerating or breaking), use this parameter, considering that positive values accelerate, while negative values break. Eventually, if you are breaking, you may result in a stopped sound source.

- **Units**: If you live in the US, you would prefer to see velocity in *Miles Per Hour* (MPH), distances in *feet*, temperature in °F. But if you live in the rest of the world, you would prefer *Kilometers per hour* (km/h), *meters*, °C. This switch allows you to choose the best units for the user interface – it doesn't impact the sound.

- **Direction**: Do you want a sound moving from *left-to-right*, or *right-to-left*? If you want other movements, don't worry, you may rotate the microphone (Mic Rotation knob) to have other directions (e.g. front to back on the right side).

1.2 Environment

This section controls the passage of sound between the sound source and the microphone, mainly attenuation (gain through distance) and *EQ* (frequency response).

- **Distance Attenuation**: Sounds located at a small distance should sound louder than sounds far away. But how louder? This parameter controls the attenuation that you get every time you double the distance. Although other parameters also control the dynamic range of the transition, this parameter can be used if you only want to change volume transition (keeping pitch and panning untouched).

- **Air EQ**: Air absorption doesn't happen equally to all frequencies. Usually, high frequencies are attenuated first, when compared with medium or low frequencies. Use the *Dry/Wet* knob to control the amount of EQ due to distance.

- **Temperature/Humidity**: These two knobs control the temperature and humidity of the air, and will be used only for EQ. If you want perfectly accurate values for temperature/humidity, check later on this manual a table with many locations around the world, and their typical temperature/humidity values.

1.3 Microphone

This section controls the virtual microphone – position, direction and microphone type.

Microphone Distance: How far is the microphone from the path of the moving sound? Closer mics will result in more abrupt sounds.

Mic Rotation: In most situations, you want the mic to be placed perpendicular to the movement (0°), but from time to time, you may want special situations: a car moving front to back on your right side, etc. Watch the animation in the display as you change this value to see where the mic is pointing to.

Mic Type: Which microphone setup do you want to use? By choosing different setups (e.g. stereo XY vs stereo ORFT), you get a different panning, like it would be in a real-life situation.

These are the available virtual microphones that you may choose from:

- Omni (mono)
- Cardioid (mono)
- Figure-of-Eight (mono)
- XY (stereo)
- Mid-Side (stereo)
- **ORTF (stereo) – The default mic**
- AB (stereo) – 2 omni's separated by 1 foot.
- 5.1
- 7.1
- First Order Ambisonics (CAN, SN3D) – 4 channels
- Second Order Ambisonics (CAN, SN3D) – 9 channels
- Third Order Ambisonics (CAN, SN3D) – 16 channels

1.4 Time & Gain

These sections control the timing information (VERY IMPORTANT) and the final gain.

- **Time to Peak**: Let's face it... Doppler is all about having that peak transition, and their changes in volume and pitch. This parameter defines when do you want that peak, i.e., the time position when the peak should occur.

  Time to Peak can be edited within 3 possible time units (changed through the arrow button):

  - Timecode (24 FPS)
  - Seconds
  - Feet + Frames

  The plugin has 3 modes of operation:

  - Signal (default unit: Seconds)
  - Loop (default unit: Seconds)
  - Timecode (default unit: Timecode)

  With *Signal* mode, you specify, how long after receiving a signal (above -60dBFS) do you want the peak (e.g. 3.2 seconds after receiving sound).

  With *Loop* mode, you will get a loop. If you use a 5 sec value: the sound will start; after 5 seconds, you get the peak; and after 10 seconds, the sound jumps again to the original position, and starts a new movement.

  If you select *Timecode* mode, you simply specify the exact position where you want the peak (e.g. I want the peak to occur at instant 1:03:28.03).

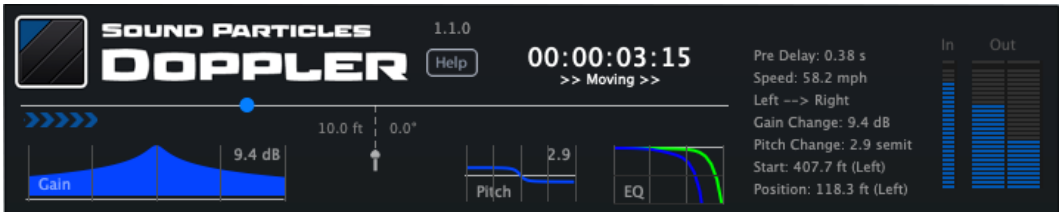
- **Reset**: Resets the Doppler – if you are in *Signal* mode, this resets the Doppler and waits for a signal, if you are on *Loop* mode, it resets the position of the sound source; if you are in *Timecode* mode, this changes its mode to *Signal* mode.

- **Now**: Changes to *Timecode* mode, and uses the current play head position as the time-to-peak value.

- **Gain**: The final gain of the plugin's output.

1.5 Display

The display will show you additional information to help you with your task.



On the top area, you can see:

- The version of the plugin.
- A "Help" button that will open this manual.
- The current time, which depending on the time mode, it could mean different things: In *Timecode* mode, it shows the same value as your DAW (some plugin architectures only update this value if you are playing); in Signal mode, it represents the time since a signal was detected; in *Loop* mode, it represents the current loop time.
- Status: "Waiting for signal", ">> Moving >>" or "<< Moving <<", depending on the status of the plugin.
- If there is an update available for *Doppler*, the message "New update available at my.soundparticles.com" will appear, and by clicking it you will be redirected to *my.soundparticles.com* to further get the new update.
- *[Trial Version]* (1) A message regarding the remaining time of the trial mode or (2) a message that the trial has expired.

On the left side, you can see:

- The path of the sound source. You will only see the blue ball when the sound source is around 100 meters/300 feet of the microphone. If the sound source is further away, you only see the “>>>>>” signals to indicate the direction (“>>” vs “<<”) and the current position (left side of the mic vs right side).
- Gain plot, a graph that shows how abrupt will be in terms of dynamic range (between 2 seconds before peak and 2 seconds after peak), with a dB value (the level difference that happens on the 2 seconds before peak).
- The mic distance and rotation
- Pitch plot, a graph with the pitch variation, with a semitone value (the pitch change between 1 second before e after the peak).
- EQ plot, a graph of the frequency response (20 – 20.000 Hz) at 100 meters (**green**) and 1000 meters (**blue**).

On the right, before the VUs, you will see some additional information:

- **Pre-Delay**: The amount of time it will take for the sound to start playing in the output, due to the propagation delay of the far-away initial position of the sound.
- **Speed**: the current speed of the sound source.
- **Left -> Right / Left <- Right**: An indication if the sound if moving *left-to-right*, or *right-to-left*.
- **Gain Change**: The amount of level change, in dB, between the last 2 seconds before peak.
- **Pitch Change**: The amount of pitch change, in semitones, during the periods between one second before peak, and one second after.
- **Start**: The initial position of the sound source.
- **Position**: The current position of the sound source.
- On the right side, you have the *VU Meters*:
- **Input VU**, with the level of the mono mixdown of all input channels
- **Output VU**, with the level of each output channel. The number of channels shown on the VU correspond to the number of outputs of the plugin. If you use the plugin as Stereo, but you select a 5.1 mic, you will only see the 2 output channels.

To clear the clip lights, simply press the VU.

Initial Delay: Imagine that you have a speaker mounted in a car, playing your sound, and you want to capture the result (Doppler) using a microphone. If the sound starts playing 1 mile away, of course the sound will take almost 5 seconds to arrive on the mic (remember the thunders vs lightning?). The plugin works in the same way. Also, if the speaker/car takes 8 seconds to arrive to the mic position, those 8 seconds of audio material will be compressed into 3 seconds (8 seconds of audio material, compressed into 3 seconds of playback, equals 5 seconds of initial silence).

Yes, we could avoid this initial delay gap, using other approaches (using a pitch-shifter that re-creates audio material, etc.), but all those approaches would have an impact in sound quality.

1.6 Time Modes

When creating a doppler sound, probably the most important aspect is to define when do you want the peak to occur. To help users getting the perfect timing, *Doppler* includes a "*Time To Peak*" parameter, which controls exactly when do you want the peak to occur.

Doppler plugin has 3 modes of operation: "*Signal*", "*Loop*", or "*Timecode*".

With "*Signal*" mode, the plugin starts counting time as soon it gets sound from the input. For instance, if you have "*Signal*" mode and a "*Time To Peak*" value of 2 seconds, it means that the peak will occur 2 seconds after receiving signal. If you are using your DAW in *Loop* mode, the plugin will automatically reset time on the loop transition. Also, during release (after the peak), a period of 1 second without sound at the output, resets the system, allowing the plugin to process new later sounds. You can also press the "*Reset*" button (near "*Signal*" mode button), to manually reset the signal detection. After that, *Doppler* will check for an input signal to fire a new doppler sound.

With "*Loop*" mode, the plugin works in loop, starts at zero, peaks at "*Time to Peak*" seconds, finishes at twice the "*Time-to-Peak*" seconds, and restarts. This mode is more propriate for initial adjustments, when you are looking for the best parameters, and you want to hear the

doppler over and over again. With "*Timecode*" mode, the plugin uses the DAW timecode to know where the peak should occur. If you specify a "*Time to Peak*" of 10 seconds, that means that the peak will occur at the same time (absolute time). With "Timecode" mode, the plugin can only fire 1 doppler motion (if you have a Doppler in an audio track, you will only get 1 doppler motion, corresponding to the timecode specified). The "*Now*" button (located near the "*Timecode*" button), allows you to manually tell the plugin the time of the peak.

Timecode vs. DAWs limitations:

- The Timecode mode, in some DAWs, may not work properly due to the limitations of the architecture of the workstations.
- Many DAWs only provide timecode information during playback, preventing Doppler from obtaining the current position of the cursor when DAW is stopped, or during offline render/bounce. As such, if the "*Now*" button is disable, it means that Doppler is not able to get timecode information.
- Some DAWs (like Logic Pro X) do not provide *Time Offset* information to plugins. As such, Doppler will consider the start of the project as 00:00:00:00, showing time differences between the timecode of the DAW and timecode of Doppler.

"*Signal*" or "*Timecode*" – although, in most situations, it doesn't matter much, there are a few situations where one of them would be more appropriate than the other.

- If you slightly change the position of your audio clip, with "*Signal*" mode, the peak will also slightly change (because it depends on the input signal). With "*Timecode*", the peak will stay on the exact position. For instance, you may use "*Timecode*" to define the peak position based on an image/frame (video track), and then move the audio clip just to change which part of the clip should be at the peak.

- If you position your play cursor inside your clip, and start playing from there, the doppler peak will shift in "*Signal*" mode (since a signal was detected later), but not on "*Timecode*".

- If you want several dopplers to be fired on the same track, you must use "*Signal*" mode, due to its ability to reset after detecting a 1 second silence after peak. With "*Timecode*", only 1 doppler motion can be fired. Eventually, you may have several plugins on the track to fire several dopplers motions.

1.7 Presets

	Source Speed	**Accel.**	**Distance Attenuation**	**Microphone Distance**	**Mic**	**Mic Rotation**	**Time to Peak**
Car (ORTF mic)	80.5 km/h 50 mph	0 (inf)	3 dB	6.1 m 20 ft	Stereo (ORTF)	0°	4 sec
Car (AB mic)	80.5 km/h 50 mph	0 (inf)	3 dB	6.1 m 20 ft	**Stereo (AB 1 ft)**	0°	4 sec
Car 2	80.5 km/h 50 mph	0 (inf)	3 dB	24.4 m 80 ft	Stereo (ORTF)	0°	4 sec
Far Away Car	128.7 km/h 80 mph	0 (inf)	3 dB	6.1 m 20 ft	Stereo (ORTF)	0°	4 sec
Race	241.4 km/h 150 mph	0 (inf)	**4 dB**	4.9 m 16 ft	Stereo (ORTF)	0°	4 sec
Jet	**804.7 km/h 500 mph**	0 (inf)	**2 dB**	45.7 m 150 ft	Stereo (ORTF)	0°	7 sec
Bullet-like	**804.7 km/h 500 mph**	0 (inf)	4 dB	**1 m 3.3 ft**	**Stereo (AB 1 ft)**	0°	**2 sec**
Old Man Driving	51.5 km/h 32 mph	0 (inf)	3 dB	91.4 m 300 ft	Stereo (ORTF)	0°	4 sec
Break and Park	128.7 km/h 80 mph	**-4 s**	3 dB	24.4 m 80 ft	Stereo (ORTF)	0°	4 sec
Left side, back to front	80.5 km/h 50 mph	0 (inf)	3 dB	24.4 m 80 ft	Stereo (ORTF)	**90°**	4 sec

Additional Notes

Knobs

- Drag the knobs to change their value.
- Dragging up or right to increase their values; dragging down or left to decrease their values.
- Use *Shift* or *Control* or *Command key (cmd / ⌘)* during dragging, to fine tune its value.
- Use *alt/option* + click, to reset to its default value.

Avid S6 Support

Doppler (AAX) plugin can have their parameters controlled through various control surfaces, included AVID S6.

Check for updates

If the plugin is running on a computer with internet access, it is able to detect if a newer update is available, informing the user of the existence of a new update, by showing a blinking phrase on the top of the display.

To achieve that, Sound Particles Doppler tries to access a simple XML file located at https://www.soundparticles.com.

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Support

If you detect a bug, if you got a crash, if you believe something is not perfect, or even if you have ideas for future versions, don't hesitate, and email us at support@soundparticles.com. We REALLY want to hear from you. Sometimes a bug lives on for too much time, simply because we haven't detected ourselves and we didn't receive any feedback from the affected users. Besides that, your feedback is very important for us.

"Help us help you"

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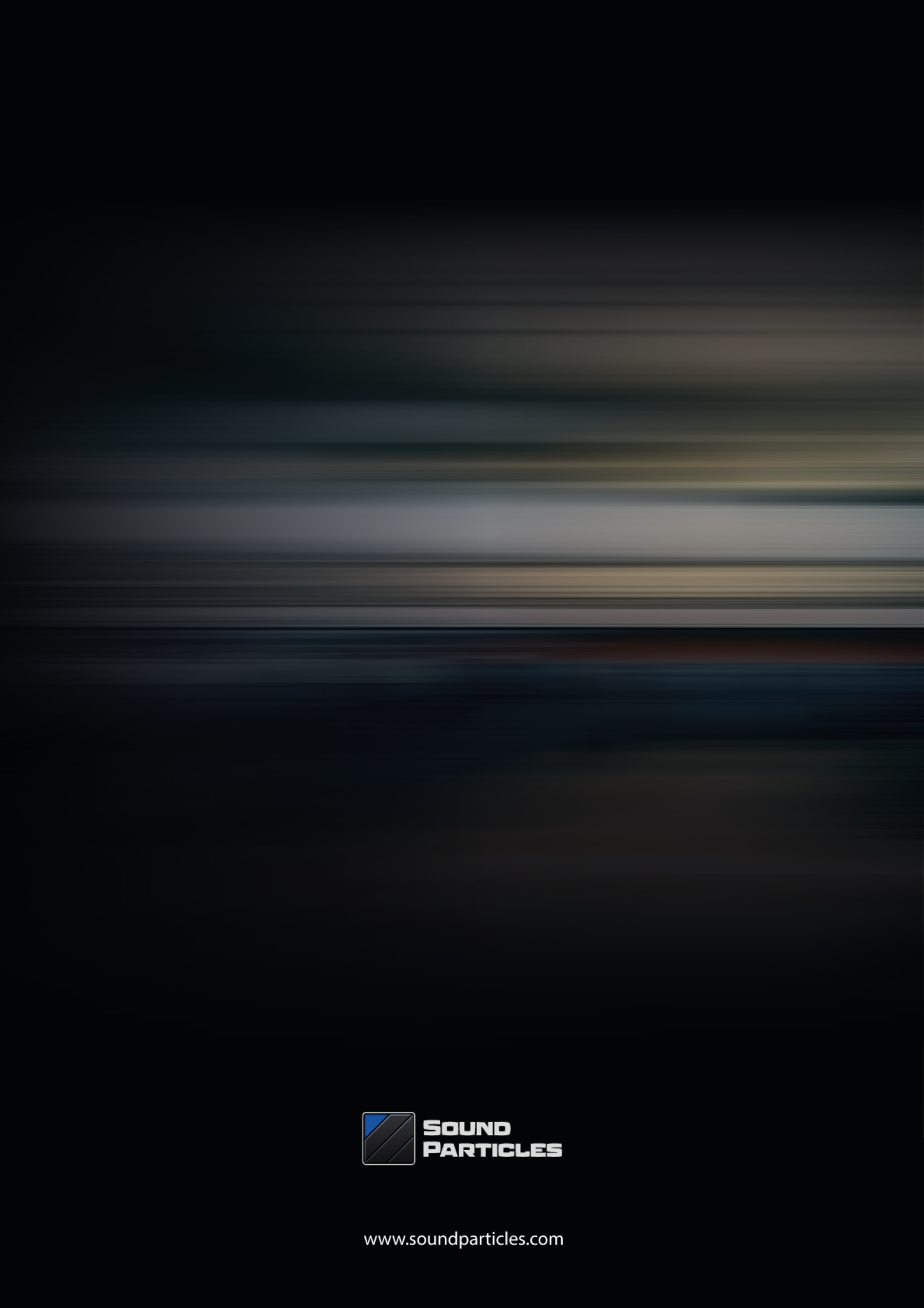

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