

DIELECTRIC OPTIONS

Each time we develop a new product, we consider a number of dielectric options in order to provide the most cost-effective solution possible.

▣ **SOLID PTFE** *Solid PTFE has been used in RF and microwave cables longer than either low loss, low density or microporous PTFE. Typically extruded, solid PTFE dielectrics are very consistent in terms of dielectric constant over length as well as from lot to lot. Solid PTFE has a dielectric constant of 2.02 and a loss tangent of 0.00022.*

Mechanically, solid PTFE dielectrics are very durable and compression resistant. Chemically, the dielectric material is exceptionally inert, offering excellent resistance to many chemicals.

Thermally, solid PTFE dielectrics have a sharp “knee” in their CTE profile around room temperature. They also exhibit a substantial amount of volumetric expansion when exposed to extreme temperatures, particularly during soldering operations.

▣ **LOW LOSS,
LOW DENSITY
PTFE**

Low loss, low density dielectrics have been used for over 20 years in RF and microwave cables. They may be tape wrapped or extruded, and typically yield greater variation in dielectric constant over length and between lots than solid PTFE dielectrics do. Low loss, low density dielectrics typically range in dielectric constant from 1.6 to 1.8 and have a loss tangent of 0.00005. The result is much lower loss at microwave frequencies than solid PTFE offers.

Mechanically, low loss, low density dielectrics are nearly as compression resistant as solid PTFE, but much more so than microporous options. Low loss, low density dielectrics will “wick” solvents and fluids, so careful consideration must be given to the cable assembly design and manufacture.

Thermally, low loss, low density PTFE dielectrics have a smaller “knee” in their CTE profile around room temperature. Unlike solid PTFE dielectrics, they remain stable when exposed to extreme temperatures, allowing them to be used for higher power applications.

▣ **MICROPOROUS
OR EXPANDED
PTFE**

Microporous PTFE dielectrics have been used for over 20 years in RF and microwave cables. They may be tape wrapped or extruded, and typically yield greater variation in dielectric constant over length and between lots. Microporous dielectrics typically range in dielectric constant from 1.3 to 1.5 and have a loss tangent of 0.00005. This means that, for a given cable size, Microporous PTFE will yield lower loss than low loss, low density PTFE.

Mechanically, microporous dielectrics are fairly soft, requiring careful handling or some form of ruggedization. Microporous dielectrics will “wick” solvents and fluids, so careful consideration must be given to the cable assembly design and manufacture.

Thermally, microporous PTFE dielectrics have the smallest “knee” in their CTE profile around room temperature. This makes them an ideal choice where electrical length stability is critical. Like low loss, low density PTFE dielectrics, they remain stable when exposed to extreme temperatures, and this allows them to be used for higher power applications.