Diamond-based gigahertz frequency clock for use in computational applications

A diamond nanocrystal is doped with nitrogen to form nitrogen-vacancy (NV) centers. Such centers have a well-defined spin state that can be controlled and read out using microwave and optical signals. These spin states serve as ideal solid-state clocks to replace current atomic clock technology. The NV center spins are well protected from the environment, operate at room temperature in ambient conditions, and thus form the basis for a stable, reliable and cheap atomic clock. Optical readout and solid-state integration mean that such centers can be integrated with ease into traditional Silicon based electronics.

**Diamond spin states provide a stable, accurate, and cost-effective alternative to atomic clock technologies.**

A diamond-spin based clock can operate at room temperature, and do not require cooling or special vacuum systems. This makes the diamond-spin based technology more stable, cost-effective, and smaller in size. In particular, since this is a wholly solid-state technology, it can be easily integrated into current silicon based computational technologies. These diamond-spin based clocks do not suffer from spectral broadening, and can be read out optically, making them convenient and robust.

**Lead Inventor:**

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**Applications:**

- Precision clocks for GPS or other locations systems, communications satellites etc.
- Clock for computer processors, mobile computing processors
- High precision clocks for research, development, and experimental work
Advantages:

• Cost effective, solid-state clock that can be easily packaged and integrated into existing technologies.
• Small in size, operates in ambient conditions at room temperature
• Ultra-stable high frequency performance with negligible drift or spectral broadening
• Optical readout increases convenience and robustness

Patent information:

Patent Pending (PCT/US12/55555)

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Related Publications:


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