

# OgierElectronics

## Line of Site v Non Line of Site

A non line of sight capability is essential for mobile systems. It is also useful in fixed systems because it can in principle avoid the need for collecting points or relays. If the conditions are right, it may in certain circumstances be possible to transmit directly from the camera to the Control Centre.

There are however serious limitations. All non line of sight systems, including our own, require the signals to be transmitted through walls or foliage, or to be reflected off buildings. If this is not possible then clearly no signal will be received at the other end of the link. It is difficult to be precise about the loss of signal when reflections occur but generally there is a 20 dB loss, which corresponds to a 10:1 reduction in range. Thus if a system has a line of sight range of 30 km like our vehicle mounted Mobile-T, it will only have a non line of sight range of 3 km. The effect when the signal has to penetrate through walls is more variable. Sometimes the loss can be 20 dB, but on occasions it can be considerably higher.

In general, the best rule of thumb is that a 10:1 reduction in range is the best that can reliably be achieved providing there is only one obstruction or only one reflection is required. If two are necessary to complete the transmission path, the loss could be double this, i.e. a 30 km system could have a range as low as 300 metres. This effect is universally true and is irrespective of the modulation.

For example, the DVB-T system we supply uses a 2,000 carrier OFDM modulation scheme whereas the best Wi-Fi option, including that used on our Ethernet equipment has only 64 carriers. This means that the DVB-T solution is far more resilient to the errors introduced by reflections, but despite this it does nothing to improve the range under non line of sight conditions.

The other serious limitation in relying on non line of sight paths is that the characteristics of the paths can well change, which means that one day there may be good communications between the cameras and the Control Centre, whereas on another day the path could become marginal or even lost. This is a typical problem with Wi-Fi and Wi-Max equipment and whilst not too serious if it is merely providing internet connectivity in domestic applications, it could be serious for professional CCTV systems where it is unrealistic to move the equipment.

An example of this is that in a separate business area we manufacture a broadband wireless system that requires a line of sight. We supply it to ISPs who use it to provide business services. The same ISPs also provide some of their domestic subscribers with internet connectivity using other non line of sight systems. However since the availability of such systems is variable and uncontrolled, the ISPs do not consider using the non line of sight system for their business customers simply because the transmission cannot be guaranteed.

In summary therefore mobile systems have to use non line of sight systems. In fixed systems however there is a choice and our recommendation is always to use a line of sight system if reasonable ranges and a high availability are required. Alternatively if these requirements are not particularly important, it may be possible to use a non line of sight system. A possible variation is to use non line of sight systems for short range applications to communicate to a collecting point and then to use a long range line of sight system to complete the communications to the Control Centre.

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