# COAXIAL CABLE ELECTRICAL CHARACTERISTIC

## ELECTRICAL CHARACTERISTIC

### 1) CHARACTERISTIC IMPEDANCE

The most general feature of coaxial cables is impedance. It does not depend on length. It depends on cable size and insulation material. It is expressed in Ohms. Coaxial cables are generally produced as 50 ohm, 75 ohm and 93 ohm cables.

A simple formula for determining an impedance of a coaxial cable;

$$Z0 = 138 \times Vp \times \log D/d \text{ ohm}$$

Z0 = Characteristic Impedance
Vp = Velocity of Diffusion
D = Dielectric (Insulation) Diameter
d = Inner Diameter of Conductor

### 2) CAPACITY (pF/m)

It is electric energy accumulated by insulation material, and depends on conductor, insulation and dielectric constant of the insulation material

$$C = \frac{7{,}36x\varepsilon r}{log\ D/d} \text{ pF/m}$$

$\varepsilon r$ = Dielectric Constant

| MATERIAL | $\varepsilon r$ DIELECTRIK CONSTANT |
|---|---|
| AIR | 1 |
| PE SOLID | 2,3 |
| FOAM PE | 1,5 |
| PTFE | 1,95 |
| FEP | 2,15 |

### 3) VELOCITY OF DIFFUSION

Cable's velocity of diffusion is equal to the ratio of the velocity of a signal inside the cable to the velocity of light.
Example: While the velocity of diffusion in the solid PE insulated cable is 66%, in Foam PE it increases to 87%.
This feature can also be shown as delay.

$$Vp = \frac{1}{\varepsilon r} \qquad \text{Delay} = 1.0167164X \ \varepsilon r$$

### 4) ATTENUATION (dB/100mt)

Attenuation is a decrease in normal signal velocity inside the cable. It depends on cable structure, frequency and length. It is mostly affected by inner conductor's DC resistance and by insulation material. Increase of temperature leads to increase of attenuation, too.

### 5) RETURN LOSS (RL)

Cable sizes, quality of insulation material and mistakes made during cable laying influence the characteristic impedance. Any single disorder or mistake results in reflections.

Return loss is equal to the ratio of output signal to the reflected signal