

APPLICATION NOTE

Glossary of Terms for Coaxial Resonators and Coaxial Inductors

<p>Coaxial resonator</p>	<p>A component in which standing waves are established in a ceramic coaxial line, short-circuited or open-circuited at the end, and remote from the drive. These resonators can be either a 1/4 or 1/2 wave-length type.</p>	<p>Unloaded Q (Q₀)</p>	<p>Q₀ is the value of Q that is obtained when only the incidental dissipation of the system elements is present. Q₀ is defined by the following equation:</p> $\frac{1}{Q_0} = \frac{1}{Q_C} + \frac{1}{Q_D} + \frac{1}{Q_R}$ <p>Where: Q_C = Q of conductor Q_D = Q of dielectric Q_R = Radiation Q factor</p>
<p>Coupling</p>	<p>The method by which a dielectric resonator is electromagnetically connected to the external environment.</p>	<p>Loaded Q (Q_L)</p>	<p>Q_L is the value of Q that is obtained when the system is coupled to an external device that dissipates energy. Q_L is defined by the following equation:</p> $\frac{1}{Q_L} = \frac{1}{Q_C} + \frac{1}{Q_D} + \frac{1}{Q_R} + \frac{1}{Q_{EXT}}$ <p>Where: Q_C = Q of conductor Q_D = Q of dielectric Q_R = Radiation Q factor Q_{EXT} = Q of the first (or last) filter resonator when terminated by the external load (usually 50 Ω).</p>
<p>Cylindrical resonator</p>	<p>A disc type resonator with a centered hole used for ease-of-mounting and improved mode separation.</p>	<p>Resonant frequency (f₀) of dielectric resonator</p>	<p>The frequency in which the dielectric resonator can store the electromagnetic signal for long time periods compared to the period of the frequency being applied.</p>
<p>Dielectric constant (ε_R)</p>	<p>The ratio of electric displacement in a medium which would be produced in free space by the same field.</p>	<p>Spurious mode</p>	<p>Output from a dielectric resonator caused by a signal or signals having frequencies other than the preferred resonant frequency. The presence of higher resonant modes close to the resonant frequency of the principle mode interferes with filter or oscillator performance.</p>
<p>Dielectric Resonator (DR)</p>	<p>An unmetallized dielectric ceramic that functions similarly to a mechanical resonant cavity at microwave frequencies, but has a greatly reduced size because of its high dielectric constant.</p>	<p>Temperature coefficient of dielectric constant (τ_F)</p>	<p>The change of the dielectric constant of the resonator as a function of temperature.</p>
<p>Dielectric Resonator Oscillator (DRO)</p>	<p>In this type of oscillator, a dielectric resonator is used as a frequency-determining element for a microwave oscillator to achieve high stability.</p>	<p>Temperature coefficient of resonant frequency (τ_F) (ppm/°C)</p>	<p>The shift in the resonant frequency of the dielectric resonator due to the linear expansion of the material, plus the change in its dielectric constant as a function of temperature.</p>
<p>Direct Broadcast Satellite (DBS)</p>	<p>A satellite broadcast system that operates in the range of 10 GHz to 40 GHz in different world locations.</p>	<p>Thermal coefficient of expansion</p>	<p>The linear expansion of a dielectric resonator in all directions with temperature.</p>
<p>Disc resonator</p>	<p>A solid cylindrical ceramic body with a height to diameter ratio of approximately 0.4.</p>	<p>Tuning device</p>	<p>A mechanical mechanism used to adjust the resonant frequency of the dielectric resonator up to 5% by perturbing the external electromagnetic fields.</p>
<p>Global Positioning System (GPS)</p>	<p>A satellite system for determining accurate location. GPS used in land, sea, air, commercial, and military applications.</p>	<p>Television Receive Only (TVRO)</p>	<p>A satellite broadcast system that operates in the 3.7 GHz to 4.2 GHz range. TVRO is used in North and South America.</p>
<p>Loss tangent (tanδ)</p>	<p>The reciprocal of the dielectric resonator's Quality Factor (Q).</p>		
<p>Quality factor (Q) = (1/tanδ)</p>	<p>The figure of merit for assessing the performance or quality of a resonator, the Quality Factor (Q) is a measure of energy loss or dissipation per cycle as compared to the energy stored in the fields inside the resonator. The Q is defined by:</p> $Q = 2\pi \times \frac{\text{Maximum Energy Stored}}{\text{Average Energy Dissipated per Cycle}}$ <p>Where π = 3.14159</p>		

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