Frequency Stability

Application is for a frequency agile radar beacon (racon). What this means is that the racon measures the frequency of an incoming radar pulse and, in response, transmits at the same frequency as the incoming pulse. For our racon, the tolerance of the frequency transmitted is $\pm 1 5$ MHz for radar pulses greater than 200 nsec in length and ± 3.5 MHz for radar pulses shorter than 200 nsec, The resolution of the frequency measuring and frequency generating (VCO) circuits is about 500 kHz.

Out of band transmissions are prevented by calibration of the VCO circuit. The VCO is excited with each of the possible voltage values and the output of the VCO is compared to the frequency of a stable oscillator accurate to ± 7.5 ppm. These value pairs make up a map of frequencies and voltage values. Re-calibration takes place at four-hour intervals, or whenever the temperature changes by ten degrees C.

When an incoming frequency is measured, circuits convert the measured value to an equivalent voltage value for the VCO. From the map of frequencies and voltage values, we can determine if the voltage value requested is in-band and allow transmission based on this determination.