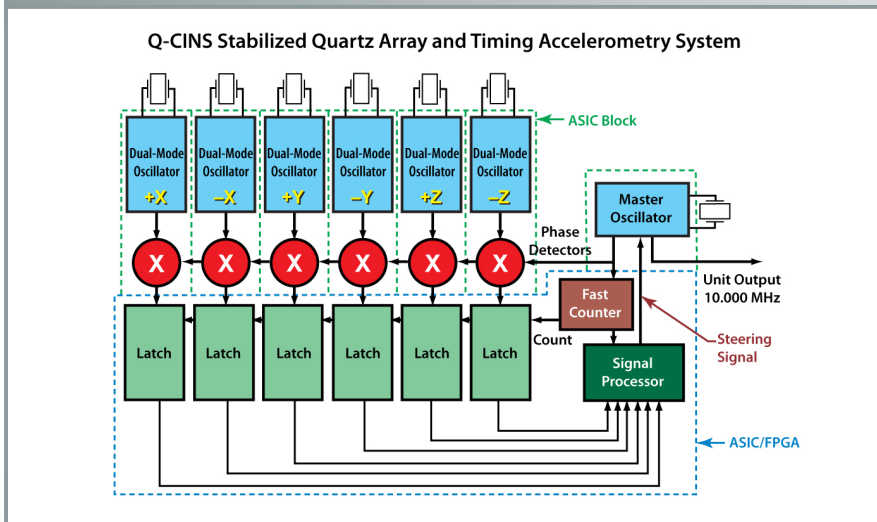


Triply Redundant Integrated Navigation and Asset Visibility System

UT-B ID 200902244



Technology Summary

A quartz time, positioning, and navigation array that solves a fundamental sensitivity problem is under development by ORNL researchers. Existing systems with good timing stability are limited by poor motion sensitivities. In contrast, this invention has stability at a much lower size, weight, and power; better acceleration and shock tolerance; wider temperature tolerance; and very high reliability.

The invention, called ORIENT (Orthogonally Referenced Integrated Ensemble for Navigation and Timing), is a part of ORNL's TRI-NAV™, a personnel/asset location system that combines inertial navigation, military-quality GPS, and robust wide-area radio frequency location. ORIENT uses an integrated group of quartz-crystal timing oscillators that are tightly matched and compensated for temperature, shock/acceleration effects, and long term drift. The system can provide short term timing performance that is superior to higher power quartz or atomic clocks; yet, it can be calibrated long term via GPS. It is also more rugged and power efficient than other clocks while maintaining comparable levels of stability.

Since the quartz array concept demands excellent timekeeping in changing environments, a very small change in frequency, or gamma, is required. Unfortunately, a small quartz gamma yields a low-sensitivity acceleration sensor, which is a huge drawback for a useful device. ORIENT's configuration incorporates a second set of crystal-driven oscillators for sensing with much higher gammas to solve this difficulty.

Advantages

- Highly stable performance in dynamic environments
- Excellent timekeeping
- Higher sensitivity and responsiveness to motion
- Robust and reliable

Potential Applications

- Position, navigation, and timing systems for government, military, commercial, industrial, Homeland Security, vehicular, asset tracking, and consumer use
- Rough terrain, urban settlements, and areas covered by dense foliage

Patent

Stephen Fulton Smith and James Anthony Moore. *Orthogonally Referenced Integrated Ensemble for Navigation and Timing*, U.S. Patent Application 13/083,366, filed April 8, 2011.

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