Engineering Notes

PPM Calculations

The electrical phase length of any coaxial cable will change over temperature. To calculate the expected phase change of a Dynawave cable for any given temperature ranges use the following method.

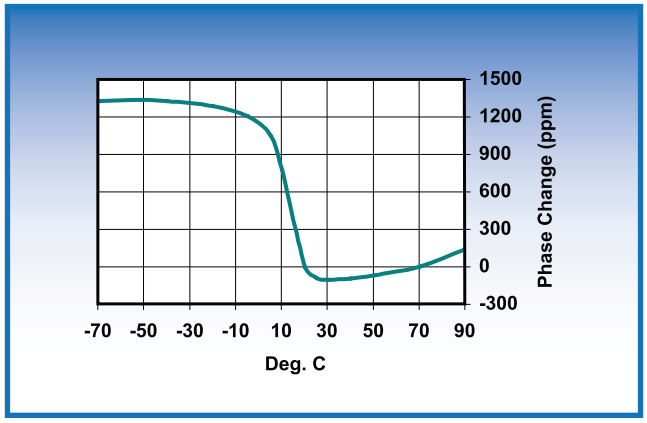
Example: Calculate the phase change of a 36 inch long DF118 assembly at -30°C at 12 GHz.

Determine the absolute phase (ω) of the assembly at 25°C.

$$\delta = \frac{5.904 \times \text{Velocity of Propagation (VP)}}{180 \times \text{freq (GHz)}} = \frac{5.904 \times 0.78}{180 \times 12} = .002132 \text{ in/°}$$

$$\omega = \frac{36 \text{ in}}{\delta} = \frac{36 \text{ in}}{002132 \text{ in/°}} = \mathbf{16{,}885.55°}$$

- From the DF100 series PPM charts -30°C produces **1300 PPM** of phase change



- $\varphi = \frac{\omega \times (\text{PPM})}{10^6} = \frac{16{,}885.55° \times 1300}{1{,}000{,}000} = \mathbf{21.95°}$

Useful Cable Assembly Formulas

Attenuation: $\alpha = [K1 \times \sqrt{\text{freq (GHz)}}] + [K2 \times \text{freq (GHz)}]$ **(dB/100 ft)**

Wave Length: $\lambda = \frac{11.803 \times Vp}{\text{freq (GHz)}}$ **(in)**

Characteristic Impedance: $Z_o = 60 \times Vp \times \ln (D/d)$ **ohms**

Time Delay: $T = \frac{1.016}{Vp}$ **(nS/ft)**

Cut Off Frequency: $Fc = \frac{7.5 \times Vp}{D + d}$ **(GHz)**

Length Given Delay: $L = .9835 \times T \times Vp$ **(ft)**