

REPORT 2C

**Simulations of the GBT Antenna  
with the Command Preprocessor:  
Approximations from 100 ms to 20 ms Sampling**

by

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In the Report 2A we simulated the performance of the antenna with the command preprocessor CPP-B for the sampling period  $\Delta t = 20 \text{ ms}$ . The command, however is transmitted to the antenna servo every  $100 \text{ ms}$ , and the value of the command for the next four samples is approximated. The approximation is as follows. Let the command  $r(t_0)$ , along with its rate,  $v(t_0)$ , and the acceleration,  $a(t_0)$ , are given at the time  $t_0$ . At the next four time samples,  $t_0 + \Delta t$ ,  $t_0 + 2\Delta t$ ,  $t_0 + 3\Delta t$ , and  $t_0 + 4\Delta t$  it is computed as follows

$$r(t_0 + i\Delta t) = r(t_0) + v(t_0)i\Delta t + 0.5a(t_0)(i\Delta t)^2, \quad i=1,2,3,4 \quad (1)$$

The question arisen, how the approximation of the pre-processed command will impact the antenna performance during slewing of 1 deg and 10 deg.

The simulations were performed for this scenario, and the results are shown in the Fig.1 (1 deg step) and Fig.2 (10 deg step). Both figures show almost the same performance as for the pre-processed steps without approximations (compare with Figs.8b and 9b of Report 2A).

**Conclusion:** The approximation as in Eq.(1) should not deteriorate the performance of the antenna with the CPP-B preprocessor.

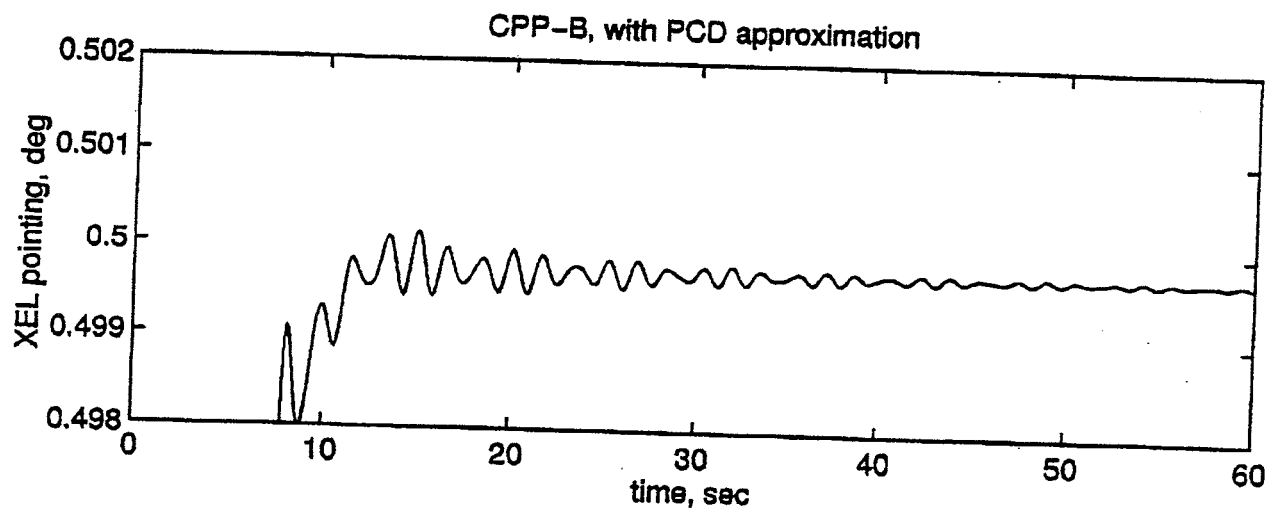


Fig.1. Cross-elevation pointing for 1 deg step command with the approximated CPP-B command.

Fig.1

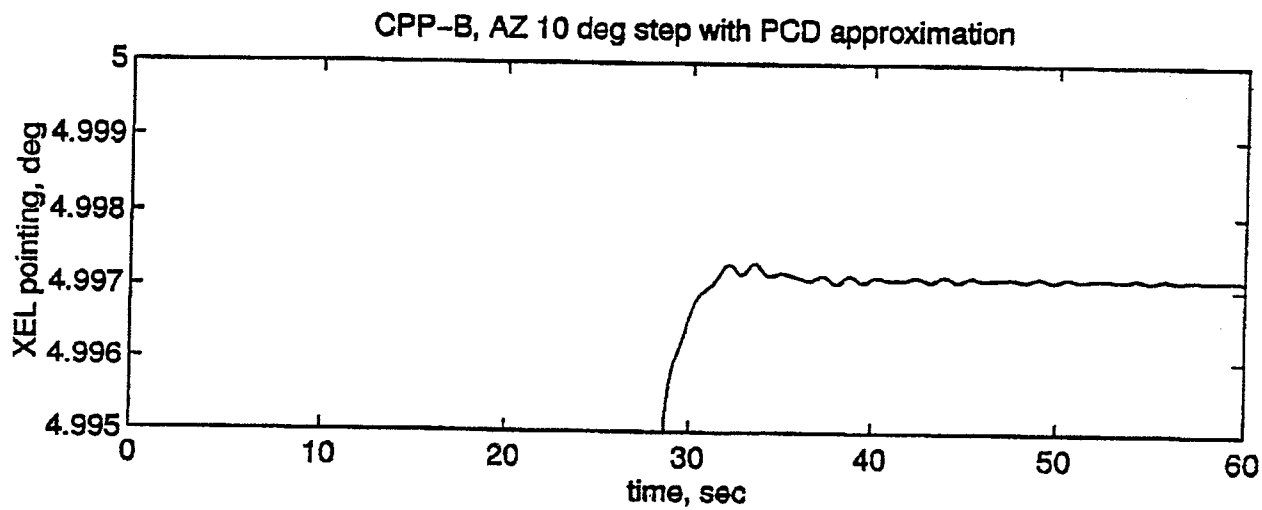


Fig.2. Cross-elevation pointing for 10 deg step command with the approximated CPP-B command.

Fig.2

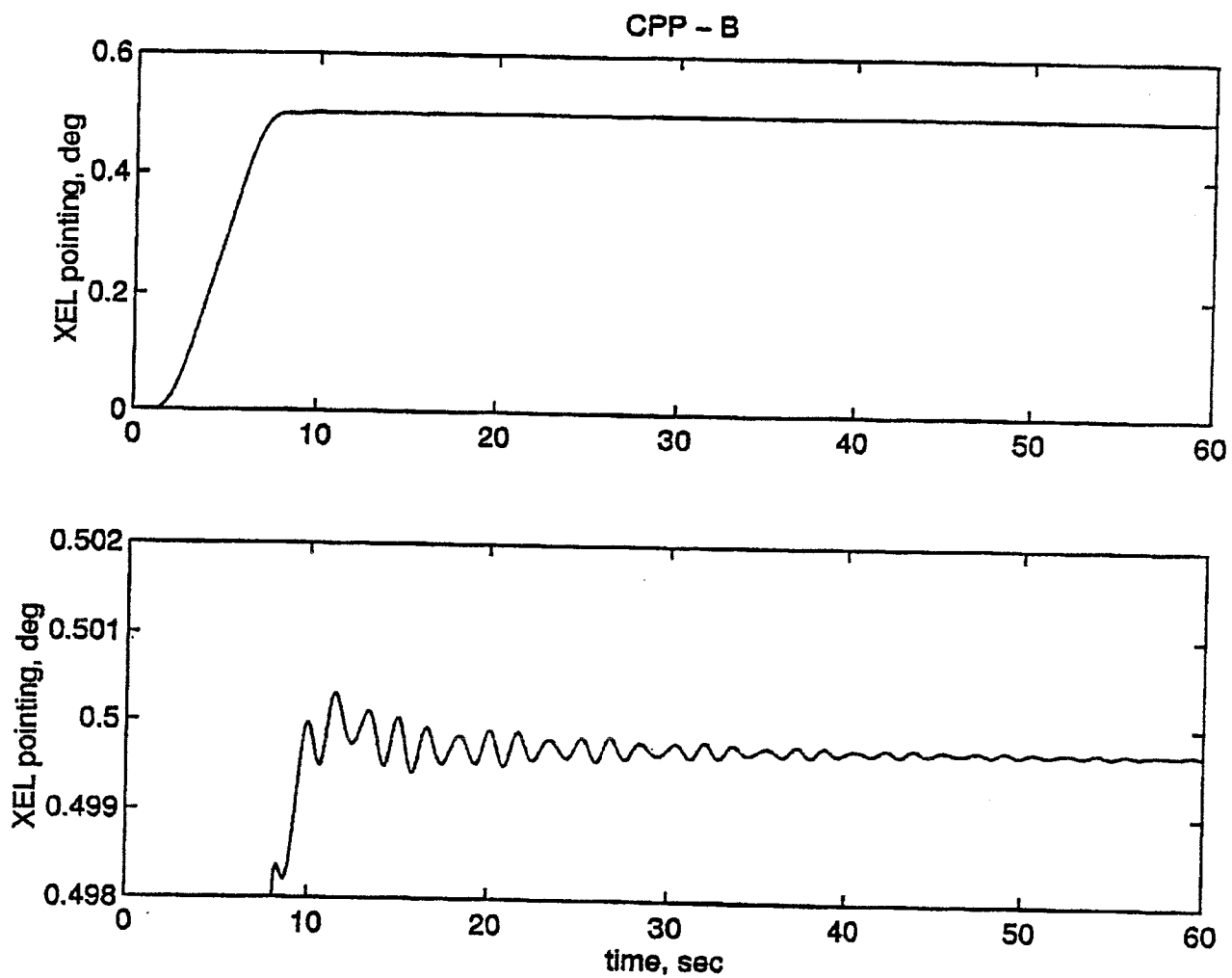


Fig.8. Cross-elevation pointing for 1 deg step command with the CPP-B preprocessor, a) full figure, b) zoomed figure.

Fig.8a,b

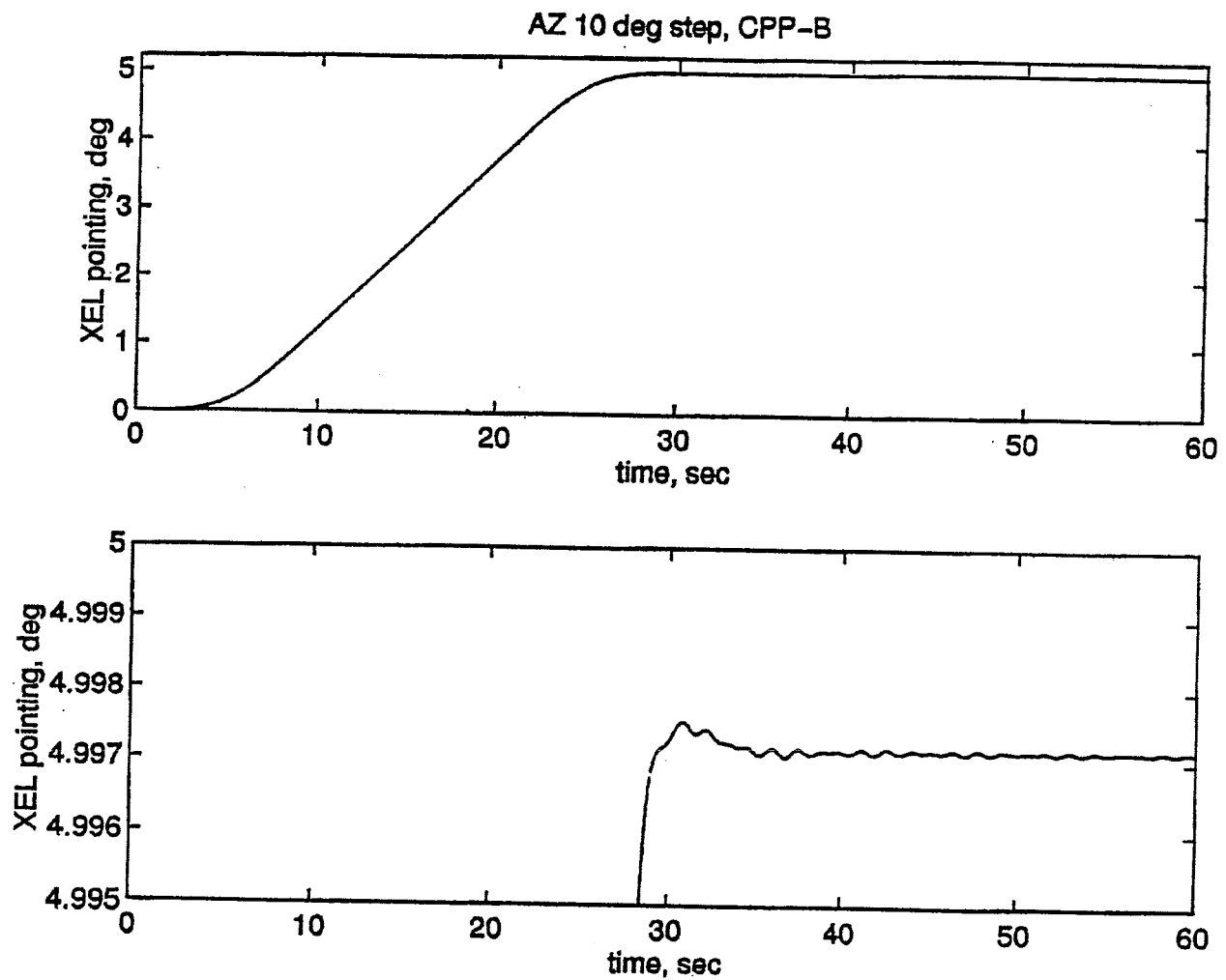


Fig.9. Cross-elevation pointing for 10 deg step command. with the CPP-B preprocessor, a) full figure, b) zoomed figure.

Fig.9a,b