Review of: "Nanotube antennas at first glance give us the impression that it is similar to the dipole antenna, which is designed in small dimensions"

Sing Kummar[1]

1 Institute of Chemical Technology, Mumbai

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Nanotube antennas, at first glance, give us the impression that they are similar to dipole antennas, which are designed in small dimensions. But this is not the case in the main theory of dipole antennas for determining the current distribution on the antenna, where the dipole radius is greater than the skin depth and also the resistance losses are so small that they can be ignored. Due to the fact that the L / d nano-dipole is significantly reduced, it is impossible to use. In single-dimensional electrical conductors such as nanotubes, the skin depth state is completely eliminated because electrons are only allowed to move along the strand, and therefore the current distribution is effectively one-dimensional. In addition to the electrons moving in only one dimension, two other important issues occur: inductance and large resistance. These properties make nanotube antennas behave very differently from classical antennas. The main difference is that the current distribution is alternating with a wavelength that is 100 times smaller than the open space wavelength for a given thermal frequency. The wavelength of the current distribution depends on the velocity of the wave in that mode. If the wavelength is the same as the speed of light, the wavelength of the current distribution is the wavelength of the electromagnetic waves in open space. On the other hand, the wave velocity in nanotubes is about one hundred times slower than the speed of light. This is because in circuit theory, the wave velocity is equal to the inverse of the square root of the capacitive capacity per unit length multiplied by the inductive capacity per unit length.

> ***Kinetic inductance per unit length of nanotubes is ten thousand times greater than the magnetic inductance per unit length of conventional antennas. Therefore, the wave speed will be 100 times slower than the speed of light. The efficiency of a classic nanotube antenna is -90dB, which is due to resistance losses.***

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