2.1 INTRODUCTION:

SKIN EFFECT:

Consider a conductor made up of a large number of fine strands of wire. A strand at the center is linked by all the internal flux in the conductor, whereas a stand on the surface is not linked by the internal flux. The inductance and reactance of the strand at the center is greater than that of the strand at the surface. The interior strand thus carries less current than the outer so as to produce equal impedance drops along the strands. This phenomenon is known as **skin effect**.

When a line, either open- wire or coaxial, is used at frequencies of a megacycle or more, certain approximations may be employed leading to simplified analysis of line performance.

THE ASSUMPTIONS USUALLY MADE ARE:

1) At very high frequency, **the skin effect is very considerable** so that currents may be assumed as flowing on flowing on conductor surfaces, internal inductance then being zero.
2) Due to skin effect, resistance R increases with $\sqrt{f}$. But the line reactance ωL increases directly with frequency f. Hence $\omega L >> R$.
3) The lines are well enough constructed that G may be considered zero.

ANALYSIS IS MADE IN EITHER OF TWO WAYS:

1) R is merely small with respect to ωL. If **R is small**, the line is considered as one of **small dissipation**, and this concept is useful when the lines are employed as circuit elements or where resonance properties are involved,
2) R is completely negligible as compared to ωL, and the line is considered as one of zero dissipation and this concept is used for transmission of power at high frequency.

LINE CONSTSNTS OF DISSIPATION LESS LINE

In gerenal the line line constants for a transmission line are:

$Z_o = \sqrt{\frac{Z}{Y}}$

Z = R+jωL

Y = G+jωC

$Z_o = \sqrt{\frac{R+j\omega L}{G+j\omega C}}$

γ = α+jβ

$\gamma = \sqrt{ZY}$

$\gamma = \sqrt{(R + j\omega L)(G + j\omega C)}$

According to the standard assumption for the line at high frequency

$j\omega L$ >> R , $j\omega C$ >> G

R = 0 , G = 0

Sub the condition in Z_o , γ

$Z_o = \sqrt{\frac{j\omega L}{j\omega C}}$

$Z_o = \sqrt{\frac{L}{C}}$

$\gamma = \sqrt{(j\omega L)(j\omega C)}$

$\gamma = \sqrt{(j^2\omega^2 LC)}$

$\gamma = \sqrt{(-\omega^2 LC)}$

$\gamma = j\omega\sqrt{LC}$

$\alpha + j\beta = j\omega\sqrt{LC}$

equate the real and imag parts,

α = 0

$\beta = \omega\sqrt{LC}$

$v = \frac{\omega}{\beta}$

$v = \frac{\omega}{\omega\sqrt{LC}}$

$\boldsymbol{v = \frac{1}{\sqrt{LC}}}$

$$\lambda = \frac{2\pi}{\beta}$$

$$\lambda = \frac{2\pi}{\omega\sqrt{LC}}$$

There are the line constants for dissipation less line.