

## **GPS Setup Showed General Relativistic Effects On Light Operate At Emission and Reception, Not In-flight As Required By Big Bang's Friedmann-Lemaitre Spacetime Expansion Paradigm**

A common mistake in dealing with relativistic time was also made by one of the Air Force contractors in relation to the GPS. This is the notion that electromagnetic radiation changes frequency (or a photon changes energy) as it propagates through a gravitational potential difference. If the physical clock adjustments have been made as described above so that all clocks are keeping a common coordinate time, then there is no effect on the frequency of radiation as measured in that coordinate time. However, the contractor had included in the computer programs to operate the system just such a correction, effectively correcting twice for the relativistic effects. Actual experience with test GPS equipment in orbit was required to persuade some engineers and physicists of their error.\*

We should not be surprised at such lack of understanding of some of the fundamental concepts of General Relativity since the subject is almost never taught to engineers and rarely even to physicists. Also confusion about these concepts is not restricted to engineers and others who must deal with ultra-stable clocks, but is widespread even among eminent physicists. Consider the following excerpts from Relativity Re-examined by Leon Brillouin (1970):

*“...All the clocks at rest in our inertial frame will give the same frequency definition with or without gravity potential. The gravity red shift is only due to the motion of photons.”*

Our experiments clearly contradict this statement. To his credit, at another place in the book he wrote:

*“...[improved atomic clocks] would allow us to perform many important experiments that would tell us definitely what to think of relativity!”*

If Professor Brillouin were still living, perhaps he would accept our experiments as convincing evidence for the correctness of Einstein's views on time.

\*Alley, C. O., Proper time Experiments in Gravitation Fields with Atomic Clocks, Aircraft, and Laser Light Pulses, in **Quantum Optics, Experimental Gravitation and Measurement Theory**, 363-427, Eds. Mystere, P. & Scully, M. O. (Plenum Publishing Corporation) 1982.