

SYSTEMATIC EFFECTS IN GPS TIME TRANSFER

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ABSTRACT

Values of the differences between the USNO Master Clock (MC) and GPS and Space Vehicle time obtained from horizon to horizon tracking of a satellite are examined in order to discover the existence of systematic effects. Differences between the transmitted satellite ephemeris and a batch-processed ephemeris will be compared with the time transfer data to see if correlations exist. In addition, simultaneous common-view time-transfer data will be inspected for systematic effects.

(ABSTRACT ONLY)

PAPER NOT SUBMITTED

QUESTIONS AND ANSWERS

PROFESSOR ALLEY, University of Maryland

Where will the new stations be?

MR. W. J. KLEPCZYNSKI, U.S. Naval Observatory

I don't know exactly where they are going to be. I saw a list of about 10 or 12 distributed geographically throughout the world, but don't ask me for an exact location right now.

MR. R. J. MCCONAHY, JHU/APL

In the SATRAK system we have had a considerable amount of experience with the GPS ephemerides, and we do use the Dahlgren batch fit ephemerides for our processing and we can confirm what you have observed here. However, the big effect is the upload time, that is, the time from the injection of the message into the satellite to the time in which you read it out. They actually take their Kalman filter and make a prediction over about a 26-hour span, and this is then uploaded into the satellite and read out from the memory of the satellite into the navigation message every hour, and that is what you are seeing, so what it does is degrade with time. If you would look at this rather close to an upload time, I think you would see quite different characteristics.

The other thing is that Dahlgren can produce for you a fit not only to the ephemeris but to the clock. In other words, they can produce a joint fit to both the clock coefficients and the ephemeris, and I think if you would use that you would see even less dispersion, probably, than you saw in your own plots.

Thank you.

MR. W. J. KLEPCZYNSKI:

Well, one of the aspects that we are interested in is using GPS as a real time distribution system.

MR. MCCONAHY:

Yes, I understand that, but in order to analyze exactly the way the ephemeris enters into your errors and corrections, I thought that --

MR. KLEPCZYNSKI:

Okay, okay.

MR. R. CRUTCHFIELD, IBM Corporation

We have the contract for the GPS control segment. One gentlemen asked the question where the new monitor station sites are going to be: Diego Garcia, Kwajalein, Hawaii, Colorado Springs, and Ascension.

I wanted to make another point on your first slide, where you mentioned that by January 15th 1983 they are going to change to the new NAV method. Actually, our plan is on December 28th to remove the long-term bias and drift from the clock that you saw, all the charts had bias and drift on them, but by January 15, you're right, that's when we will go to the new NAV method.

Now one other question I wanted to ask you; I find your results quite interesting, did you look at multipath as a possible problem?

MR. KLEPCZYNSKI:

No.

MR. CRUTCHFIELD:

We noticed with the receiver we had in Gaithersburg that multipath would give you a quite repeatable pseudo-range error every day, it will look the same every day.

MR. KLEPCZYNSKI:

Yes. Okay, but the comparison between the two ephemerides doesn't depend on that.

MR. CRUTCHFIELD:

Yes, I agree. That seems to rule that out.