**THE PHENOMENON OF CORONA**

Air is not a perfect insulator and contains a minute number of electrons and ions as a result of various effects such as ultra violet radiation from sun, cosmic rays, radio activity of soil, etc. When an electric gradient is set up in air, between two large parallel conducting planes, the electrons and ions are set in motion by the electric field and they maintain a small current by convection between the conducting planes. When the electric field intensity is less than 30 kV/cm, this current is very small and hence negligible.

The phenomenon undergoes a radical change when the electric field intensity reaches the critical value of 30KV/cm. At this intensity, the ions attain a sufficiently high velocity and on striking another neutral molecule dislodge one (or more) electrons from this neutral molecule. This produces a new electron and a positive ion which in turn are accelerated until they collide with other molecules and produce more ions. An ion avalanche (Town-send effect) results. If the field is uniform everywhere (as in the case of parallel plate electrodes) the conditions necessary to produce such avalanches are reached simultaneously everywhere in the gap. Therefore, a complete electric breakdown occurs and an arc is established between the two electrodes.

The electric field in the vicinity of a cylindrical conductor is not uniform. The intensity is maximum at the surface of conductor and then decreases in inverse proportion to the distance from the center of the conductor. As the voltage applied to the conductor is increased. A layer adjacent to the conductor gets ionized as soon as the electric field intensity at the surface of the conductor becomes more than 30 KV/cm. the field intensity must reach this value in a layer, around the conductor, at least as thick as an average free path before ionization can start. The ionization will be restricted only to this layer because outside this layer, the filed intensity being less than 30 KV/cm, the ions will not have sufficient energy to cause further ionization.

Consequently, in contrast to the case of uniform field, no complete breakdown of the gap will take place but a region of sustained ionization will persist around the conductor. This ionization is accompanied by a luminous glow around the conductor. If the conductors are rough or dirty, usually the brightest parts of the luminous envelop are near the rough or dirty spots. At the same time a hissing noise can be heard and the characteristic smell of ozone can be detected. The glow increase in size and brightness and the intensity of hissing noise increase with increase in voltage. The term corona is used to designate in particular, this visible luminous envelope and in general all the phenomena accompanying its formation. Corona occurs in power lines of 100 KV and above. The ions produced by the corona result in space charges which are being moved around by the ac field. The energy required for this movement is taken from the conductor and this energy loss is known as corona loss. The energy is dissipated in the form of light, heat, sound and chemical action. The rate of ionization in the corona discharge is not uniform but has certain fluctuations and sudden changes which produce similar other changes of the electric field. These changes can disturb radio reception and thus, bring, about the radio interference (RI) aspect of corona.

If a high direct voltage is applied between two conductors, there is a difference in the appearance of the positive and negative wires. The positive wire has a uniform glow about it while the glow around the negative wire is more spotty and even sometimes in the form of short streamers from the rough or sharp spots on the wire. With alternating voltage applied to the conductors, the appearance of the two conductors is the same since the conductors are alternately positive and negative.

As the voltage applied to conductors is increased the corona envelops grow larger and larger. The corona extends until the increase in the effective diameter of the conductor is sufficient to bring the potential gradient at the edge of corona down to the critical gradient and corona can then spread no further at this particular voltage under consideration. If the voltage is increased to a very high value the envelope grows so large that finally there is a spark over between the conductors. If the spacing between conductors is less than three times the conductor radius, the spark over may occur even before any corona is noticed.