

# Making the Most of Fluidsynth Reverb

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## Not Preferred, but Better than Nothing

Reverb is very important to organ sound. Most pipe organs are in churches, cathedrals and concert halls, all very reverberative environments. Someone once remarked that the most important stop on the organ is the room it's played in.

The “gold standard” of reverb is convolution reverb, in which the acoustic profile of a room is mathematically applied to a dry recording. You can hear just what your organ would sound like in any room if you have that room's impulse response. Convolution reverb sounds natural, and there are as many possibilities and settings as there are recorded impulse responses.

Fluidsynth's reverb falls short of that “gold standard,” but it is better than nothing. After some experimentation, I've got a better idea of how Fluidsynth's reverb works, and how to make the best of it if no other reverb is available.

## Fluidsynth Reverb's Controls

There are four parameters. Room, Damping, Width and Level.

### Room

The “Room” setting determines the length of the reverberation. After some experimentation playing the sound of an impulse (a synthesized snap sound) through Fluidsynth reverb, I assembled results in the chart at the right.

### Damping

Damping shortens the duration of the higher frequencies in the reverb. EAX reverb has two settings that are similar: high frequency decay ratio and air absorption. A higher setting shortens the higher frequencies. A lower setting lengthens them.

### Width

Width determines the length of lower frequencies in the reverb. A high setting sounds deeper, a low setting sounds thinner.

### Level

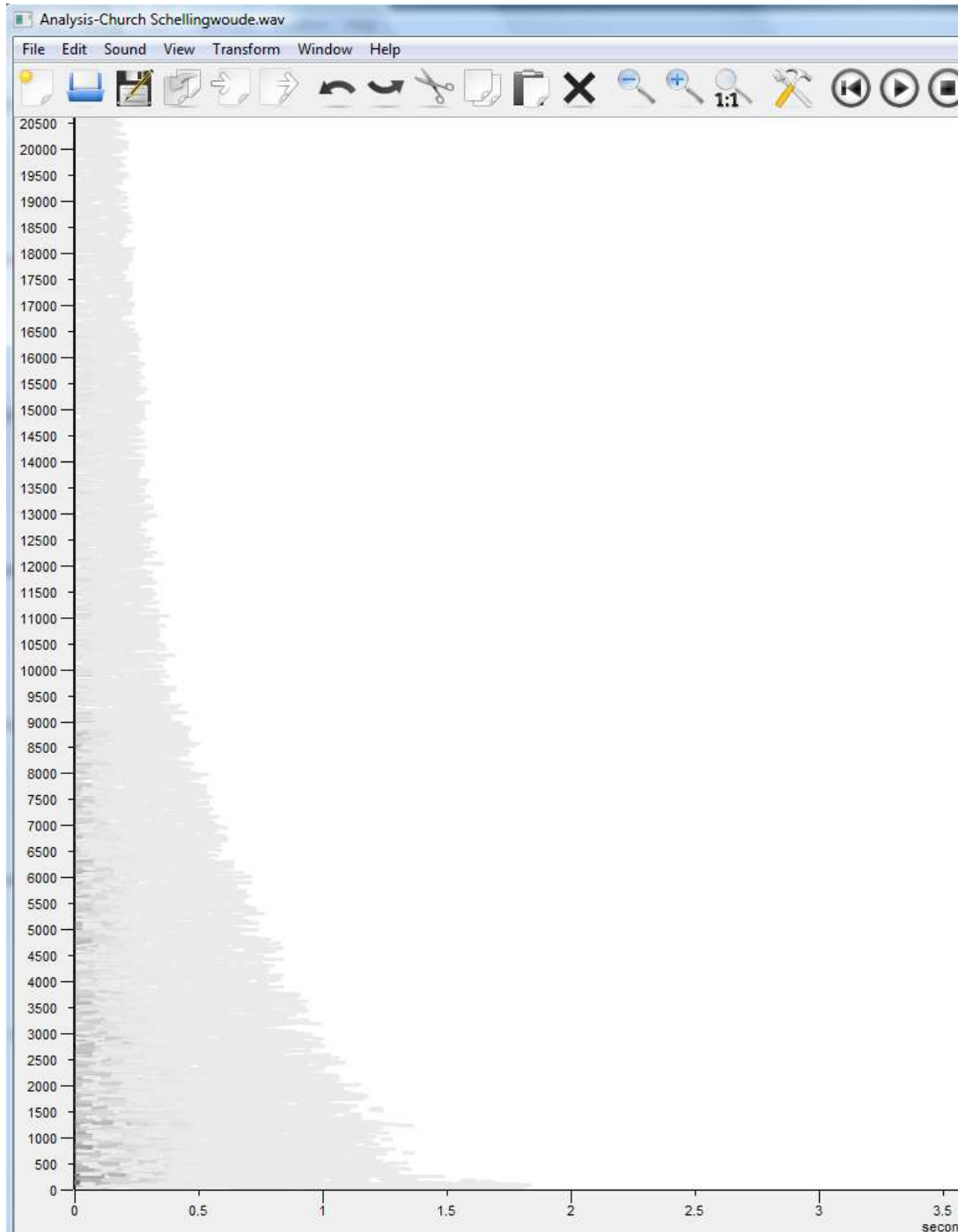
Level determines the volume of the reverb compared to the dry signal (the sound without the reverb. A lower setting will give the illusion of

Setting	Length (seconds)
<b>1.00</b>	<b>10.00</b>
0.99	9.10
0.98	8.40
0.97	7.80
0.96	7.20
<b>0.95</b>	<b>6.70</b>
0.94	6.20
0.93	5.80
0.92	5.30
0.91	4.90
<b>0.90</b>	<b>4.65</b>
<b>0.85</b>	<b>3.70</b>
<b>0.80</b>	<b>3.10</b>
<b>0.75</b>	<b>2.50</b>
<b>0.70</b>	<b>2.00</b>
<b>0.65</b>	<b>1.75</b>
<b>0.60</b>	<b>1.60</b>
<b>0.55</b>	<b>1.35</b>
<b>0.50</b>	<b>1.25</b>
<b>0.45</b>	<b>1.12</b>
<b>0.40</b>	<b>1.00</b>
<b>0.35</b>	<b>0.90</b>
<b>0.30</b>	<b>0.82</b>
<b>0.25</b>	<b>0.79</b>
<b>0.20</b>	<b>0.75</b>
<b>0.15</b>	<b>0.70</b>
<b>0.10</b>	<b>0.65</b>
<b>0.05</b>	<b>0.60</b>

sitting closer to the instrument. A higher setting will give an illusion of distance.

## Using an Impulse Response to create a corresponding Fluidsynth Reverb Setting

I analyzed some impulse responses with Spear. Spear is an analyzer/synthesizer which enables you to see every frequency represented with a line along a time scale.



I decided to base a Fluidsynth setting on the data represented: Longest IR harmonic, and harmonics at 3500 and 500 Hz.

Here is the data of some of the more interesting Impulse Responses:

Impulse Responses	Spear Analysis		
	Longest	3500 Hz	500 Hz
	IR Harmonic	IR Harmonic	IR Harmonic
Zwolle	7.4	3.2	6
YorkMinster Cathedral	6.2	2.4	5.7
Chicago Church	5	1.8	3.1
St. Nicolaes Church	3.89	3.2	2.8
Petrikirche Freiberg	3.51	1.65	3.27
Medieval Church	3	2	2.9
Church Schellingwoulde	1.8	0.92	1.3
Cement Blocks 1	0.76	0.515	0.65

To have a corresponding setting in FS reverb, I used the following fomulas:

**Room** = Longest harmonic, compared with chart on p. 1

**Damping** =  $(1 - [\text{length of 3500 Hz harmonic}] / [\text{length of longest harmonic}]) / 2$

**Width** =  $(\text{length of 500 Hz harmonic} / \text{length of longest harmonic}) / 4$

**Level** is comparable to the "wet" setting in a convolution reverb program. Set lower if the effect seems too harsh.

Using those formulas, I came up with the following settings:

Impulse Responses	Fluidsynth Reverb Settings		
	Room	Damping	Width
Zwolle	0.97	0.28	0.20
YorkMinster Cathedral	0.95	0.31	0.23
Chicago Church	0.90	0.32	0.16
St. Nicolaes Church	0.82	0.09	0.18
Petrikirche Freiberg	0.80	0.26	0.23
Medieval Church	0.80	0.17	0.24
Church Schellingwoulde	0.65	0.24	0.18
Cement Blocks 1	0.20	0.16	0.21

The result isn't a perfect equivalent, but a comparable setting that has some basis in reality. Fluidsynth's reverb seems to be monophonic, and some of the dominant harmonics in Fluidsynth reverb give a "spring-tank" harshness. Still, it can be useful if no other reverb is available.