

Microwave Educational Set

Low-Cost Receiver-Transmitter Set

We would like to introduce a low-cost high-performance Receiver-Transmitter Set for educational and research purposes. The set contains two separate units: a receiver and a transmitter. Both units have wave-guide adapters to standard wave-guide WR90 to make them compatible with wave-guide circuitry in a basic microwave laboratory. The set provides a complete 10 GHz Transmitter-Receiver Line with low phase noise, and with a modulation-demodulation ability, which makes this set a broadly useful tool.

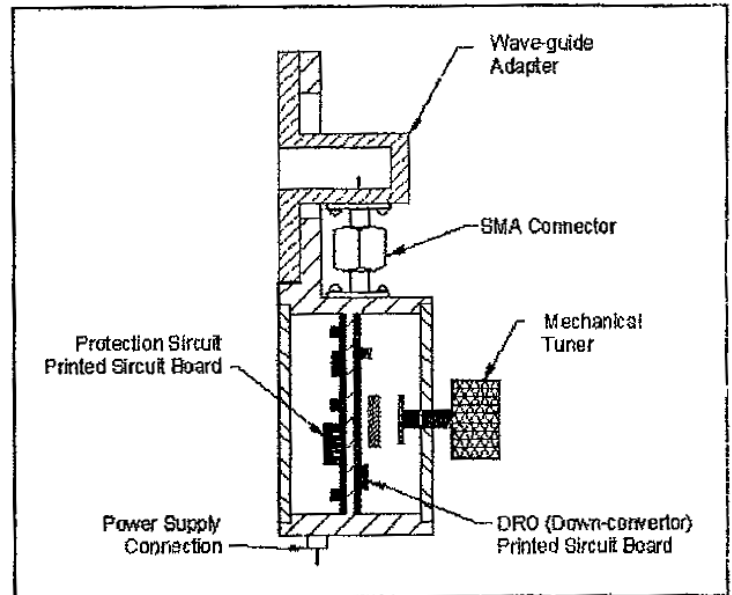


Figure 1

Introduction

We decided to develop a high-performance, low-cost microwave transmitter, based on electrically tunable dielectric resonator oscillator (DRO) with low phase noise and at constant output power; and a high-performance, low-cost, DRO based microwave receiver with internal down-converter. The transmitter and the receiver would be suitable in a wide range of experiments such as point-to-point data transfer, antenna's measurement, motion detecting and so on. Related to the purpose, both units have internal protection circuits. As a result if the user reverse or exceeds the supply or modulation voltage, the units will not be damaged.

Transmitter

The main part of the transmitter is DRO. It is built on the printed circuit board, and located at the top part of the transmitter. In dielectric resonator oscillator, the frequency of the oscillator is determined by the resonance circuit, and it can be changed by closing or opening the distance between the resonator and the mechanical tuner. The mechanical tuner allows the user to change the frequency over the broader range (about 150 MHz). The tuner has stoppers at the both end positions, which keep the resonator from being damaged.

The frequency of the oscillator can be changed electrically by applying positive voltage to the Automatic Frequency Control port (AFC). A typical electrical tuning for DRO is 1-2 MHz per volt. Also the AFC port can be used to modulate the transmitter frequency with bandwidth up to 2 MHz, that opens wide perspectives for experimentation.

Figure 1 shows the variation of the frequency versus the position of the tuner and of the voltage applied at AFC port.