

Abstract Submitted
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Why there is no noon-midnight red shift in the GPS NEIL ASHBY, MARC WEISS, Time & Frequency Division, National Institute of Standards & Technology, Boulder, CO — Although the effects of solar (and lunar) gravitational potentials on the frequencies of orbiting Global Positioning System (GPS) clocks are actually no more than a few parts in 10^{15} , a naïve calculation appears to show that such effects are much larger, and depend on whether the orbiting clock is between the earth and the sun, or on the side of the earth opposite to the sun. Consequently questions about whether such effects have been properly accounted for in the GPS continue to arise. This issue has been discussed in a misleading way in terms of cancellations arising from a second-order Doppler shift in the literature for almost 50 years. The purpose of this article is to provide a correct argument, based on fundamental relativity principles, so that one may understand in a simple way why the effects of external solar system bodies on orbiting or earth-bound clocks in the GPS are so small. The relativity of simultaneity plays a crucial role in these arguments.

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