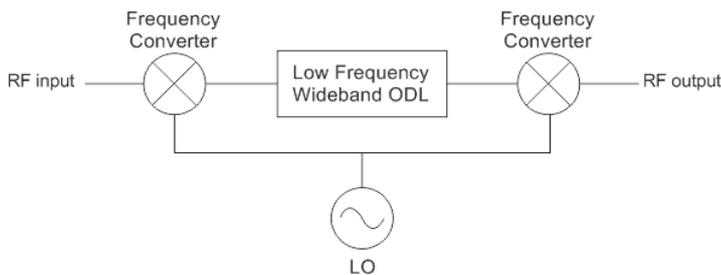


Band Slice Optical Delay Line

Fast tunable RFoF based wideband Optical Delay Line Application Note

In many applications of Optical Delay Line (ODL) the RF signals are centered within a range of microwave or mm-wave bands. In most of these cases the RF signal is relatively an instantaneous narrow band signal as compared with the RFoF ODL bandwidth. When the target application involves a single RF signal with an a-priori known bandwidth it is possible to use a frequency converted ODL. In a frequency converted ODL the RF signal would be converted to a lower frequency band with the aid of a low phase noise local oscillator (LO) signal and fed to a low frequency ODL with the output signal converted back to the original frequency band using the same LO signal. Such a system is shown in Figure 1. Appropriate filters may be added if out of band signals are of concern. In this approach the ODL has an instantaneous bandwidth of say 3GHz or higher as may be necessary yet this tunable ODL can service any RF frequency band as may be necessary.

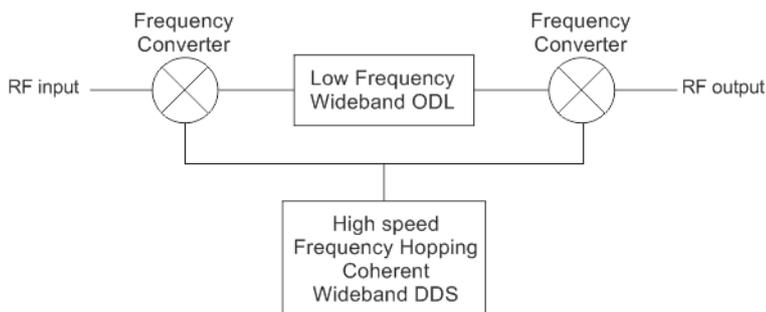
Figure 1: Frequency Converted ODL basic concept



In many cases the ODL system is used across a number of frequency bands either as a part of a test setup or where a number of frequency bands are used sequentially across a wide swath of the microwave spectrum. In such cases and where each signal is itself relatively a narrow band signal relative to the bandwidth of the ODL it is possible to

replace the LO source with a tunable synthesizer. In this approach a low frequency ODL can serve applications well into the mm-Wave bands. Such a system can produce a very cost effective alternative to a full wideband ODL.

ODL applications typically require phase coherence and therefore prefer to use a wideband ODL to a frequency converted ODL. Using a patented coherent DDS RF Optic can offer a unique solution that is capable of providing ultrafast band switching and has a wide instantaneous bandwidth. In this approach the DDS would generate the relevant LO signals to fold any slice of the RF band into the ODL bandwidth and then regenerate the original signal frequency. The inherent coherence of the all the DDS signals guarantees that as far as phase is concerned the ODL will function transparently as a full bandwidth system.



In a typical application the DDS would generate selectable signals at 6GHz, 12GHz. And 18GHz to allow a 3GHz ODL to service the DC to 21GHz frequency range. Denser LO frequency plan may be desired to avoid band edge coverage issues but the principle is the same.