Proposals for experimental verification of the origin of the cosmological red-shift

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Abstract

We have two conflicting hypothesis about the origin of the cosmological red-shift. Hypothesis A: The red-sift is caused by the relativistic Doppler effect due to the expansion of the Universe (Hubble law). Hypothesis B: The red-shift is caused by the lost of energy of photons during the travel from the source to the observer (Bellert's law). The paper presents propositions of experimental validation of B. Proposition No.1, is based on the paper: S L Hahn, Possible experimental verification of Bellert's red-shift law using the Cosmic Background Radiation, Astrophysics and Space Science, vol.345, No.2, 2013, pp.363-366. Satellite missions confirmed that MBR is isotropic and has Planck spectrum of temperature 2.725 K. However, assuming the validity of Bellert's red shift law, it was shown that the temperature 2.725 K corresponds to a summation of radiations of a temperature about 3.5 K reaching the observer from all directions of the observable Universe. In a project submitted to ESO (code 2013.1.00936T, date 2013-12-05, not accepted) the author proposed to verify the hypothesis B using radio-astronomy observations of the dark Moon. The Moon is not transparent for mm wave MBR. Therefore, if an antenna located at Earth would detect in the cone defined by a point on Earth and the circle of Moon's radius, a radiation of temperature 3.5 K, the Bellert's law would be confirmed. Note that the dark Moon has a temperature of about 160 K. Therefore, the eventual detection of a radiation of 3.5 K would be possible only by application of statistical methods. Proposition N.2: A signal generated by a highly stable laser frequency standard should be transmitted in vacuum along a large distance *d* and compared at the receiver site by a second frequency standard to obtain a beat frequency. For a distance from Earth to a geostationary satellite, the beat period equals about two hours and for a distance from Earth to the Moon equals few minutes. The above experiments require the application of two laser frequency standards. Another possibility is to use the existing LIGO arrangement (Large Interferometer Gravitational Observatory). The laser beam in a vacuum tube 4000 m long is circulating 100 times. This corresponds to a value of d = 8000x100=800000 m =800 km, i.e. much less as the distance to the geostationary satellite. However, since the measurements can be repeated many times, there may be a chance to detect a very long beat period. In the case of LIGO, no second frequency standard is required.

Biography

Stefan L Hahn is a Retired Professor of the Warsaw University of Technology since 1981 and a Full Member of the Polish Academy of Sciences and a Life Senior Member of IEEE. He is the author of several papers printed in USA, Poland and Germany. He is the author of the book, "*Hilbert Transforms in Signal Processing*" (ArtechHouse 1986) and the coauthor of the book, "*Complex and Hypercomplex Analytic Signals: Theory and Applications"* (ArtechHouse 2016). He is the author of the extension of Gabor's analytic signals to higher dimensions (Proc. IEEE, 1992). He is also the author of a paper about the origin of gravitation (jmp.2015.68117).

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