

# HELIX

## What The Heck Is An IR?

The music industry loves coming up with terms and acronyms to describe both new and existing technologies, and it can be daunting to try and keep up with every new phrase that comes along. Just as soon as we guitar guys finally learn what the heck a “DAW” is, another new term pops up that we either have to drop into a search engine or ask the nearest 12-year-old about.

Of the newer crop of technological terms, impulse responses or “IRs” have gained a significant amount of traction in gear publications as of late. As well as moving music technology forward in a major way, it turns out that IRs have a lot of applications for guitarists and guitar technology – so we should know what they are.

Simply put, an impulse response is an audio file that contains a capture of the inherent sonic characteristics of a piece of gear, acoustic environment, or playback system. IRs were first used to recreate unique acoustic spaces in reverb processors, and they changed the professional music mixing game by making huge rooms like the Sydney Opera House available as studio reverbs for the first time.

As for what the audio file itself contains, an impulse response of a huge church would capture the room’s reverb decay characteristics, as well as the sonic character of the construction materials and the recording gear used for capturing the audio. An IR of a mic’d 4x12 speaker cab would capture the sound of the speaker and speaker enclosure in the room, the microphone and microphone preamp used to capture the audio, and the speaker cable used by the power amp to drive the cab.

It’s important to note that both of these scenarios involve a number of variables that can audibly affect the impulse response. For instance, if the inside of the church was covered in wall-to-wall carpet instead of stone, the reverb decays would be far shorter at some frequencies due to absorption, and thus the reverb tails would have a muffled tone when compared to the long and clear decay of a huge stone room.

After capture, a convolution processing engine takes the short impulse response file and expands it into a working model of a 4x12 speaker cabinet or huge church. At that point, the IR acts just like a preset in an effect unit and imparts the sound of the impulse file to any audio run through it.

Impulse responses are quite short, so another thing you’ll need to know is a number – usually 1024 or 2048. These relate to the number of samples used to capture the audio file, with a higher number referring to a longer capture (CD’s use 44,100 samples per each full second of audio, so you can see just how short these files are).

Just remember this basic rule: the longer the capture time, the higher the resulting accuracy.

The question is “what does all this technical mumbo jumbo mean to us guitarists”? The answer is that it means that the speaker cabinets we now use in modeling gear can potentially have a realism that wasn’t previously possible using simple filters and resonance (the old way of doing speaker emulation). It also means that we can use some available free tools to capture the sound of our own speaker cabs and mics, if we have a unit lying around that can load our homemade impulse responses.

As for the “unit lying around” part, Helix gives you the ability to load impulse responses and save them with your preset, opening an entire new world of speaker cabinet customization to you as a player. If you want to experiment but don’t have the ability to capture your own responses, there are a number of companies that sell good-sounding speaker impulse files a la carte (Red Wirez and Ownhammer being two popular choices).

After all of this talk of user customization however, it is important to note that just because something preloaded into a piece of gear isn’t listed as being an “IR” specifically, it doesn’t mean that it wasn’t created with an impulse response. For instance, in some modeling devices (Helix and the Fractal Axe FX, for example) the factory speaker cabinets are created using impulse responses. So just because you have the option to load third-party impulse responses into a device like Helix, it doesn’t mean that you necessarily have to for realism’s sake.

Lastly, it’s important to remember that running IRs is a highly DSP-intensive activity for a processor – so it’s normally only done on devices that can allocate DSP resources dynamically. We wanted to ensure that Helix didn’t automatically run out of power when running multiple speaker emulations, so we came up with a proprietary scheme we call “hybrid cabs” that grants the same resolution as an HD speaker impulse, but at lower DSP usage. If you’re interested in getting more information about hybrid cabs, please read the separate blog I wrote exclusively about HX Cabs.

Impulse responses have moved music technology forward in a big way, allowing for far more realistic recreations of time-domain attributes and acoustic spaces. Helix ships with a pile of captured speaker cabs and microphones with multiple positions, and comes with an additional bunch of IRs you can load yourself for additional experimentation. Hear and feel the difference that accurate speaker cabs and mics can make at your local certified Helix dealer, and be sure to check out [www.line6.com/helix](http://www.line6.com/helix) for more information.

For all of you tech heads that want to know more about this entire subject, Apple does a nice job of explaining the entire thing using Logic Audio’s tools here:

[https://manuals.info.apple.com/MANUALS/1000/MA1655/en\\_US/impulse\\_response\\_utility.pdf](https://manuals.info.apple.com/MANUALS/1000/MA1655/en_US/impulse_response_utility.pdf)