

Re: zippers and rabbits

Source: <http://sci.tech--archive.net/Archive/sci.electronics.design/2008-10/msg04052.html>

- *From:* Guy Macon <<http://www.GuyMacon.com/>>
 - *Date:* Tue, 28 Oct 2008 02:58:48 +0000
-

Don Bowey wrote:

But Amplitude Modulation, as it is conventionally known,
does NOT vary the amplitude of the carrier,

For evidence to the contrary, look here:

"In an AM signal, the idea is to modulate the carrier waveform
without changing phase — only the amplitude is supposed to change."
http://education.tm.agilent.com/index.cgi?CONTENT_ID=9

Amplitude Modulation: Noun Abbr. AM The encoding of a carrier wave
by variation of its amplitude..."
<http://www.thefreedictionary.com/amplitude+modulation>

Google Search: ["amplitude modulation" "amplitude of the carrier"]
<http://www.google.com/search?q=%22amplitude+modulation%22+%22amplitude+of+the+carrier%22&num=100>

AMPLITUDE MODULATION: How it works:

"Notice as the modulating wave goes up the total amplitude
of the carrier wave (measured from negative peak to positive
peak) goes up. As the modulating wave goes down the amplitude
of the carrier wave goes down. When the modulating wave is
at zero (the point where it begins and ends) the carrier
wave is at its middle or unmodulated value. Think of the
modulating wave as controlling a valve that the carrier
wave is passing through..."

http://www.angelfire.com/electronic/funwithtubes/How_AM_Works.html

Wiggle the volume
control on that one and you could get amplitude modulation with

Re: zippers and rabbits

no electronics at all.

What you describe is simply causing a signal (the carrier) to be varied in amplitude by changing the volume. This will not generate sidebands, so it is not AM.

Most potentiometers can be modified so as to spin freely without any stops. Why don't you hook one up to a small motor, run a carrier through it, and see the sidebands on a spectrum analyser for yourself? If you have an audio spectrum analyser, do it with a 1KHz sine wave. Otherwise pick whatever carrier frequency your analyser can see and the pot can pass.

I expect the non-linearity of the abrupt change in resistance at the moment the shaft moves the resistance from maximum R to minimum R would generate an AM signal, but that is not the case being discussed.

OK, wiggle it by hand. Or use a cam and a rubber band so the motor wiggles a slide pot. You *will* see sidebands if your spectrum analyser has enough resolution.

Don Bowey wrote:

John Devereux wrote:

Amplitude modulation creates sidebands. This remains true if the modulation is done in an analog multiplier, or by varying the power supply, or by turning a volume control knob. Although obviously the frequency offset will be tiny with a manually operated control, they are still there.

How do you know this to be true?

I told you how you can personally prove to yourself that it is true. Rotary pot. Motor/cam. Carrier. Test equipment. Do the experiment, see the sidebands. See the sidebands, modify your theory. Done.

If you are unwilling to do the experiment, do the math:

Re: zippers and rabbits

Re: zippers and rabbits

Describe the frequency, amplitude, and phase of the sine waves that, when combined, create the signal shown here:

[http://www.angelfire.com/electronic/funwithtubes/images/Modulation_Envelope-1.gif]

(Assume for ease of calculation a 1 Hz modulation and a 1KHz. carrier.)

Clearly the signal can be created with an analog multiplier, a 1Hz signal and a 1KHz signal. Just as clearly it can be created with an audio amplifier with a volume knob, a 1KHz signal, and a steady hand wiggling the volume knob at a 1 Hz. rate. If you have a problem with the "steady hand", assume a servomotor doing the wiggling.

Now describe the the frequency, amplitude, and phase of the sine waves that, when combined, create the signal shown in the case where it is created with the wiggling volume knob.

Any chance you might be willing to change your name so that I can say "Kenneth, what is the frequency?" <grin>

(For those puzzled by the above reference, please see:

http://en.wikipedia.org/wiki/Dan_Rather#.22Kenneth.2C_what_is_the_frequency.3F.22

Seriously, though, *please* open up your mind to the possibility that somewhere along the line you learned some things about amplitude modulation that are true of typical cases of AM but not true about all cases of AM, and incorrectly assumed that those things *define* AM. Gaining a deeper understanding of what is actually happening in the frequency, amplitude and phase realms will help you to be a better designer. Please think about this before dashing off a quick response full of arguments that you are right. I will be glad to examine all those arguments and will be happy to admit my error if the arguments are sound, but I would implore you to first slow down and consider that you just might be wrong.

—

Guy Macon

<<http://www.GuyMacon.com/>>

.

Re: zippers and rabbits