

Re: AC sine wave: What does increasing the frequency do?

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Date: Sun, 28 Nov 2004 19:06:35 -0800

On Mon, 29 Nov 2004 00:54:10 -0000, "john jardine"
<john@jjdesigns.fsnet.co.uk> wrote:

>
> "John Larkin" <jjlarkin@highlandSNIPtechTHISnologyPLEASE.com> wrote in
> message >
>.....
>> a. For a sinusoidal source, a time-varying resistive load can have a
>> load current with a non-zero fundamental phase shift, hence a reactive
>> load component. This load component can be expressed as an equivalent
>> inductance or capacitance.
>>
>> b. For a sinusoidal source, a time-varying reactive load can have a
>> load current with a non-quadrature phase shift, hence a real load
>> component. This real component can be expressed as a positive or
>> negative equivalent resistance. This is why a varicap can be used as a
>> parametric amplifier.
>>
>>
>> In case a, it takes no power to vary the resistance (as say moving a
>> pot wiper or switching resistors in or out) because the synthesized
>> reactance doesn't dissipate power. In case b, power must be involved
>> in varying the reactance (spinning the shaft of a variable cap, or
>> pumping a varactor) because we're synthesizing a real resistance.
>>
>> Also interesting is that, in case a, since we can shift the
>> fundamental but can't shift the zero crossings, we must also generate
>> harmonics. There's probably something similar in case b.
>>
>> I'm not trying so much to win an argument as I am marvelling over a
>> few things I hadn't given a lot of thought to before. There's some
>> sort of neat duality going on here. I'm especially impressed by the
>> requirement to generate harmonics to reconcile the fundamental phase
>> shift with the zero crossings.
>>
>>
>

sci.electronics.basics: Re: AC sine wave: What does increasing the frequency do?

- > *The classes of gyrators here, has made for an interesting and*
- > **understandable* thread.*
- > *Sometime this kind of stuff will be written up in depth, (maybe already*
- > *has!).*

Tons of theoretical work has been done on time-varying capacitances, mostly in the 60's and such when two-terminal devices (varactors, tunnel diodes, step-recovery diodes) were the rage.

- > *I'll bet that during the process 'understanding' will be #1 item to*
- > *fall by the wayside :-)*
- > *regards*
- > *john*
- >

I like to try to avoid equations until I can really feel what's going on. Being able to do the math doesn't mean you understand it, just that you can push some symbols around. This is risky of course, because instincts are often wrong about stuff like this. But the guys who just do the math can make ghastly blunders, too, and they sometimes don't have the instincts to recognize an absurd result when they see it.

Things like Fourier transforms can be visualized and sort of done by inspection, but not many EE courses try to track that along with the math.

To a creature that was sufficiently intelligent, everything would be intuitively obvious.

John