



Complex Modulation with the 1140A Microwave Synthesizer

The 1140A's unique architecture allows "complex modulation" - the ability to upconvert a baseband signal to anywhere in the 1140A's output range. FM "chirps", phase modulated signals, frequency hops, now can be produced as easily at 20 GHz as they can at 500 MHz.

CW Operation

The block diagram below shows the architecture of the output section of the 1140A VXIbus Microwave Synthesizer. The 1140A uses standard microwave synthesizer techniques to produce a stable, spectrally pure signal in the 2 to 20 GHz range with 1 Hz resolution. This signal enters the block diagram at the upper left. To produce a CW output signal, the 1140A mixes this 2 to 20 GHz signal with a 420 MHz or 840 MHz signal from the IF Driver. This produces a signal at the final output frequency. This signal is filtered with a tunable YIG filter with an approximately 50 MHz bandwidth and amplified. To illustrate, suppose a 10 GHz signal is desired from the 1140A. When 10 GHz is programmed over the VXI bus, the 1140A internally sets its fine and coarse loops to generate a 9.160 GHz signal at the LO port of the mixer. This signal is mixed with an 840 MHz signal from the IF Driver to produce the 10 GHz output. The YIG filter is set at 10 GHz to eliminate the other mixer products and a pure 10 GHz signal is sent towards the output.

After the YIG filter, the signal is sent through a pulse modulator and step attenuator to generate the final output. Output leveling and AM is done by controlling the amplitude of the IF signal to the mixer, with an external AM input and/or the signal from a diode detector on the output leveling coupler.

To produce a signal below 2 GHz, a signal is coupled off after the pulse modulator and mixed with a fixed 6.3 GHz signal from a dielectric resonant oscillator (DRO). For applications that do not require frequencies in this band, the 1141A is available which is identical except for the absence of the .01 to 2 GHz band.

Complex Modulation

With the above described architecture, it is simple to translate an IF frequency to any microwave output frequency. Instead of providing the fixed 420 MHz/840MHz signal, the IF Driver now passes through a signal from the front panel IF Input. In this way, any modulation present on this signal (within the 50 MHz limit of the YIG filter) is present on the output signal at the desired microwave frequency. Changing the microwave carrier frequency is as easy as programming the 1140A with a new frequency value.

The 1140A can still provide pulse modulation and step attenuation even in the complex modulation mode. In fact, the leveling loop of the 1140A can be used to control the output level of the upconverted signal or, if the level of the IF input is to be maintained, the leveling loop of the 1140A can be turned off.

