

Autonomous, Resilient PNT Solution

Quantum Navigation offers a fundamentally different approach than GPS.

- Not relying on external signals from satellites.
- Using intrinsic properties of the physical world and the ship itself, measured with extraordinary precision using principles of quantum mechanics.

Giving the ship an ultra-sensitive, entirely self-contained "sense" of its position and movement, independent of any outside signal.

Using Sensor Technology

The system leverages quantum sensors – devices exploiting the unique, highly sensitive behavior of matter at the atomic or sub-atomic level – to perform two key functions with unprecedented accuracy:

Quantum Inertial Navigation

measure the ship's acceleration and rotation with precision.

Quantum Gravity Gradiometry

measure the earth's gravitational pull variations (gravity gradients) with extreme sensitivity.

Q-Nav involves precisely measuring quantum states—such as the waveforms or energy levels—of atoms to detect minute changes in motion or position, enabling highly accurate navigation without relying on GPS.

While GPS signals are weak and easily disrupted, either accidentally (atmospheric conditions, equipment malfunction) or intentionally (jamming, spoofing – where false signals are broadcast to trick the system), Q-Nav is stable and precise.

GPS doesn't work underwater, in areas with physical signal blockage, or in regions where access is restricted, but Q-Nav is reliable and accurate.

Key equipment components

1. Atom Interferometers: They measure acceleration and gravity with high precision, enabling precise inertial navigation.
2. Quantum Accelerometers and Gravimeters: They measure acceleration and gravity with high accuracy and without drift.
3. Vacuum Chambers: They are used to minimize disturbances and improve performance.
4. Laser Systems: They provide the light sources needed for manipulating and detecting atoms.
5. Modulators: They shift the frequency of a single laser to perform different functions within an atom interferometer.
6. Quantum Sensors: They offer enhanced sensing capabilities in various applications.

Strategic Advantages for Maritime Operations

Quantum navigation offers unmatched resilience, ensuring safe, continuous, and accurate maritime operations without reliance on external systems. It enhances strategic independence, promises long-term precision, and prepares fleets for a future where resilient positioning is critical.

QUANTUM NAVIGATION (Q-Nav)

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GPS replacement:

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Key equipment required:

Quantum Sensors
Vacuum Chambers
Laser Systems
Atom Interferometers
Quantum Accelerometers and Gravimeters
Modulators

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