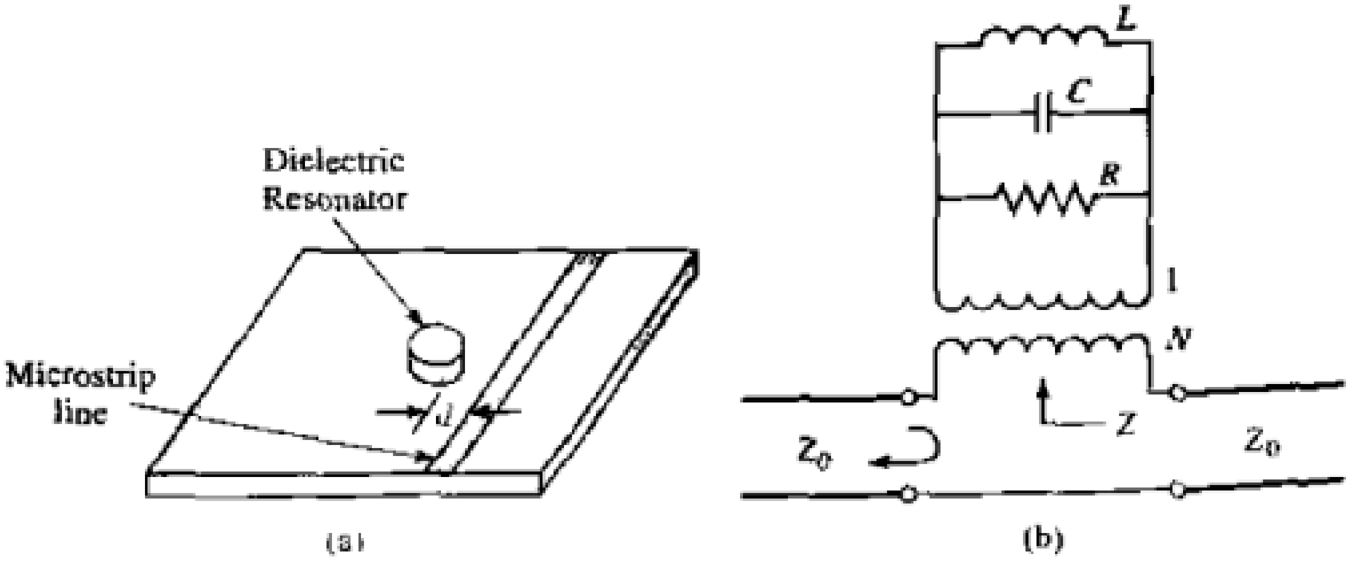
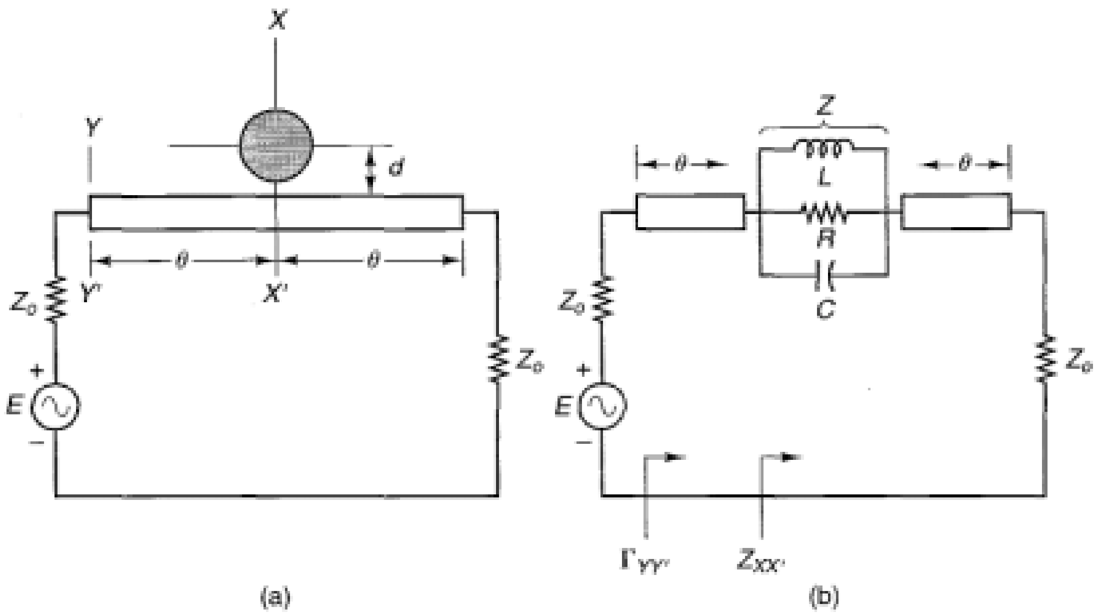
(a) Dielectric resonator oscillators (DRO)

Oscillator stability is enhanced with the use of a high-*Q* tuning network. The dielectric cavity resonator can have an unloaded *Q* as high as several thousands, is compact and easily integrated with planar circuitry, and can be made from ceramic materials that have excellent temperature stability.

A dielectric resonator is usually coupled to an oscillator circuit by positioning it in close proximity to a microstrip line:

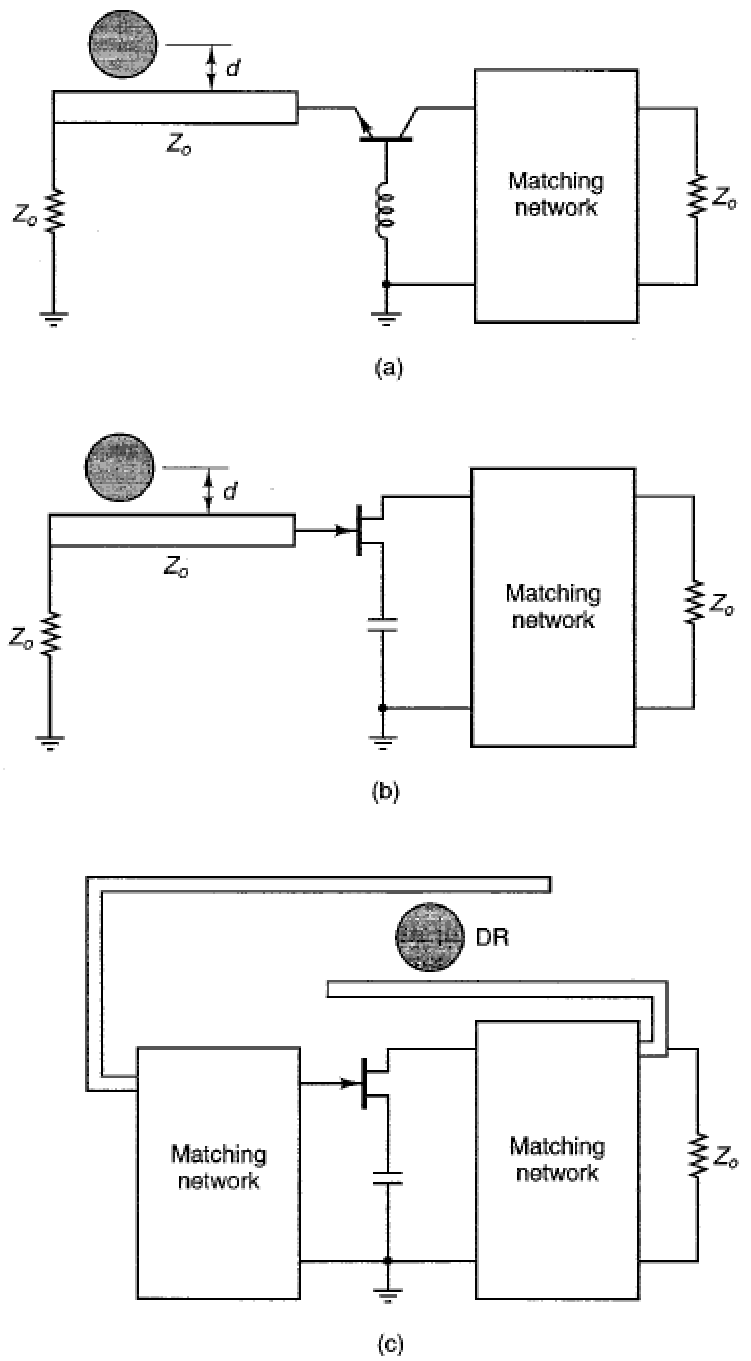


(a) Geometry of a dielectric resonator coupled to a microstrip line; (b) Equivalent circuit (Pozar's way).



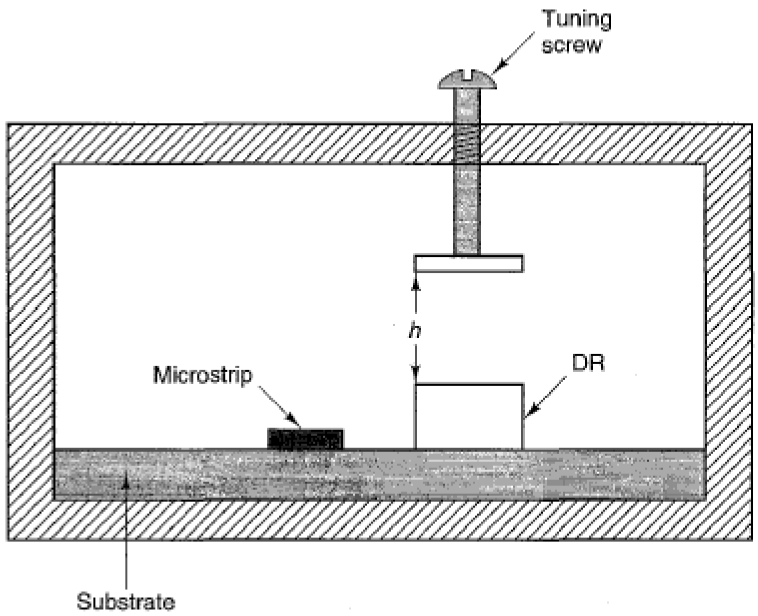
(a) Dielectric resonator coupled to a microstrip line; (b) Equivalent circuit (Gonzalez' way).
In real design, simulation tools such as ADS or Ansoft Designer need to be used to obtain frequency response of the dielectric resonator. For quick estimation, please refer to 'Pozar' 12.2 or 'Gonzalez' 5.5 for equivalent circuit values.

Here are some practical circuit configurations for DROs:

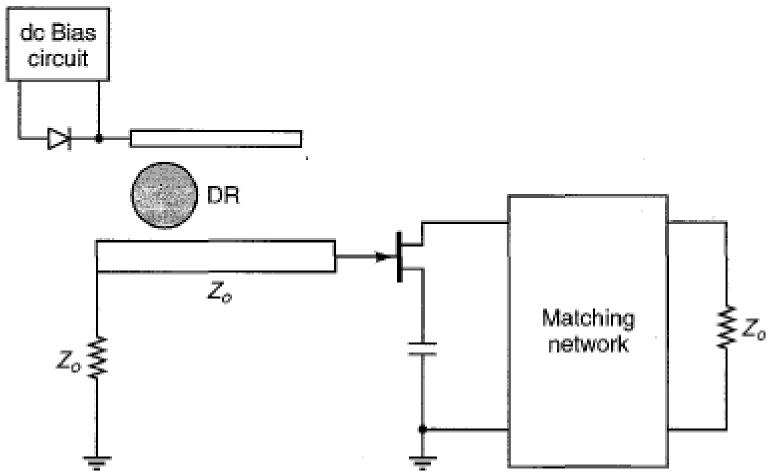


(a) A DRO using a BJT; (b) A DRO using a GaAs FET; (c) A parallel feedback DRO, where the forward gain of the transistor compensates for the insertion loss of the DR;
DROs can be tuned over a narrow range of frequencies using a metallic shield with a tuning screw. The depth of the tuning screw increases the resonant frequency of the DR. DROs can also be tuned electrically. For example, a varactor can be coupled to

the DR, resulting in two coupled circuits. The varactor's capacitance can be changed with an appropriate dc bias voltage, and this in turn changes the resonant frequency of the DR. The two tuning mechanisms are shown as follows:



(a)



(b)

(a) A mechanical tuning arrangement for DROs. (b) A varactor-tuned DRO.