# EION BYTES

EION Wireless Link Budget Calculation Essential Parameters

What is Link Budget?

The wireless link budget is the term used that accounts for the power received at the receiver. This accounts for all the gains and losses from the transmitter to the point at which the receiver receives it. It includes losses from cables and other components in the Tx/Rx chain, gains from the antenna, amplifiers etc. and propagation loss when travelling through air.
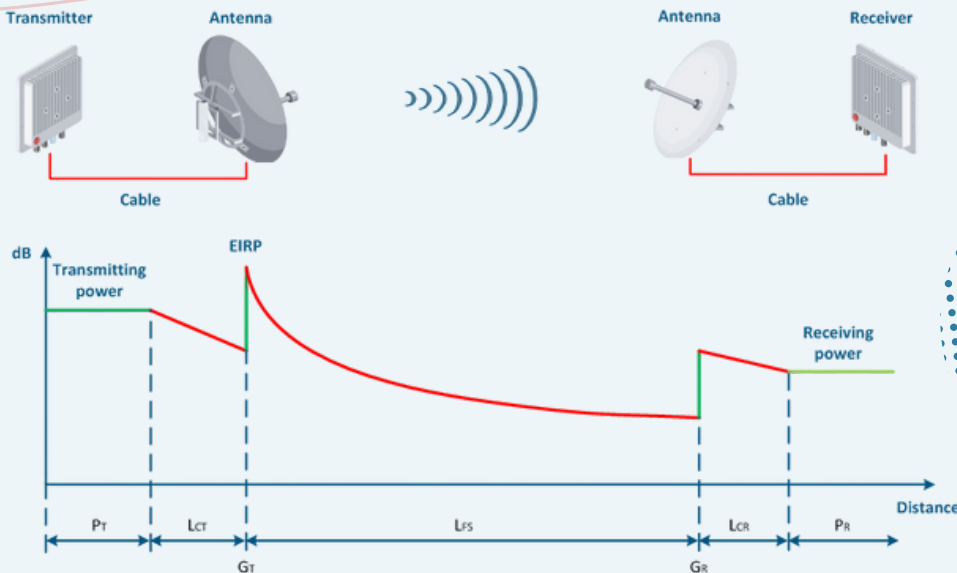
Received power (dBm) = Transmitted power (dBm) + gains (dB) – losses (dB)

Transmitter Power

The transmitter generates a signal and transmits it to the cable that connects the transmitter and antenna. Transmit power at the radio RF connector specified in dBm.

Cable Loss - Transmitter & Receiver Sides

During the signal propagation in the cable, some of its energy is converted to heat, i.e. the antenna receives an attenuated signal. This parameter includes all the losses between the radio RF connector and the antenna, including signal attenuation as it propagates through the cable and losses in any connectors along the way.

Free Space Loss

Free Space Loss refers to the reduction of the signal strength as the signal radiates away from its source. When there are no obstructions, every time you double the distance, the movement is reduced by a factor of 4. This is equivalent to subtracting 6 dB from your signal strength. The Free Space Loss assumes no obstructions in the link path, sometimes referred to as having a "line of sight." However, note that "line of sight" means that at least "60% of the first Fresnel Zone " is clear of any obstructions.
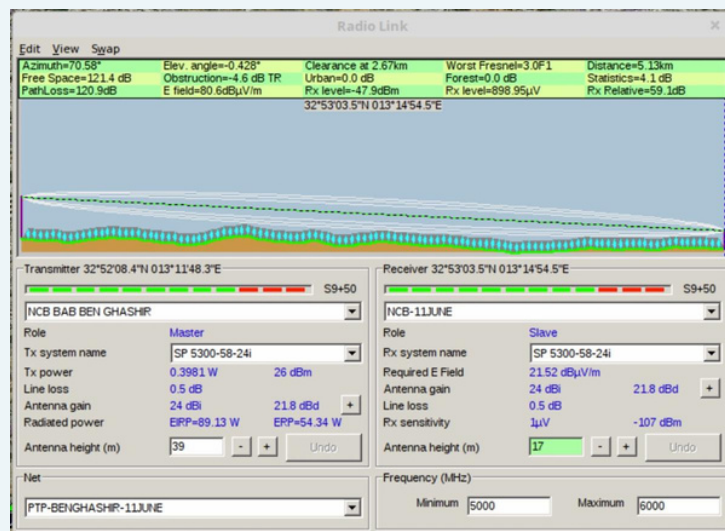
Receiver Antenna Gain

The receiving antenna converts the radio signal energy into a current and transmits it through the cable to the receiver.

Receiver Sensitivity

An important receiver parameter is a sensitivity - the possibility of receiving weak signals. I.e. if the received signal power is below the sensitivity level, the signal will not be recognized.

Fade Margin

The Fade Margin differs between the Received Signal Strength and the radio Receiver Sensitivity. When you deploy a link, you want a Receive Signal Strength that is sufficiently above the radio Receiver Sensitivity to survive signal fading due to various factors. These factors might include slight misalignment of the antennas, losses due to fog and rain, etc. As a rule of thumb, you should try to get at least 15 dB of fade margin in your links.

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