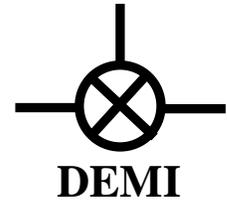# Down East Microwave Inc.

Design Note

DEMI

From: DEMI R & D Dept.

DN#: 030

Date: April, 5, 2012

Re: Understanding the frequency capabilities of VHF ApolLO with DEMI transverters

PREFACE: This document will aid the understanding of the frequency capabilities of the VHF ApolLO synthesizer that may be utilized in any DEMI VHF/UHF transverter. It will also cover some common misconceptions that have been frequently asked.

CIRCUIT UNDERSTANDING: This document assumes that the "VHF ApolLO Background, Theory of Operation and Test Instructions" have been read. This is a pre-requisite before installing the VHF ApolLO in any DEMI VHF transverter.

After reading, you should understand that there are many frequency selection options available but all options are not useable in a standard DEMI transverter. This is because of the filtering schemes utilized in the transverters. It is simplest to set the VHF ApolLO to the same frequency as the original oscillator frequency in all transverters. If you intention is to now operate with a different IF frequency or to extend the frequency range of the transverter, there are a few "Cautions" to be aware of.

To start with, if you desire a different IF frequency from the standard, select one that is band specific for your transverter that is found on the frequency list. Because of the IF filtering in all DEMI VHF/UHF transverters, you are limited to their range of between 24 and 32 MHz. It is important to understand that your 28 MHz IF transverter **will not** operate at a 50 MHz IF just by changing the LO frequency. To do this and yes it is possible, It would require the IF filter to be redesigned for the desired IF frequency. BUT- that is a secondary problem.

All DEMI VHF/UHF transverters have filtering in the LO sections of the transverter. Because of diode multipliers or harmonic content of the Buffer Amplifier or Active Multipliers, helical filtering has been implemented in the design of the LO circuit. The helical filters may be retuned for optimization to achieve the correct Mixer drive level, but to assume that they can be moved 10's of MHz is incorrect. At best, a delta of 3-4 MHz may be obtained and not without affecting the 2nd and third harmonic levels of the final LO signal injected into the mixer.

So, the question is why we made other frequencies available in the VHF ApolLO that are not simply utilized in all DEMI VHF /UHF transverters? Well we have a few reasons. First, it gives us an opportunity to expand our product line with other transverters such as 222 MHz units with 50 and 144 MHz IF's. Will this happen soon? Its very difficult to determine when or if even at all. BUT—the frequencies in the VHF ApolLO are available for experimenters to use and enjoy.

UTILIZING THE VHF APOLLO TO BAND EXPAND: The VHF ApolLO is instantly programmable. This means that if you desire full band coverage on 2M or 1.25 cm, a switch may be employed to instantly change the configuration such as 28 to 30 MHz. = 144 to 146MHz. Then a simple switch flip, and 28 to 30 = 146 to 148 MHz. It is possible to incorporate this in the TR function of the transverter for different splits that your IF transceiver may not be capable of. BUT—caution is required in the RF performance of the transverter. The transverters are optimized for the weak signal portions of the band. De-rated performance is expected as you migrate away in frequency form the low ends of the band. Yes, the helical filters and the tuning of the LNA are the issues but they both can be re-optimized for a compromise across the band if you desire full band use.

CIRCUIT MODIFACTIONS TO TRANSVERTERS: Basically, anything can be done to a DEMI transverter to enable your desired function. If you break down the transverter to a block diagram making the Mixer the center of the circuit, you will see that any LO/IF combination will work. Massive circuit modifications such as eliminating the LO amplifier, filters, or the complete IF circuit may be required. If you maintain correct levels to the mixer and employ filtering where required, there is no reason you cannot achieve your desired results.