

# Brainwave Synchronization

By David Johnston

## About Brainwave Files

Cool Edit Pro's Brainwave feature (**/Transform/Special/Brainwave Synchronizer**) works like many meditation tapes and light/sound devices on the market, which range in price from \$200 to \$500. There are even boards available with plug in glasses (which have blinking lights) for your PC in the price range of \$495. The files created using the 'Wave' transformation are even more powerful, and are definitely more pleasing to the ears. Most other devices and tapes have a "humming" sound or some other tones to induce the right brainwave frequencies. This program allows you to use ANY sound to encode the frequencies with. The most effective we have found are by using the Noise Generator, which creates pleasing waterfall like sounds. This function only works on **stereo** waveforms, and the effects work if only if listened to with **stereo headphones**.

Listening to sounds that have been waved for periods of 5 minutes or more will produce the desired state of awareness in the listener. Sessions of 25 minutes or so work really well!

## Major brainwave pattern frequencies and possible uses for brainwave synchronization

<b>Delta</b>	1-3 Hz	Deep sleep, lucid dreaming, increased immune functions.
<b>Theta</b>	4-7 Hz	Deep relaxation, meditation, increased memory and focus.
<b>Alpha</b>	8-12 Hz	Light relaxation, "superlearning", positive thinking.
<b>Beta</b>	13-25 Hz	Normal state of alertness, stress and anxiety.
<b>Gamma</b>	30 Hz on up	Hyper-awareness
<b>High Gamma</b>	200+ Hz	Various effects

**Immediate Relaxation and Stress Relief** - Choose between 5hz and 10 Hz for different levels of relaxation.

**Meditation** - Choose between 4hz and 7hz, either cycle between a few, or stay at a particular frequency for different results.

**Sleep Replacement** - A 30 minute session at 5Hz replaces about 2-3 hours of sleep, allowing one to wake up in the morning more refreshed. Try listening 1/2 hour before waking up in the morning, or 1/2 hour before going to bed.

**Improved Sleeping Patterns** - Any of the Alpha and Theta frequencies (8Hz to 4Hz) for 30-45 minute sessions at the same time each day.

**Treatment of Insomnia** - Choose between 4hz and 6hz for starters (the first 10 minutes), then go into frequencies below 3.5hz (for 20-30 minutes), settling on about 2.5hz before fading out.

**Improved and Lasting Sense of Well Being** - Try Theta (4Hz to 7Hz) for 45 minutes, daily.

**Creative Visualization** - About 6hz for a while, then up to 10hz works well while using visualization techniques.

**Alleviation of Migraines and Headaches** - Experiment with Alpha and Theta combinations. Try and visualize the pain getting smaller and smaller until it disappears.

**Reduction of Depression Symptoms** - Again, Alpha and Theta combinations, mostly theta.

**Self Hypnosis** - Choose about 8hz to 10hz while playing any self-hypnosis tape, or guided meditation.

**Accelerated Learning** - Choose about 7hz to 9hz while playing any learning tapes, like foreign language tapes, etc. to increase comprehension. Also, while studying, take breaks every half hour and listen to 10 minutes of Alpha (10Hz) while reflecting on the material you just learned.

**Subliminal Programming** - Choose 5hz to 7hz while playing your favorite subliminal tapes, or make your own by recording some affirmations, and mix pasting (Edit:Paste Special) them from the clipboard at barely audible volumes.

**Improve Intuition (or ESP?)** - Theta frequencies help in this area, 4hz to 7hz.

**Reaching Higher States of Consciousness** - Theta again, with daily half hour minimum sessions. Give at least a month for results.

**Quick Refresher on long days** - Low Alpha 8hz to 10hz for about 15 minutes works well. Sort of induces a cat-nap.

**Increased Immune System** - Relaxing to Alpha and Theta combinations daily. Learning how to relax, and relaxing more often can lower blood pressure and increase the body's natural defenses. Using Alpha Synchronization (8Hz to 12Hz), expect similar increases in the neuro-chemical levels of Norepinephrin (11%), Serotonin (21%) and Beta-Endorphins (25%).



### **DISCLAIMER**

By using this program, you agree that the author will not be responsible for any damage as a result, direct or indirect, of using this program. The author makes no claims about the effectiveness of these sounds for any particular

purpose. The user is encouraged to do his/her own research into the area of brainwave synchronization via auditory stimulation.

### **WARNING**

Sounds generated by the wave function may not be suitable for epileptics or persons undergoing psychiatric treatment.

### **About Carrier Waves**

A carrier wave is needed to transport the brainwave frequencies. Because the carrier wave is not what you hear through the headphones directly, you do **not** need to buy super high-end headphones (5Hz-25KHz) to reproduce the effects. These sounds may be recorded using any stereo cassette recorder and played back on any stereo cassette player without losing effectiveness. In other words, your headphones do not need to be able to reproduce a 5Hz signal if you are generating a 5Hz theta-frequency brainwave file, and your tape deck does not need to be able to record frequencies this low either. The brain *does* however respond better to the lower frequencies because of the nature of the synchronization algorithm, so the better the headphones you buy, the more dramatic the results may be. The best headphones are the kind that cover the entire ear, so outside noise does not get in. Plus, these headphones have much higher response to low frequencies. The active ingredient, so to speak, are the frequencies from about 40Hz up to about 2kHz depending on the frequency being encoded and the intensity.

Carrier waves must have some correlation between the left and right channels, no matter how slight. So mono (total correlation), inverse (total negative correlation), and spatial (natural recordings that have some of the same sounds coming in both channels) will work great.

The best sounds to use as carriers are sounds that are spread across the entire frequency range, or at least most of the lower frequency range. Good examples are ocean, waterfall (most any recordings from nature), and noise generated by this program. Experiment with mono (both left and right channels the same), inverted (like mono, but the left channel is the inverse of the right, obtained by using the Channel Mixer), and spatial stereo (spatially encoded sounds in nature, recorded with microphones about 9 inches apart to simulate separation between the ears). But don't let this stop you from digitizing your favorite music, and using it as a carrier, or converting your favorite to a mono or inverted wave.

To generate a carrier wave, you can do three things:

**Record a sample** - Once recorded, use the Channel Mixer to create a mono, or inverted wave. The channel mixer will also allow you to put in just the amount of correlation you desire (for example, a 20% mixture of both channels, leaving the rest untouched.) Or just leave it the way it was recorded. You may find changes in effectiveness of the brainwave files depending on how you use the Channel Mixer. Keep in mind that this function only operates on stereo waves, so when "mono" is mentioned, it means that the exact same signal is present on both channels--the left channel and right channel are the same.

**Generate Tones** - You may use the Generate Tones function to find a pleasing, relaxing tone for the background (but we find "noise" sounds more relaxing). The way tones work the best is if the left channel's tone frequency is 5-6 Hz different from the right channel's tone. This creates a beat pattern equal to the frequency difference, which the brain responds to somewhat (this is the property that many theta-inducers rely on). To do this, generate one tone with left volume at 40, and right volume at zero. Then generate the second tone with the left and right volumes reversed. Finally, Paste Special (with overlap) one tone on top of the other. Use low frequency tones, like 50Hz to 120Hz for best results. These tones, by themselves, will help coerce the mind into the state associated with the difference between the frequencies. For example, for a theta state of 6Hz, use a 70Hz and a 76Hz tone. Combining this tones sample with an existing brainwave file, by overlap pasting at a quiet volume (20%) is even more effective.

**Generate Noise** - Use the Generate Noise function (pink and brown work best) in any of the modes: mono, inverse, or spatial stereo (independent channels noise will **not** work as a carrier for brainwave frequencies at all, since there is no correlation between the left and right channels). Using pink noise in spatial stereo, and running it through the Quick Filter to get rid off some of the "edge" if any works the best. Inverse works quite well too, but the brainwave "effect" is more pronounced, and can be distracting, and some sound boards have trouble reproducing sound that is inversed between channels.

Once you have found a pleasing sound, about 10 seconds or so of a monotonous sound (tones, river, waterfall, noise...) you're ready to start. If a monotonous sound is used, more disk space can be saved because we will use the play list to repeat portions. If a music sample were used, it is quite noticeable that the same 10-second piece is being played over and over and over again.

If you're curious you can also spatially locate a mono sound to the left or right. Do this if you wish to have the illusion that a particular sound is coming from one side or the other. The function works by pasting a mono sound sample into a stereo waveform, and using the Digital Delay function. Having a quiet "ping" (generated by using the sine wave tone generator with the bell curve envelope) play spatially on the left, then on the right at about 5 second intervals is very relaxing.

### **Encoding Brainwave Information**

There are two types of brainwave files that you can create: A **flat file**, and a **cued file**. The flat file takes more memory, and plays straight through from beginning to end, while the cued file is actually contains pieces of the entire audio program, that when played in the proper order become the brainwave file. The cued file takes less memory, and can very quickly be modified at any time by re-arranging the audio pieces. The average length of a cued file is about 3-4 minutes for a program that can last as long as desired. The flat file is a standard wave file, which means to create a long program, you must have enough space for it. The only advantage to using a flat file is if you are waving music, since music cannot be split into pieces and rearranged, otherwise it would sound discontinuous. Creating

brainwave files using the flat file method will be discussed first, since it is more straightforward.

### **Flat Brainwave File Generation**

Create a file the length you wish to make your relaxation program using the carrier wave(s) of your choice. Either record music, or use the pink noise generator and copy and paste (or Paste Special) to the desired length. If you are using a monotonous sound, you would be better off using the cued file method. Lengths of good relaxation programs vary from 15 to 30 minutes, and beyond. This means you must have enough hard drive space for the entire file. Since the temporary file takes up hard drive space as well, the maximum size of file you can create, and be able to save, will be one that takes up half of the initial free hard drive space.

Use the Wave function to encode the brainwave patterns into the carrier wave by highlighting a section of the wave, or the whole thing, and choosing Transform:Wave, or click the wave icon. With the wave transformation, you have complete control over the brainwave frequency being encoded, the strength of the signal, and the positioning of the signal left or right. Over the selection highlighted, the intensity, and position remain constant, but the frequency can be varied using the graphical input control. See the section on Authoring Brainwave Files to learn what settings to use for the Wave function, and how to build effective files.

Once the entire file has been waved to your satisfaction, you can save the file if you wish, and play it using the Play button. An interesting side effect is that different sounds are heard if you listen to one channel, listen to both channels with one ear, or listen to each channel with each ear.

### **Cued Brainwave File Generation**

These files contain many short snippets of brainwave encodings at different frequencies. Each snippet is cued using the Cue List, and a Play List is generated by adding entries from the Cue List, and looping them if necessary. To listen to a cued brainwave file, you must use the Play button in the Play List dialog box.

First you must figure out how you want to divide up the brainwave program (your 20-30 minute masterpiece) into components. For example, you may want to have patterns of 5Hz, 7Hz, and 9Hz at different points in the program. In this case, you will need at least three pieces for your creation. The actual file will just be 10 seconds of carrier wave at 5Hz, followed by 10 seconds at 7hz, followed by 10 seconds at 9Hz. All the pieces are placed in the cue list by highlighting the piece, and choosing **Add**. It is best to add the piece to the cue list once it is created, or pasted at the end of the current waveform. To create the final program, the pieces are added to the Play List in the order you wish to listen to them. Each piece can be looped if needed. So a 20 minute program can be generated from 3 10-second pieces by adding the cues to the play list and looping.

First you need to create 10 to 20 seconds of carrier wave, and save in a special file in case you need the carrier wave again later. Highlight the wave, and Edit:Copy. When you need another copy of the initial carrier wave, you need only to Paste it.

Add the first carrier wave snippet to the Cue List by pressing the **Add** button in the Cue List dialog. Give the cue for this snippet a name that reflects the waveform transformation you will be using, for example, "6Hz to 5Hz drop".

Choose the **Transform:Wave** function to encode the proper patterns into the carrier wave. Look at the section on Authoring Brainwave Files to learn what settings to choose.

Click past the end of the wave file (make sure the rightmost part of the file is in view), and choose Paste to insert another copy of the carrier wave. Once you do this, you can add the newly inserted selection to the cue list, and give it a name. Repeat the step above for creating a brainwave encoding over the carrier wave you just inserted. Do this as many times as needed until you have all the pieces you need to build the final brainwave file.

Once all the pieces have been generated, add them in the order you like to the play list. To make pieces last longer (if the beginning and ending of the piece are at the same brainwave frequency), increase the number of loops for that entry in the play list.

When Played from the play list, the pieces will be played in the order shown, and looped if necessary.

To get familiar with the cue list, and play list, open one of your favorite wave files, and highlight sections then add them to the cue list. After you have a few selections in the cue list, add them to the play list, and choose a loop count of greater than one for some of them. Choose Play from the play list, and listen to what you've just created.

### **Authoring Brainwave Files**

After learning about carrier waves, and encoding procedures, all you need to know is what frequencies to use, and when to use them during the course of the listening session. Once you know what frequencies to use, and at what intensity, you can generate the completed file using either of the methods above.

Effective brainwave files have some sort of encoding going on the entire length of the session. For the first 3 minutes or so of the session, the listener will not be in a "relaxed" state, and will not respond greatly to the frequencies being presented. During this *warm-up* period, gradually decreasing from about 12Hz down to 8Hz works nicely. After about 4 minutes, the listener's brainwave patterns will start to synchronize with the patterns in the headphones, and the serious brainwave programming can begin.

Frequencies of 8-10Hz correspond to an alpha state -- light relaxation, like a quick afternoon siesta. Frequencies of 6-7Hz correspond to a theta state - - meditation. 4-5Hz correspond to deep relaxation. You can create a session that is constant, in one of these states, or create a session that dynamically flows from one to the other. When going down in frequency, give the listener about one minute to *catch up*, and stay in sync with the wave. Going up in frequency does not require the listener to catch up. In

other words, if you go from 6Hz down to 4Hz over a 20 second timespan, and hold at 4Hz, the listener may not be at 4Hz for another minute. When going from 4Hz to 8Hz in 20 seconds, the listener will be at 8Hz at the end of the 20 seconds. It appears to take extra time when going down in frequency, but no extra time when going up. This basically holds true for the first 20-30 minutes of a session. After that, the opposite tends to occur. It is easier to go lower than go higher. This means that to bring a listener from 4Hz (where she has been for the last 30 minutes) up to 12 Hz, it should be done over a 5 minute period or so. One nice *trick* to do is to keep the listener at around 4-5 Hz for a while, then about once every 2 minutes, go up to 8Hz and back over a 20 second span. This will *alert* the listener slightly, and make them aware for a few seconds of what they are thinking. This is great for getting creative insights and the like. It acts as a sort of *window* to the subconscious, allowing one to remember what is going on. It's kind of like remembering dreams: you do it better if you are awakened in the middle of one.

Another effective method of producing relaxation files is to overlap them. That is, have portions that are one frequency, and slightly spatially located to one side overlapped with a slightly differing frequency spatially located slightly to the other side. This gives the listener the chance to *decide* which frequency to be at, and gives them more freedom over the experience. For example, a session could go from 8Hz to 4Hz over 10 minutes overlapped with 7Hz to 5Hz over the same 10 minutes.

For nice *super-relaxing* effects, generate panning waves (frequencies of 0.05 to 0.2) over your session after encoding the initial brainwave patterns. For example, if you are generating a brainwave file out of 20-second pieces, after generating the main brainwave frequency over the 20 second period, generate a panning wave of 0.05 or 0.1 (which means a period of 20 or 10 seconds) with an intensity of about 50 or so. This will make the sound appear to shift left and right to the listener over a 20 or 10 second period. Now, overlapping a 24-second piece panned at 0.125 (8 second period) at 5Hz with a 0.167 (6 second period) at 6Hz will combine the practices of multiple frequencies with panning for an extremely super-natural effect! Once you get started creating a few files, and see what the different frequency ranges do, you will become familiar with the different effects and how to generate just the effects you want.

High Gamma frequencies of 200Hz or more seem to help in relaxation, and do something no doubt. This is an area you can experiment with. When generating frequencies above 40Hz or so, it is best to keep the intensity very low, like 7 or 8. The higher the frequency, the lower the intensity has to be, otherwise the encoding will overwrite itself and the signal will be lost.

### Sample Theta File - Step-by-Step

Create a new blank file with **File:New**. Choose a **Stereo** file, either 8 or 16 bit and a 11025, 22050, or 44100 sampling rate. The final file size will be one of the following sizes listed below depending on your choice:

	11025	22050	44100
8-bit	2.6M	5.2M	10.5M
16-bit	5.2M	10.5M	21.2M

You must make sure you have enough memory for a file of this size, plus an additional meg for working space. If you plan on saving the file when you are done, you must have at least **twice** this amount of hard drive space available, since a temporary file is used instead of memory while working on the wave.

Choose **Generate:Noise**. Select **Pink, Spatial Stereo** (500  $\mu$ Seconds) for **15** seconds at an intensity of **3**. This is usually the longest portion of the generation of brainwave files. Because of this, it is advised that you save this piece of *noise* so that in generating future files, you can just load in this pre-calculated noise as a starting point.

Choose **Edit:Copy**. From now on, we will paste the noise in when we need it! Make sure the noise is highlighted. If it is not, select all by double-clicking on the waveform until it is highlighted.

Choose **Add** in the Cue list, and give the entry a **Label** of **10Hz to 8Hz**, and a **Description** of "**Warm-Up**"

Choose **Transform:Wave** to bring up the brainwave dialog box. Enter **10** for the **Highest Frequency**, and **8** for the **Lowest Frequency**, and an **Intensity** of **35**. On the graph above, click the leftmost dot, and drag it to the top of the graph. Click the rightmost dot, and drag it to the bottom of the graph. This will product a frequency encoded at 10Hz at the beginning, and glide down to 8Hz by the end. Choose **OK** to generate the encoding. This shouldn't take nearly as long as it did to generate the noise.

Click the mouse at the rightmost portion of the wave (just beyond the *black* waveform display area). When you do this, the yellow cursor arrows should be all the way to the right of the wave. You must always add new pattern blocks at the **end** of the current waveform.

Choose **Edit:Paste** to insert another copy of the original noise that we had copied originally.

Create the following pattern blocks as before (following the steps 5 to 8) ,  
except with the following values for the cue list and waveform transformation:

<u>Label</u>	<u>Description</u>	<u>Hi Freq.</u>	<u>Lo Freq.</u>	<u>Intensity</u>
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(Graph should go from left=highest to right=lowest)

8 Hz	Alpha	8	8	37
8 to 6Hz	Glide Down	8	6	38
6Hz	High Theta	6	6	40
6 to 5Hz	Deeper Theta	6	5	45
5Hz	Theta	5	5	50

(Graph should look like an upside-down "V" for Spike)

5-8-5	Spike	8	5	50
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(Graph should go from left=lowest to right=highest for Awake)

5 to 12Hz	Awake	12	5	40
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Once all the blocks are generated, and in the cue list, Add the pieces to the play list by selecting the wave portion in the cue list and clicking **Add** in the play list. Select the pieces listed below in the order given. After doing so, select each item in the play list, and change the **Loops** for each so the final play list looks like this:

- (1) 10 to 8Hz
- (3) 8Hz
- (1) 8 to 6Hz
- (7) 6Hz
- (1) 6 to 5Hz
- (18) 5Hz
- (1) 5-8-5
- (12) 5Hz
- (1) 5 to 12Hz

When you choose **-Play-** from the play list, the sequence will be played in the order given, looping the number of times specified. This list gives a 21 minute theta session, with bursts into alpha at four points.

If you wish to save this piece, and have enough hard drive space, you can do it now. The wave is complete. Enjoy.

### ***How to use brainwave synchronization files***

Once you have created your brainwave file (15 minute files on up work best), Loop Play them for a longer listening time. Sessions of 15 minutes or more work best. It is best to listen to the sessions lying down in a quiet place where you will not be disturbed. If there is no place like this near your PC, it may be a

good idea to record the session on tape and listen to it where you can be comfortable and relaxed. When you're fully comfortable, start the session, close your eyes, and let the magical sounds from *Cool Edit* do the work. Remember, this only works if you listen to the sounds with stereo headphones.

You may notice helicopter, or "washing" type noises moving around in your head. These sounds are actually created inside your head, and are not coming directly out of either channel from the sound board. It is this noise that is doing the work of helping your brainwaves get synchronized to the patterns you have chosen. When you have mixed two different (but similar in frequency ranges) brainwave files together, you may notice a jet airplane noise moving slowly from left to right in the background. Some people don't hear these artifacts at all, while others hear them extremely well.

Another side effect is that of a wandering mind. When you use frequencies under 8hz, you may find yourself thinking of the strangest things. You may find that you are not thinking of anything in particular, and your thoughts become very interesting. The feeling is also "warm" and "happy" for some people. Others start recalling their favorite memories as a child, even some they thought they had forgotten forever!

After a session of 15 minutes or more, you may feel quite refreshed, light, airy, clear-headed, etc. Some claim that doing this for 30 minutes a day can result in subtle but great changes in your life. ESP experiences increase, and you may be able to reach new levels of awareness in your everyday life.

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