

SOME SERVICES OF THE TIME AND FREQUENCY DIVISION  
OF THE NATIONAL BUREAU OF STANDARDS

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ABSTRACT

The Time and Frequency Division of the NBS provides several services to the general public. The radio broadcasts of WWV, WWVH, and WWVB supply reliable, unambiguous time signals to many, many users, if at a modest level of accuracy. Surprisingly, the NBS telephone time-of-day service also attracts several hundreds of thousands of calls each year. Periodically, the NBS provides courses on specific topics relating to time and frequency technology. In March 1974, the NBS will hold a general course on time and frequency. In addition to numerous technical papers published each year, the NBS has prepared the first volume of a comprehensive monograph on time and frequency which is at the printers now and is scheduled for delivery in January 1974.

The results of research in the Time and Frequency Division of the NBS have had significant impact. An active TV time system capable of serving most of the U.S. currently awaits a ruling by the FCC on a petition filed last year on behalf of the NBS by the Department of Commerce. Three more recent developments are: (1) a TV frequency comparator (patent applied for); (2) a method to perform an independent (absolute) frequency evaluation of commercial cesium beam oscillators; and (3) a method of removing one source of frequency drift in commercial cesium beam oscillators.

QUESTION AND ANSWER PERIOD

DR. WINKLER:

Now, we have time for one or two questions. Any questions right now?

DR. ALLEY:

In one of the earlier slides, a footnote referred to a small correction for the gravitational shift. Could you explain just what was done there in a little more detail, please?

DR. BARNES:

The assumption was that Boulder being about one mile above sea level, we should be providing a frequency offset due to the gravitational red shift of about 2 parts in 10 to the 13th, 1.8 I believe is correct.

Our comparisons are made, in effect, via Loran-C to the BIII and other laboratories. Since we are located in elevation of the order of two kilometers, one and a half kilometers above them, there should be a gravitational red shift amounting to about 1.8 parts in 10 to the 13th, which was accounted for.

DR. WINKLER:

I think Dr. Smith of RGO has a question.

DR. SMITH:

Thank you.

I was very interested in Dr. Barnes' account of the investigations which are being made of the factors affecting the frequency of the Hewlett-Packard standards.

Now, I am told by one of our electronic experts that the frequency of our standard is affected by the harmonic generator level and therefore recently we have adopted the practice of adjusting the harmonic generation level to a value where the affect of changing of level has a minimal affect on the frequency.

And I wonder if Dr. Barnes has found a similar affect, and whether he would like to comment? Thank you.

DR. BARNES:

It is true, I believe, that we at the Bureau of Standards, in our work, do see frequency changes which are due to the microwave power level, depending on the excitation.

This is what one would expect, in fact, it is due to two effects. The power level will affect the velocity distribution that is important in the transition, and hence if there is any cavity phase shift in the cavity itself, this will manifest itself as a frequency dependence on the power level.

This is an important thing in evaluating a primary frequency standard, and if you are interested in pursuing that, I would say talk to Helmut Helwig, who can give you much more detail on the matter.