jpl

3557-79-017

TO R. E. Covey SEC. 365 DATE March 15, 1979

FROM R. J. Wallace SEC. 355 EXT. 4734

SUBJECT Summary of IRTF Servo Loop Testing

This IOM is to summarize the results of the servo loop testing of the IRTF that has been completed to date. These tests include the open and closed rate and position loops for both axis and an estimate of the tracking error. The results are only summarized here because the actual data was left with Gerry Smith in Hawaii. Also final tracking error data will be taken after some minor problems with noise and deadband are resolved.

The lowest structural frequency was measured at 3.5 Hz in HA and 8.5 Hz in Dec. The finite element model used by John Garba and his group predicted these frequencies at 3.9 and 7.5 respectfully. This 10 to 13% spread is reasonable considering that the model was not updated for the changes made during final design. A larger variation however was found between the measured HA structural frequency and a frequency of 5.2 Hz predicted from a simplified mass-spring condensation of the finite element model used for servo loop analysis. The cause of this variation should be better understood to enhance the validity of future modeling activities of this type.

The model used for servo analysis also indicated a resonance at 2 Hz because of the soil and foundation. The effect of this resonance was not visible in the data that was taken either because the soil is stiffer or the quality of the response data was poor. A set of accelerometers was left at the site in hopes that Gerry Smith and the U. of H. personnel will have time to conduct series of additional tests to resolve this question.

The closed loop bandwidth of the rate loops was measured at between 70 and 100 Hz in both axis. The position loop bandwidth was set between 1.5 and 2 Hz in Dec. and between .5 and .7 Hz in HA. The lower position loop bandwidth in HA reflects the lower structural frequency. As predicted the step response settling time specification can be satisfied in Dec. but not HA. The tracking error specification can be met in both axis in the present configuration and should be improved after the clean up of the noise and deadband problems are completed.

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