

GPS and agriculture equipment



The Project team understands that farmers increasingly rely on precision global positioning systems (GPS) to guide farm equipment and manage field operations. Therefore, a common concern among farmers is the potential interference of GPS systems when operated in the vicinity of transmission lines.

GPS and Global Navigation Satellite System (GNSS) receivers operate in microwave frequency bands within the gigahertz (GHz) range, which is significantly higher than the frequencies associated with electric and magnetic fields generated by overhead transmission lines. As a result, transmission lines are not expected to adversely impact the operation of GPS systems.

While high-voltage lines can produce localized radio-frequency activity through corona or electrical discharge under certain conditions, research has consistently shown that this activity occurs at frequencies well below those used by GPS and GNSS systems. Although temporary reductions in signal quality, carrier-to-noise ratios, or real-time positioning performance may occasionally occur in the immediate vicinity of transmission facilities, these effects are generally minor and short-lived. Furthermore, while large solid structures can block satellite signals, the individual wires of a transmission line are too small to cause significant physical obstruction. Modern GPS and GNSS equipment maintain accurate positioning and reliable operation when used near or directly beneath high voltage transmission lines.

For example, research from the Electric Power Research Institute (EPRI) confirms that operating receivers directly beneath high voltage lines results in no measurable signal loss.

For farmers using older, ground-based RTK systems, where a local base station on the farm broadcasts correction data to field equipment via a local radio link, any rare disruption is not typically a loss of GPS, but rather a temporary interruption of this local radio signal. These RTK systems typically communicate using Ultra High Frequency (UHF) radio bands. If a local base station is placed directly adjacent to the transmission corridor, the line's structures can occasionally block the direct line-of-sight radio path, or older radio equipment may experience localized electromagnetic noise. This issue is easily mitigated. Placing the stationary RTK base station on a high point of land away from the immediate transmission corridor maintains a clear line of sight. Additionally, modern RTK systems employ frequency-hopping radio technology and error-correcting software that automatically filters out environmental noise, allowing seamless, centimeter-level precision throughout the field.



If the operation of a transmission line permitted by the Minnesota Public Utilities Commission (MPUC) causes interference with GPS navigation systems, the MPUC's route permit requires the permit holder to take all necessary actions to restore GPS-related agricultural navigation systems to reception levels equivalent to those that existed before construction of the transmission line.

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