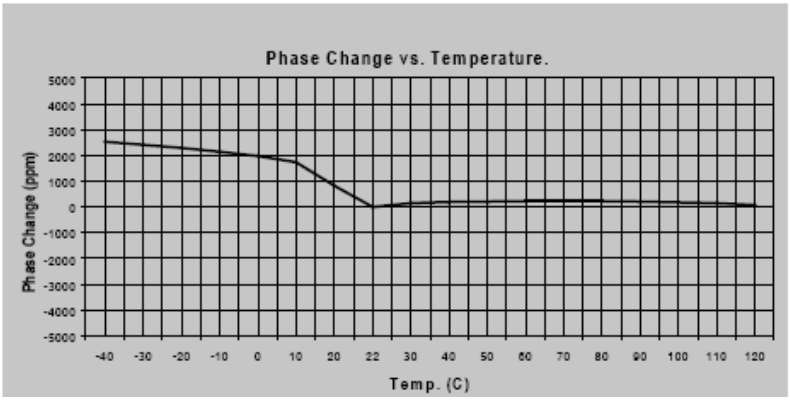
PHASE STABILITY OVER TEMPERATURE

Engineering Data | **Phase Temperature** | SHEET 1 OF 1 | 6/25/2014



Phase Change:
The electrical length for a given frequency will "shift" as a result of environmental changes. The *degree* of change is based on mechanical stresses, connector torque and thermal conditions.

The *degree* of phase shift as a result of temperature variation can be calculated by using this formula:

$$\Delta\Phi = \Phi * \left(\frac{ppm}{10^5}\right)$$

Before calculating the expected phase shift there are a few additional questions that need to be answered.

- What is the mechanical length of the assembly (ft)
- What is the frequency of interest (GHz)
- What is the electrical length at the frequency of interest (Φ)
- What is the dielectric constant of the insulation €
- What is the temperature of interest (ºC)

Once these questions are answered the phase shift can be calculated.
For example, what would be the change in phase for a 10 ft. cable assembly of LL142 at 80ºC at 18 GHz?

Step 1: Calculate the electrical length using the following formula

$$\Phi = 365.7 * \sqrt{E} * (ft) \times (Ghz)$$

$$\Phi = 365.7 * \sqrt{1.478} * 10 * 18 = 80{,}032°$$

Step 2: Using the chart above, determine the parts per million (ppm) at 80ºC.
212 ppm @80ºC

Step 3: Now Solve

$$\Delta\Phi = \Phi * \left(\frac{ppm}{10^6}\right)$$

$$\Delta\Phi = 80{,}032° * \left(\frac{212}{10^6}\right) = 16.97°$$

The cable assembly will become 16.97° longer at 80°C at 18 Ghz