

Skin Effect and Dielectric Loss Formulae

Skin effect loss in percent-signal-loss per inch of trace

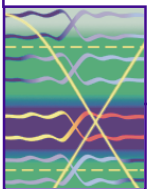
$$\frac{1}{2} \frac{R_{\text{SKIN}}(1\text{GHz})}{Z_0} \sqrt{\frac{f}{1\text{GHz}}}$$

Dielectric loss in percent-signal-loss per inch of trace

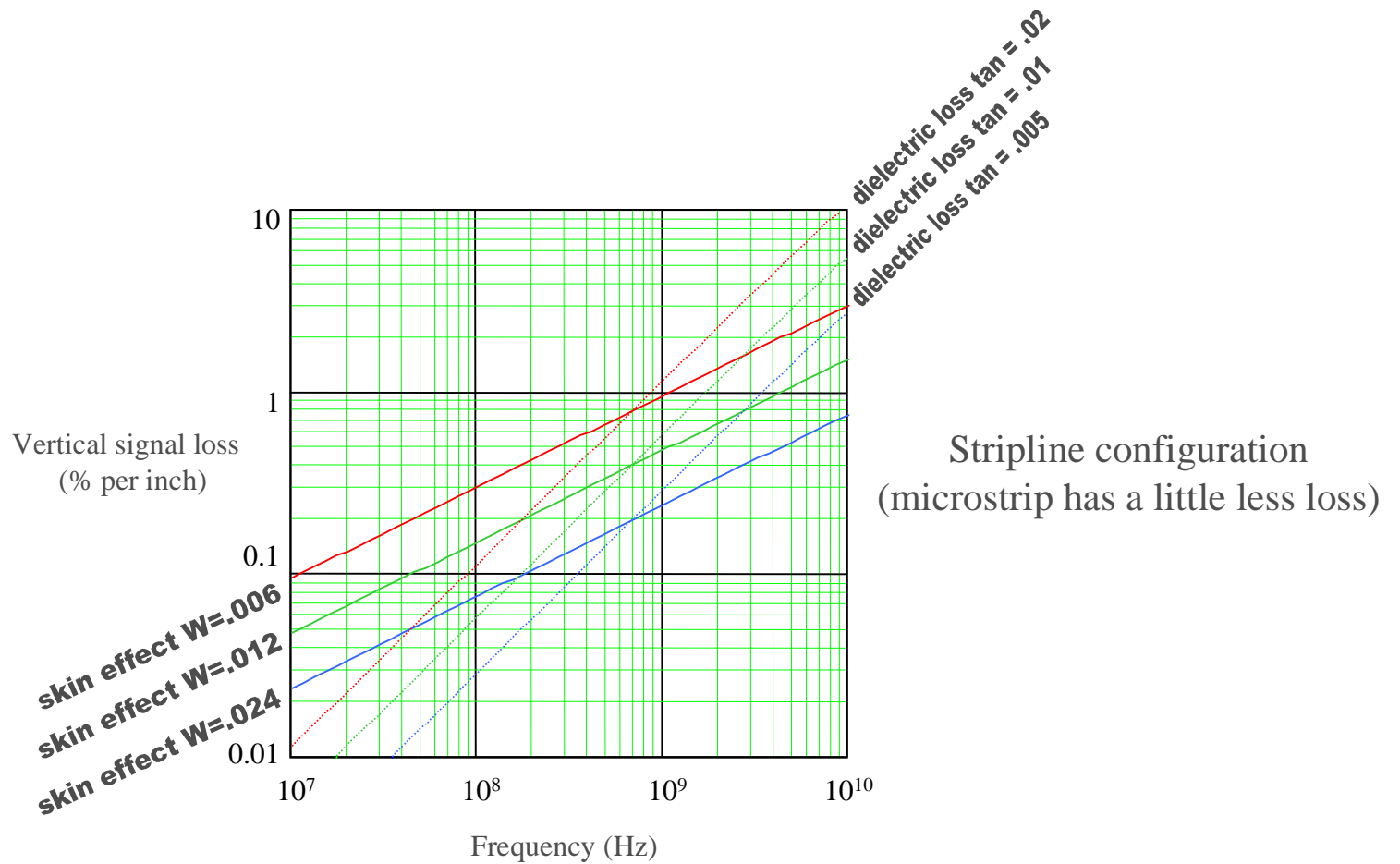
$$\pi f \theta T_D$$

Loss tangent

Trace delay per inch

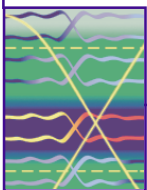


Skin Effect and Dielectric Loss Chart



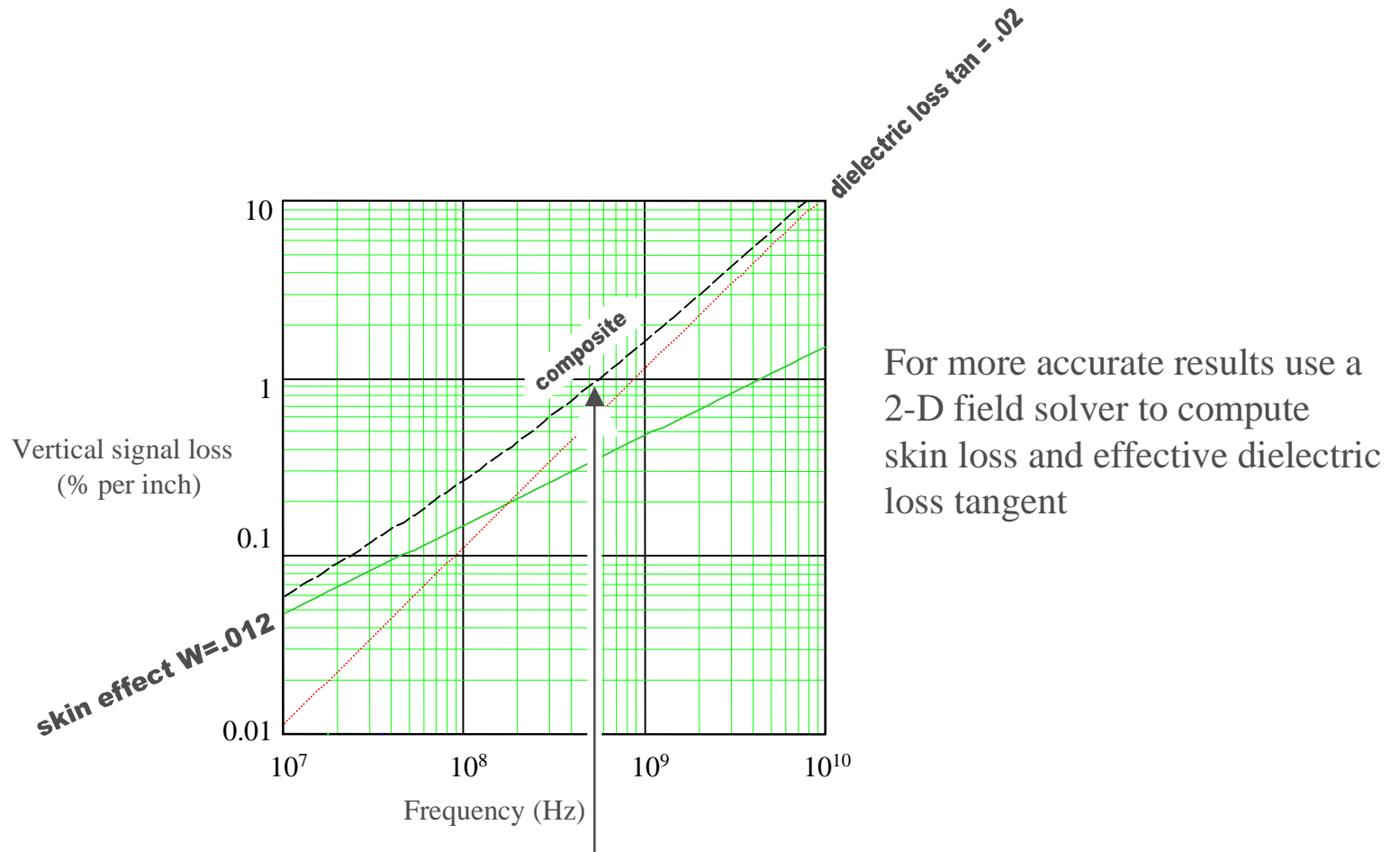
100-ohm differential pairs

Stripline configuration
(microstrip has a little less loss)



Skin Effect and Dielectric Loss Example

Fiber Channel 1.06 Gb/s over 18" of FR-4



For more accurate results use a 2-D field solver to compute skin loss and effective dielectric loss tangent

Composite loss at max. data alt. rate of 530 MHz = 1% per inch
Loss in 18 inches is 18%

