



GNSS Anti-Interference Antenna

1. Main Applications of GNSS Anti-Interference Antennas

1.1 Civil Domain

Drones and Autonomous Vehicles: Ensuring stable navigation in complex electromagnetic environments for drones and autonomous vehicles.

Aviation and Maritime: Helping aircraft and ships maintain high-precision navigation in frequently interfering environments.

Intelligent Logistics: Ensuring reliable navigation signals for cargo tracking devices in harsh environments.

1.2 Industrial Domain

Base Station Synchronization: Providing reliable clock synchronization signals for communication base stations.

Power Systems: Offering stable signals for power grid synchronization in high-interference environments.

Agricultural Machinery: Assisting precise agricultural equipment in achieving high-precision navigation operations.

1.3 Military Domain

Tactical Communication: Providing anti-jamming positioning signals for military communication equipment.

Missile Guidance: Ensuring the missile navigation system operates normally under strong interference conditions.

Electronic Warfare: Enhancing the anti-jamming capabilities of military navigation equipment.

2. Key Performance Indicators of GNSS Anti-Interference Antennas

2.1 Signal Anti-Jamming Ability

Anti-jamming Indicator: Capable of maintaining normal operation under interference signals above -60 dBm.

Anti-spoofing Ability: Able to differentiate between real signals and spoofing signals and filter out the spoofing signals.



2.2 Signal Gain

High Gain (e.g., above 30 dB): Enhancing the ability to receive navigation signals.

Gain Directionality: Ensuring the antenna receives signals in a specified direction while shielding interference from other directions.

2.3 Operating Frequency Band

Supports multi-band GNSS systems: such as GPS L1/L2, Beidou B1/B2, Galileo E1/E5, GLONASS, etc.

2.4 Other Important Parameters

Bandwidth: Capable of covering the full frequency range of GNSS.

Voltage Standing Wave Ratio (VSWR): Typically less than 1.5 to reduce signal reflection.

Noise Figure: As low as possible (e.g., below 2 dB), improving reception sensitivity.

3. Principles and Methods of GNSS Anti-Interference Antennas

3.1 Anti-Jamming Principles

Multi-Beamforming Technology: Using antenna arrays to generate multiple beams, boosting gain for target directions and forming 'nulls' in interference directions to block out interference.

Spatial Filtering: Separating the signals from interference sources in space to enhance signals and suppress interference.

Adaptive Algorithms: Real-time adjustment of beams and antenna gain to adapt to complex electromagnetic interference environments.

3.2 Implementation Methods

Array Antenna Design: Arranging multiple antenna units in an array and controlling phase differences to achieve beam steering.

Low-Noise Amplifier (LNA) Integration: Integrating LNAs in antennas to enhance weak signal reception.

Digital Signal Processing: Using algorithms to analyze and process the received signals for interference suppression.

Conclusion

GNSS anti-interference antennas have broad applications in drones, autonomous vehicles, precision agriculture, and military navigation. Through high gain, multi-beamforming, and spatial filtering technologies, these antennas significantly improve the reliability and anti-jamming ability of navigation signals.

In complex electromagnetic environments, the performance of GNSS anti-interference antennas is crucial for ensuring the stability of navigation and positioning. With technological advancements, anti-interference antennas will continue to drive the widespread adoption and performance improvement of GNSS applications.