Low Profile Antennas in IoT Applications

With the continued expansion of wireless enabled equipment being used in everyday life, occasionally there will be cases where the installation is required in a public area or heavy use environment. There are several points to be aware of when selecting this type of antenna to ensure that the equipment is being used with maximum efficiency.

What is a low profile antenna

A low profile antenna is designed for discrete installations so that it doesn't look like a traditional whip or stubby style antenna and being fixed very closely to what it is mounted to. The low profile design is inconspicuous to avoid attention and offers an alternative for many IoT applications that require a wireless device to transmit a signal which is vertically polarised. As low profile antennas are relatively flat the radiating element is mounted in a horizontal plane and as a result the direct performance will be slightly affected. As such the low profile antennas are deisnged to use the mounting point as an extended ground plane to improve signal performance and remain hidden.

Mounting of the antenna

If the antenna can be mounted vertically, this helps improve the system performance but be mindful of the mounting surface. There are a number of groundplane dependent and groundplane independent products available from Siretta. Low profile antennas with a steel base are generally groundplane independent whilst others that have a PCB element encased in plastic housing are groundplane dependant. This will affect the radiating performance of the antenna and therefore care should be taken to use the corrcet type of antenna for the mounting surface as the radiation pattern when transmitting will be offset, affecting the transmission range.

Most low profile antennas for wireless IoT and telemetry applications have a screw threaded bolt through which the RF cable in retained. This means that no external cable is visible once the installation has taken place. Different mounting surfaces have different thicknesses and in the case of fibre glass or plastic mounting surfaces, consideration needs to be given to check whether the through hole section will be long enough to allow the mounting nut and washer to connect to the screw thread.

Cable length considerations

Low profile antennas tend to use a ¼ wavelength tuned dipole within a low height plastic enclosure. As with all antennas, the smaller the antenna used in the design, the more susceptible it will be to detuning and its performance be affected. This situation is made worse by the use of long cable runs. It is worthwhile keeping the cable run as short as possible to minimise RF loss over the length of cable. However if this cannot be avoided, it is worth considering a low loss RF cable and in the case of cellular communication, changing from a high frequency network band to a lower frequency network band will greatly improve signal performance.

Ensuring a waterproof fit

When using a low profile antenna it is possible to ensure a very tight fit to the mounting surface. In outdoor and mobile environments it is important to ensure that moisture does not get through the mounting hole and into the enclosure. Water ingress can be prevented or largely reduced by using an adhesive and/or rubber gasket between the antenna and the mounting surface. This is particularly important if the antenna is used in a mobile environment and is travelling at high speed.

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