

# STEM Works

## Microwave Filter [mi-cro-wave fil-ter]

A circuit or structure that impedes the transmission of certain microwave frequencies, or frequency bands, while allowing the passage of others. Filters may be described as lowpass, bandpass, highpass or multiplexers, and may have functional characteristics such as Chebyshev, Butterworth or elliptic. Filters are essential components in radar and communications systems.

**1897** Lord Rayleigh proposes the concept of waveguide for electromagnetic waves. He later develops wave theory to explain the Whispering Gallery waveguide mode of St. Paul's Cathedral that acts as a resonant cavity filter for acoustic waves.



**1937** W.P. Mason and R.A. Sykes pioneer early analytical work in the field of microwave filters prior to WWII by deriving filter impedance and attenuation functions using ABCD parameters.



**1948** "The MIT Radiation Laboratory Series," Vol. 9 (Chapters 9 & 10) by R.M. Fano and A.W. Lawson provides a classic introduction to the theory and design of microwave filters.

**1957** S.B. Cohn provides the first comprehensive theory with practical application for designers.

**1964** G.L. Mathai, L. Young and E.M.T. Jones publish their well-known treatise on filters, impedance matching networks and coupling structures. This widely used reference is still in print.

### 1960s & 70s

Temperature stabilized dielectric resonator filters are introduced, providing high Q in a compact size.

**1970s** Linear phase filters are developed for low distortion in modern communications systems.

### Subsequent Advances

The rapid synthesis of complex multimode/multiband structures in various media with improved in-band and out-of-band characteristics is enabled through the use of EM simulation and optimization algorithms.

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