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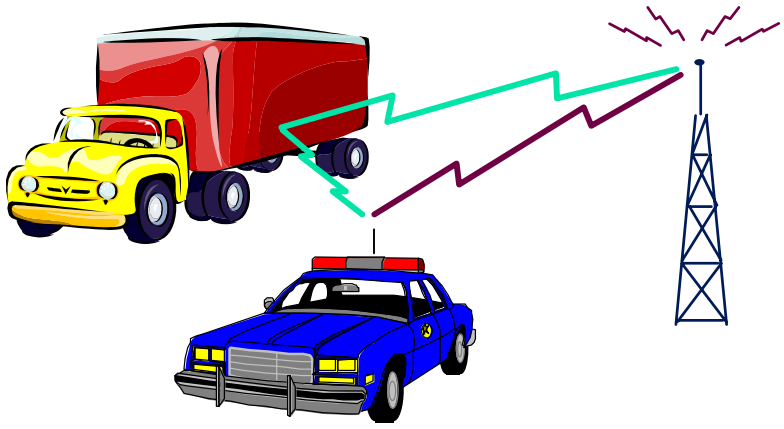
AN INTRODUCTION TO INTELLIGENT DIVERSITY RECEPTION

INTRODUCTION

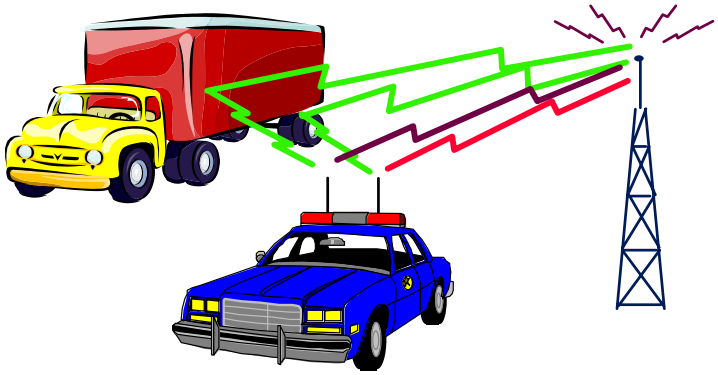
IPMobileNet's patented Intelligent Diversity Reception™ system represents a breakthrough in mobile data communication technology. Mobile units equipped with IPMobileNet's digital radios enable users in a marginal reception area to receive messages where other systems fail. IPMobileNet's digital base stations (featuring triple diversity, with three separate receivers and antennas) allow for the full benefits of diversity, including a reduction of "holes" in the coverage area and improved performance along the boundaries of the coverage area. Diversity ensures optimal performance at high data transmission rates, such as the 32 Kbps utilized in IP MobileNet's IP Series 32 systems. With diversity, users benefit from more reliable and consistent communications at a lower cost.

FADING EFFECTS

All radio systems suffer from signal fading effects that are influenced by distance between transmitter and receiver, terrain effects, and other conditions. Fading effects in mobile reception occur at periodic, half-wavelength intervals, have a 50 dB dynamic range, and are aggravated by increasing vehicle speed. Unfortunately, most radio systems do nothing to correct this fading problem. For each fade – when the signal level drops below the receiver threshold – data is lost. Data must be retransmitted to reconstruct the message.



Above, a reflected signal interferes with a good signal transmitted from a tower to a police vehicle in a non-diversity setting.



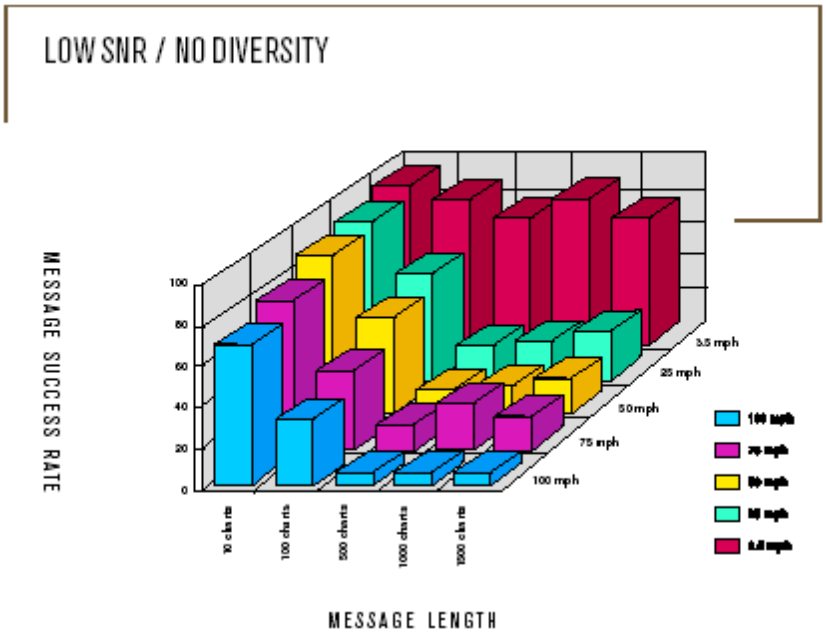
Using intelligent diversity, the best signal – even if it is a reflected signal – is selected to ensure successful first-time message reception.

The patented intelligent diversity receiver subsystem of the IP Series radios effectively mitigates the propagation losses normally associated with Rayleigh fading. Automatic switching between multiple receivers ensure that a reliable receive path is maintained, even when one receiver experiences a deep multipath fade.

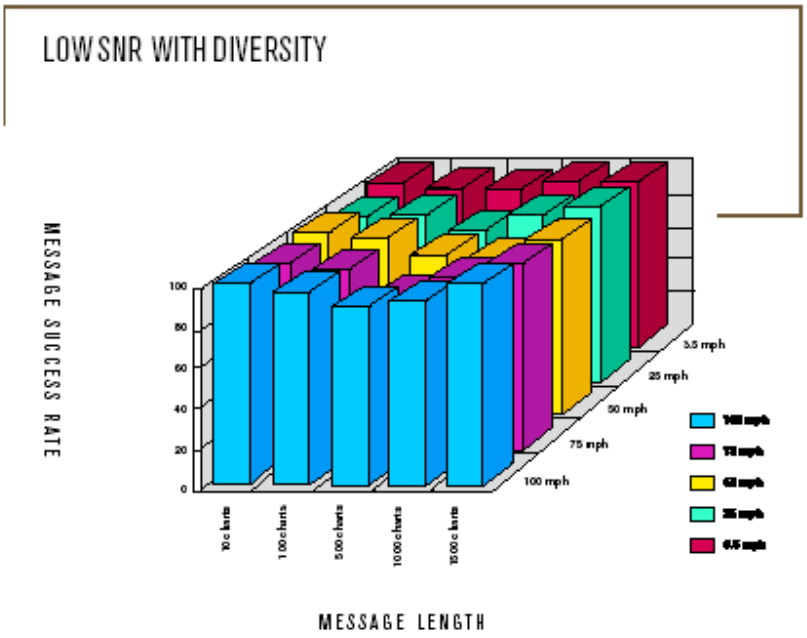
Message Success Rate

All IP Series radios incorporate a patented Intelligent Diversity Reception system to offer an unequalled first-time success rate for all message transmissions. This system provides industry-leading radio transmission reliability in the most challenging radio environments, including speeding vehicles and deep Rayleigh fading conditions. This high success rate minimizes the need for message retries, delivering a significant boost to the total effective network capacity available to all users.

Message Success Rate indicates the percentage of messages which get through successfully on the first try. IPMobileNet's Intelligent Diversity Reception utilizes the multiple antenna principle and extends its effectiveness with a patented multiple receiver circuit. Successful diversity reception depends on one of two antennas (mobile) or one of three antennas (base stations) receiving the highest quality signal at any given time. The IPMobileNet receivers in each radio continuously monitor signal quality at all antennas. The intelligent circuit then selects the antenna and receiver that will ensure successful communications.



The graph above displays data collected in a field test. It demonstrates first-time message success rates of messages sent from a base station to a vehicle. The "Z" axis is the percentage of times a message is successfully received. The "X" axis illustrates messages of different sizes. The third variable, displayed on the "Y" axis, is vehicle speed. This chart demonstrates that in a non-diversity setting, as message size and speed increases, the first-time message success rate decreases.



With IPMobileNet's patented Intelligent Diversity Reception, message success rates dramatically improve, both for large message sizes and at high vehicle speeds.

Conclusion

All radio systems suffer from signal fading effects that are influenced by the distance between transmitter and receiver, by motion, and by terrain effects. Also, fading effects impact different frequency bands (VHF, UHF and 800 MHz) in different ways due to how the signal travels in each band (wave lengths). Fading effects in mobile reception are particularly difficult to correct in that they are periodic (occurring at half-wavelength intervals), have a 50 dB dynamic range, and are aggravated by increased vehicle speed. IPMobileNet's Intelligent Diversity Reception dramatically improves throughput and message success rates by using the well-known multiple-antenna/multiple receiver principle, enhanced by our patented intelligent receiver circuit.

Secure. Reliable. Easy. Fast and reliable data communications are achieved with IPMobileNet's patented Intelligent Diversity Reception™ technology.