

**THE FREQUENCY AND TIME PROGRAM  
AT THE JET PROPULSION LABORATORY**

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**(PAPER NOT AVAILABLE FOR PUBLICATION)**

## QUESTIONS AND ANSWERS

DR. STEIN:

On your last slide you showed time synchronization requirements that varied in the 10 to the minus 14 to 10 to the minus 15 and I was wondering where the frequency stability requirement for 10 to the minus 15 comes from? For what applications?

DR. SYDNOR:

There are differences as we have seen in the past between requirements, desires, and needs. And this is probably the minimum that the frequency, the time synchronization people will accept. The three parts in 10 to the 16th is what they need to get the residuals down to a level where they are not bothering their solutions too greatly. At this point the major error source is the frequency standard as I understand it.

DR. STOVER:

What concerns me is whether you are putting one of these block diagrams at each station or is that the one at the Jet Propulsion Lab?

DR. SYDNOR:

This is at each station. At least at each of the major stations. Some of the minor stations have a somewhat reduced set of blocks in the block diagrams.

DR. STOVER:

You showed a present requirement of Observatory or Bureau of Standards time as being 50 microseconds and your next was just a few nanoseconds. There are three orders of magnitude difference there. Why is that?

DR. SYDNOR:

There is a difference there between the precision that we need to synchronize our various stations and the precision that we need to know absolute time, epoch. And if you look at the 10 nanoseconds, that is an internal problem. While on that same slide the need to know epoch time was like 100 nanoseconds in the same timeframe. And it is true that between now and five years from now there are three orders of magnitude difference, but right now we are working on that other one. And we have some results which you will hear later about how well we are doing.

**QUESTION:**

You mentioned going exclusively to the 36-bit NASA code. Is this something that is absolutely going to happen and if so, what would be the earliest possible time in years?

**DR. SYDNOR:**

Well it is not absolutely going to happen. This is something that we are considering at the moment. With this great number of codes, especially with the binary codes with the 50 lines going out all of the places, it is prone to a lot of failure. We would like to standardize our equipment so we don't have the spares and the maintenance problems, and simplify everything. We think it will happen. If it does happen, it will be 5 years downstream.

