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## Clocking on to a better time

Published on 5 February 2007

**A low-cost time source accurate to one second in 30,000 years could improve the capacity of wireless networks, boost the quality of wired communications systems, protect financial transactions, and make positioning with 20cm resolution possible.**

The source is in development by OptiSynx, an early-stage company based in Cambridge, UK. The company says it is working towards offering the accuracy of caesium-based atomic clocks, widely used as reference standards, at the price of the GPS-based alternatives in use today.

Caesium atomic clocks work by bombarding boiling caesium atoms with microwave radiation whose frequency is adjusted to match the very precisely defined frequency at which caesium atoms change between two energy states. Once the two match, users can derive highly accurate time signals from the microwave signal. Such sources are expensive and complex so are often substituted with rubidium-based clocks, which are less accurate, or timing derived from the atomic clocks carried on GPS satellites.

Optisynx says its alternative derives its accuracy from directly converting a source signal running at thousands of gigahertz (terahertz or THz) down to megahertz frequencies. The fact this conversion is done in one step using optical, rather than electronic, conversion techniques avoids introducing the jitter and phase-noise components that reduce the accuracy of clocks based on multiple electronic conversion stages.

Dr Dominic Mikulin, CEO of OptiSynx, says the company plans to build OptiBoxes and calibrate them to a factory reference time standard, so that every OptiBox will carry exactly the same time, to the same accuracy. Mikulin says that improving the accuracy of time signals will also enable wireless network operators to squeeze more channels out of a fixed spectrum. This will be possible because operators currently have to allow 'guardbands' to stop interference between channels whose centre frequencies may shift due to poor clock accuracy. "Effectively you could get three basestations for the price of two," said Mikulin.

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It will kill them

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