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SOURCE EXCITATION OF AN OPEN, PARALLEL-PLATE WAVEGUIDE. NUMERIC--ETC(U)
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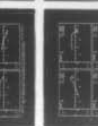
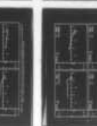
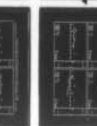
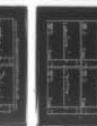
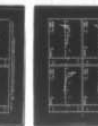
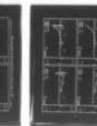
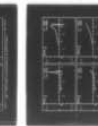
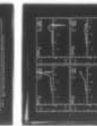
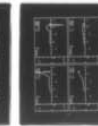
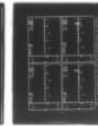
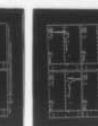
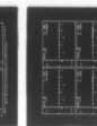
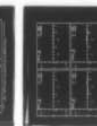
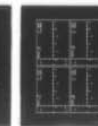
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ELECTROMAGNETICS LABORATORY
SCIENTIFIC REPORT NO. 78-13

October 1978

LEVEL III

SUPPLEMENT TO ELECTROMAGNETICS LABORATORY

REPORT NO. 78-4

(SOURCE EXCITATION OF AN OPEN,
PARALLEL-PLATE WAVEGUIDE. NUMERICAL RESULTS)

V. Krichevsky

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Electromagnetics Laboratory Report No. 78-13

SUPPLEMENT TO ELECTROMAGNETICS LABORATORY

REPORT NO. 78-4

6 SOURCE EXCITATION OF AN OPEN, PARALLEL-PLATE WAVEGUIDE. NUMERICAL RESULTS Supplement.

by

10 V. Krichevsky

9 Scientific Report

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SUPPLEMENT TO ELECTROMAGNETICS LABORATORY
REPORT NO. 78-4

beta

In Electromagnetics Laboratory Report No. 78-4, we have calculated the electromagnetic fields as functions of β , the normalized propagation constant in the z-direction. The parameters chosen for the computation in the report were:

$$\frac{H}{L} = 0.16670, \quad \frac{L}{\lambda_0} = 5, \quad \text{where } \lambda_0 = \frac{2\pi}{\omega\sqrt{\epsilon\mu}}.$$

At the request of Dr. D. Giri of SAI, we have now derived additional numerical results for the following choice of parameters, which correspond to those of the experimental parallel-plate structure being investigated at Harvard.

$$L = 12.5 \text{ m}$$

$$H = 12.75 \text{ m}$$

$$f = 25 \text{ Mny } (\lambda_0 = 12\text{m})$$

$$\frac{H}{L} = 1.020 ; \quad \frac{L}{\lambda_0} = 1.041667$$

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The propagation constant in the x-direction can be written in the form:

$$\alpha_n = \frac{\pi}{H} \frac{kH}{\pi} - m^2 \quad 1/2, \quad m = 0, 1, 2, \dots$$

where $k = k_0 \sqrt{1 - \beta^2}$, $k_0 = \frac{2\pi}{\lambda_0}$

$$kL \leq k_0 L = 2\pi \frac{L}{\lambda} = 6.544985.$$

The asymptotic analysis presented in our report 78-4 was based on the assumption ($kL \gg 1$). Consequently, great care should be exercised when the range of application of these formulas is extended below $kL = 10$.

It is not difficult to prove that in the range $0 < \beta < 0.337916$, only three modes are above cut-off in the x-direction. Furthermore, two modes are propagating in the range $0.337916 < \beta < 0.882353$ and only one mode can propagate in the range $\beta > 0.882353$. The application of the formulas and computer programs developed in Report No. 78-4, though not the theory itself, is restricted to the range where two modes can propagate in the x-direction. For this reason, we develop the numerical results only for the region $\beta \geq 0.34$, and specifically for the range

$$0.34 \leq \beta \leq 0.9.$$

We would like to mention that it is possible to develop the necessary formulas and numerical results for the region $0 < \beta < 0.34$ using the theory given in the Electromagnetics Report No. 77-19.

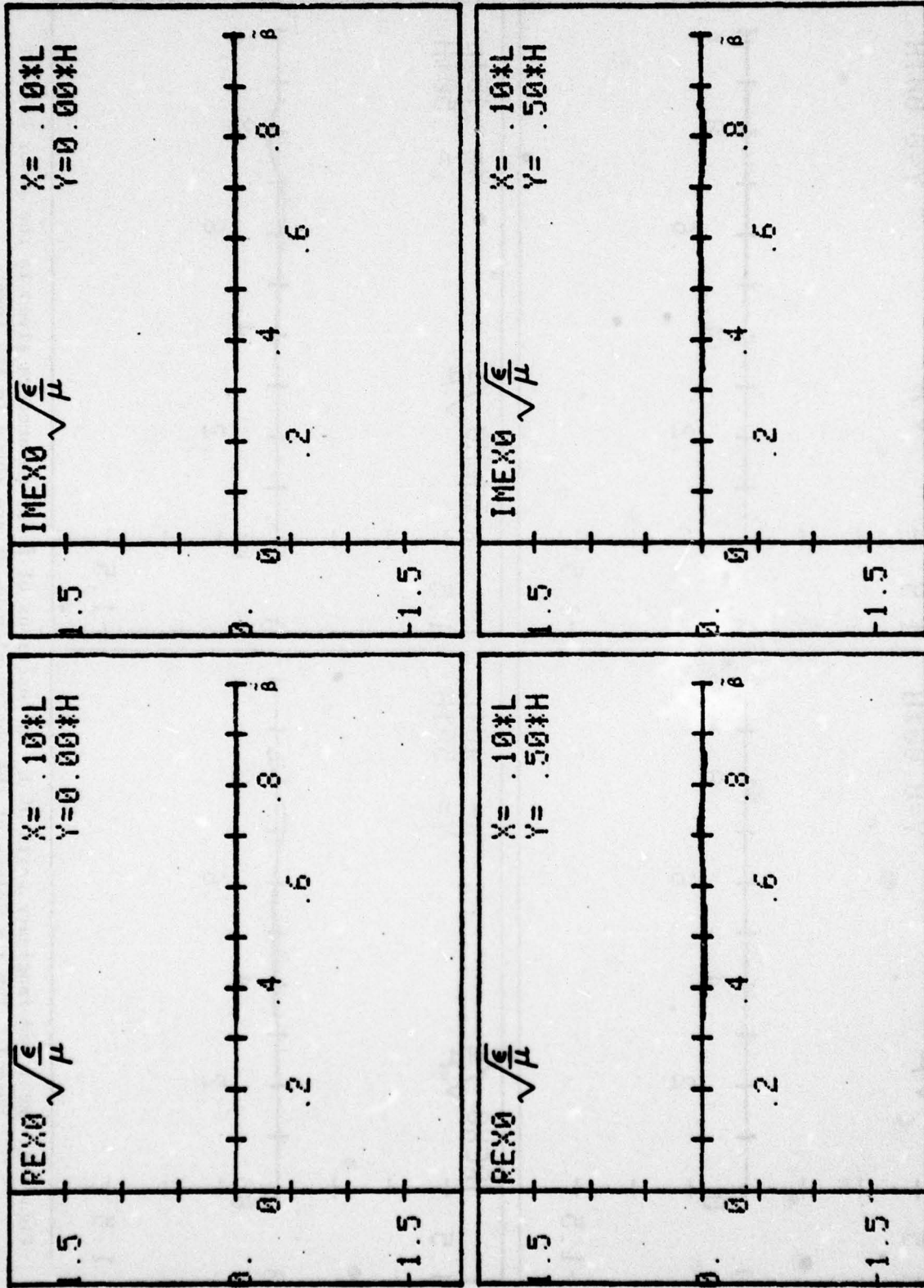


Figure 1. Real and imaginary parts of E , as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

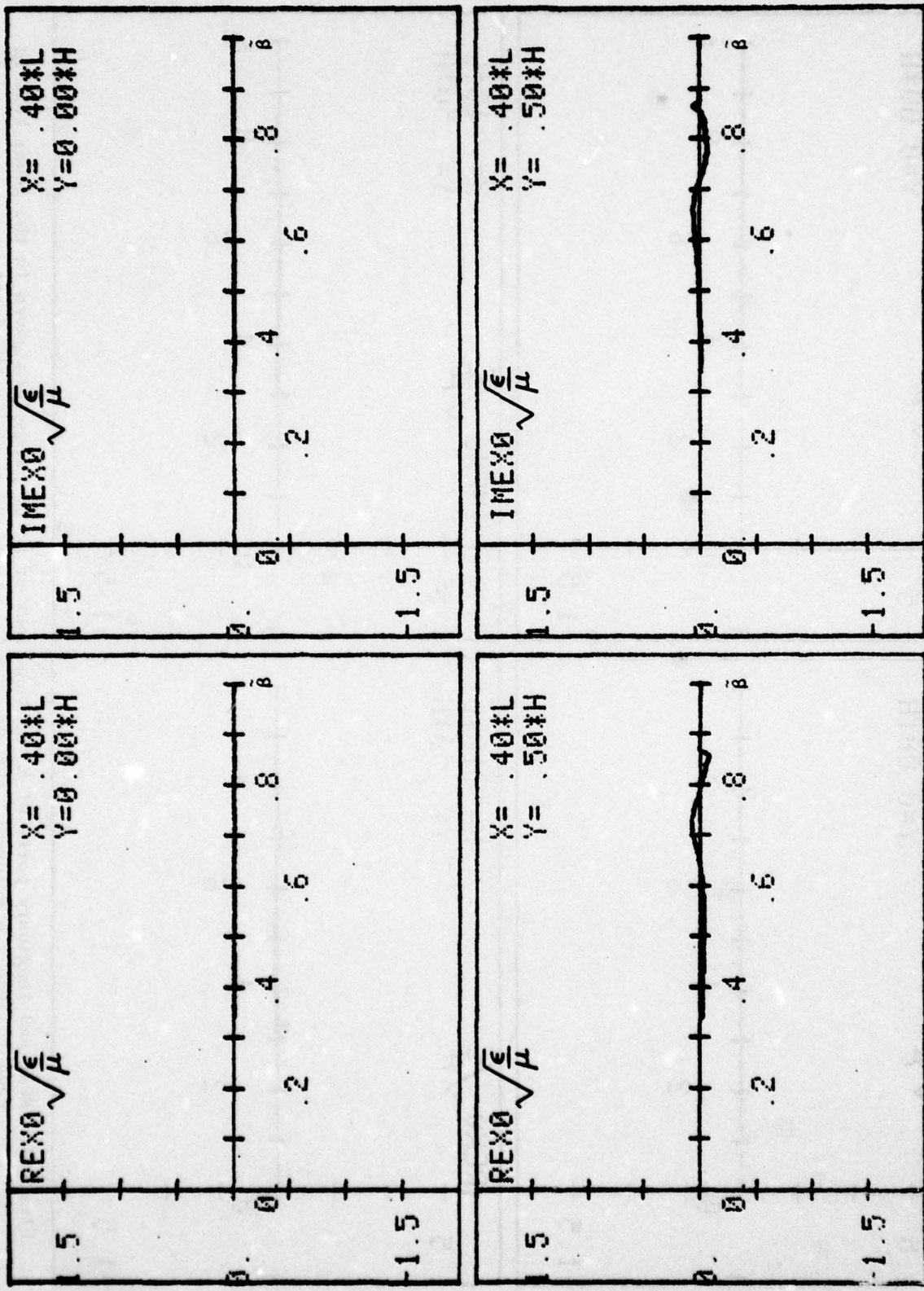


Figure 2. Real and imaginary parts of E as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

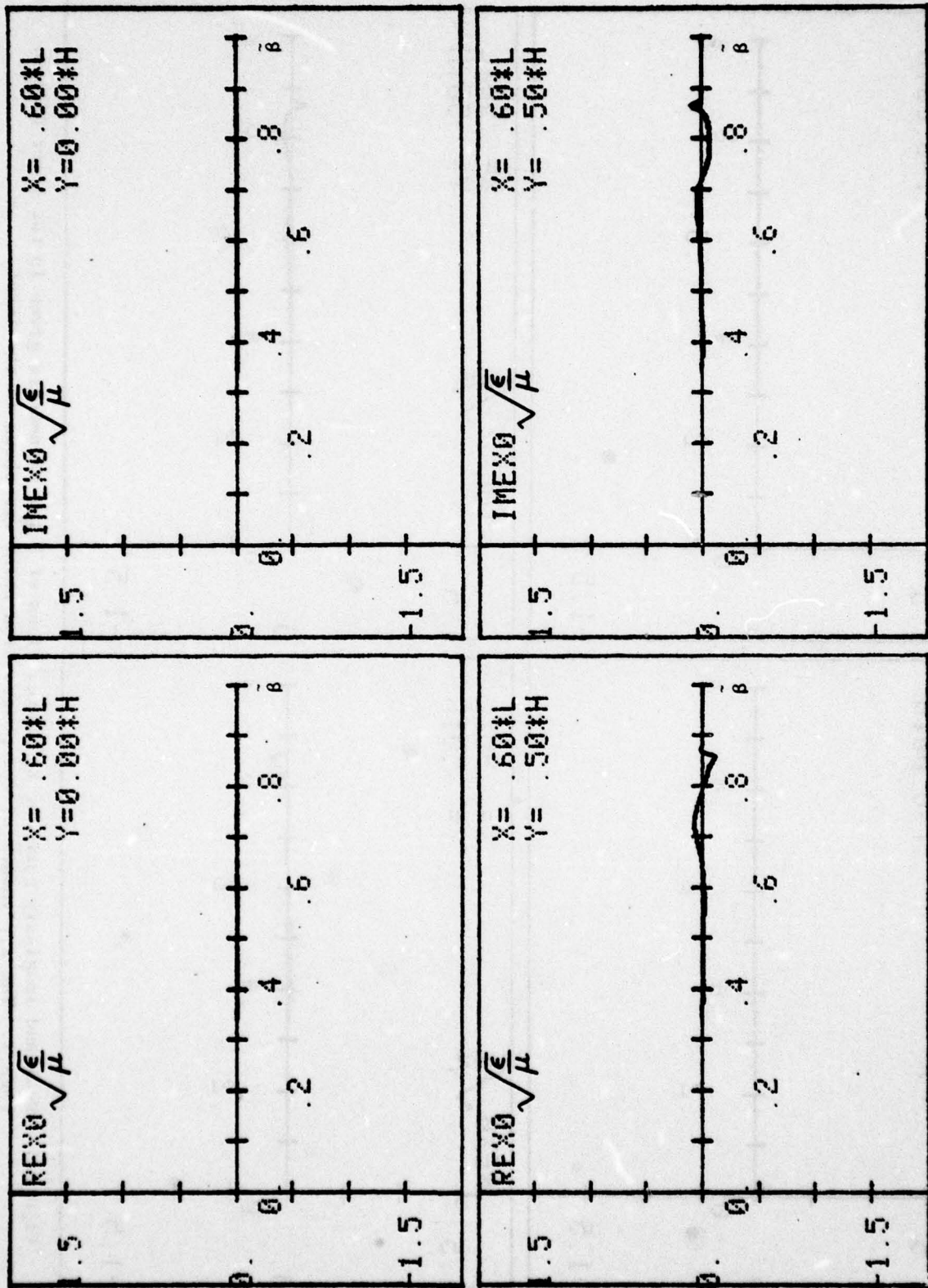


Figure 3. Real and imaginary parts of E_x as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

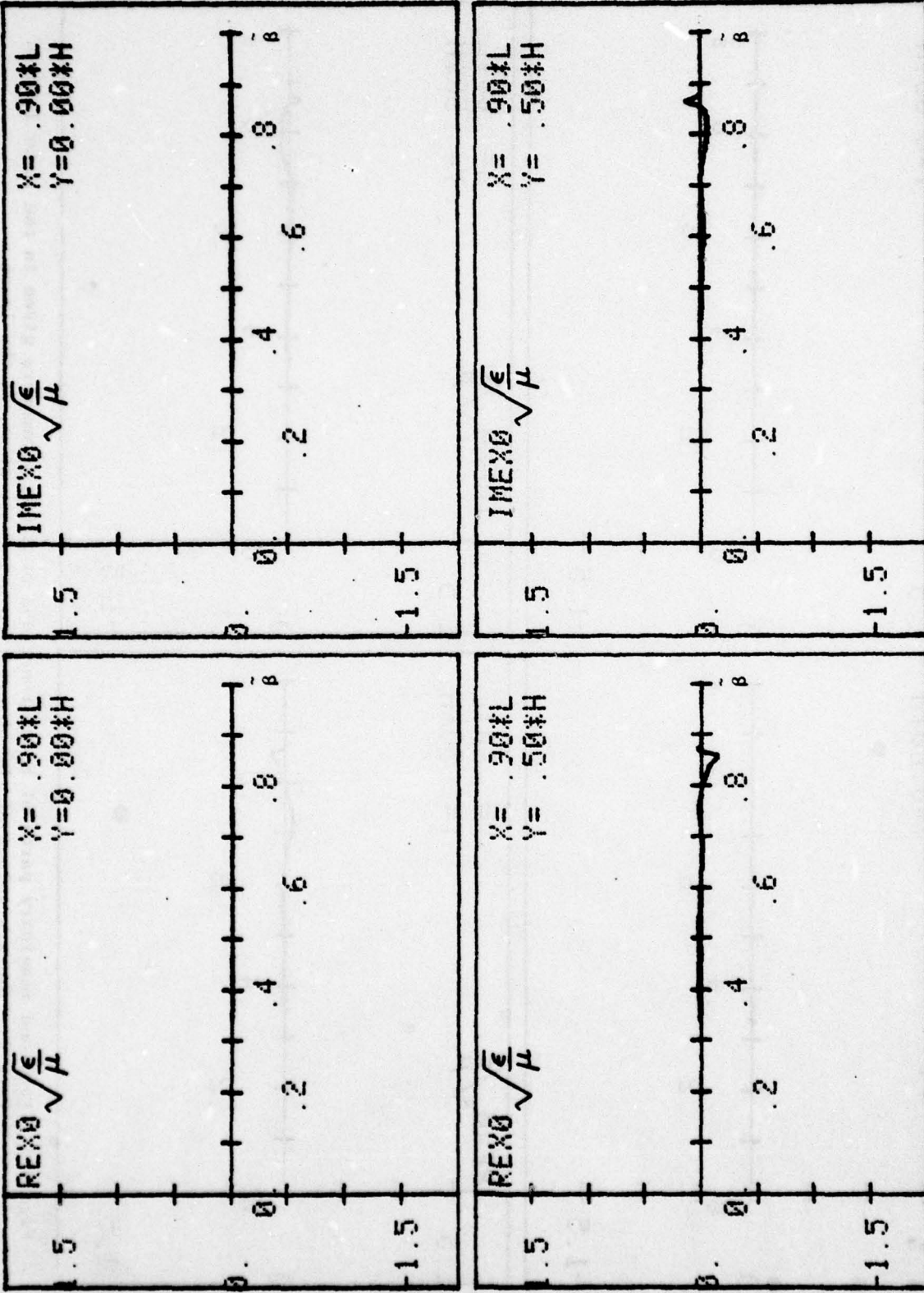


Figure 4. Real and imaginary parts of E_x as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

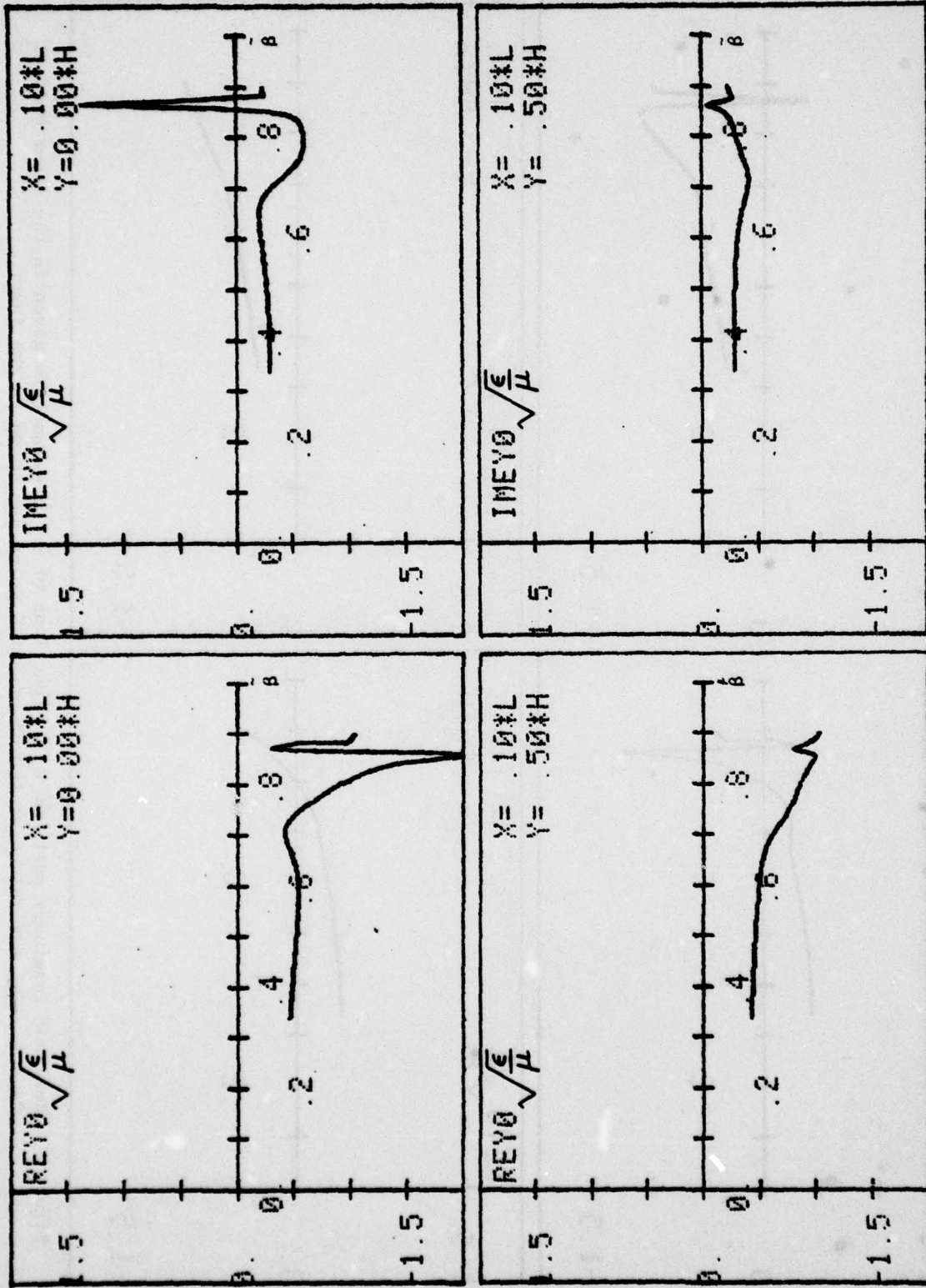


Figure 5. Real and imaginary parts of E_x as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

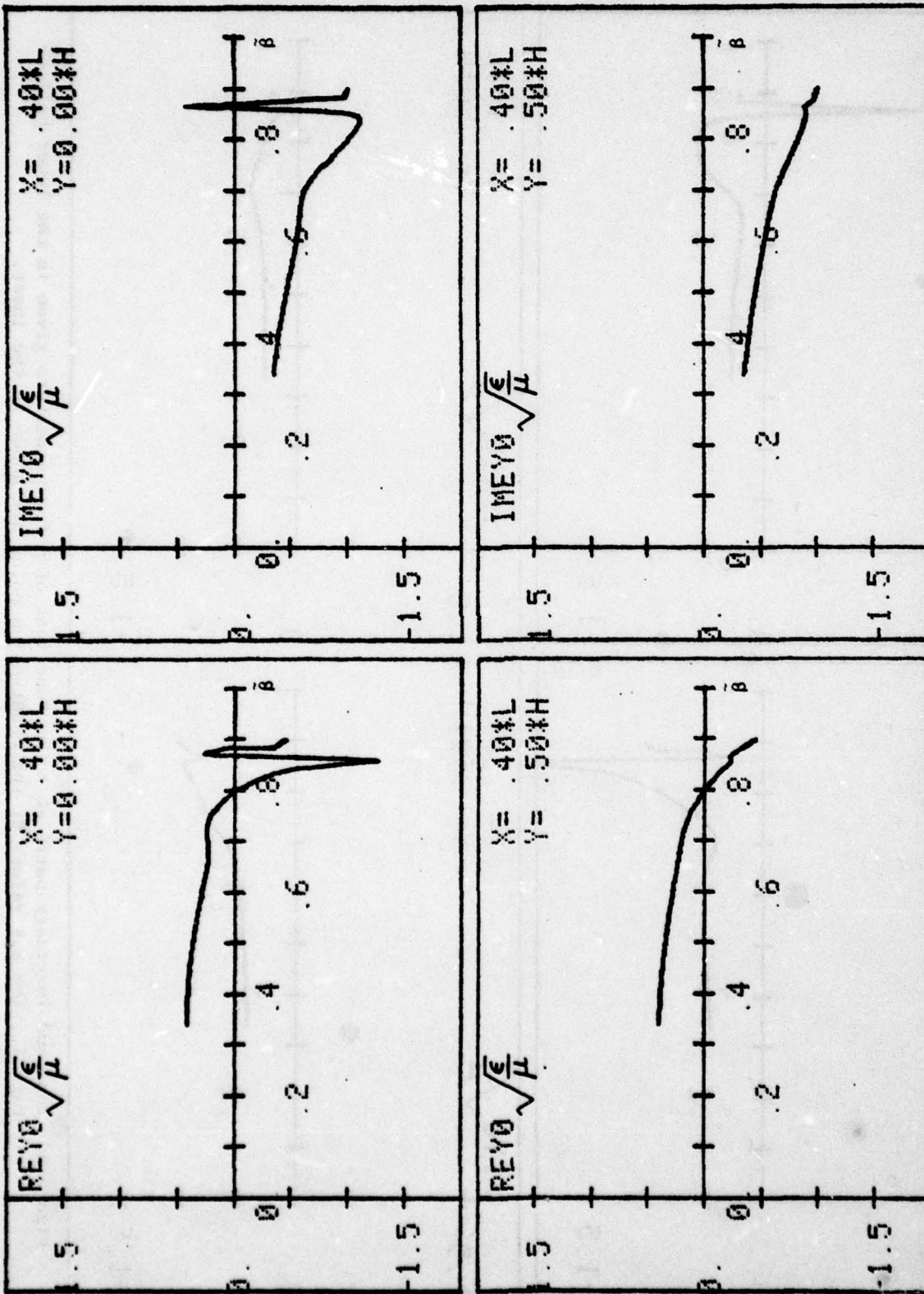


Figure 6. Real and imaginary parts of E_x as functions of β for parameters given in the lower half of Page 1. The x,y values of the observation point are shown in the inset.

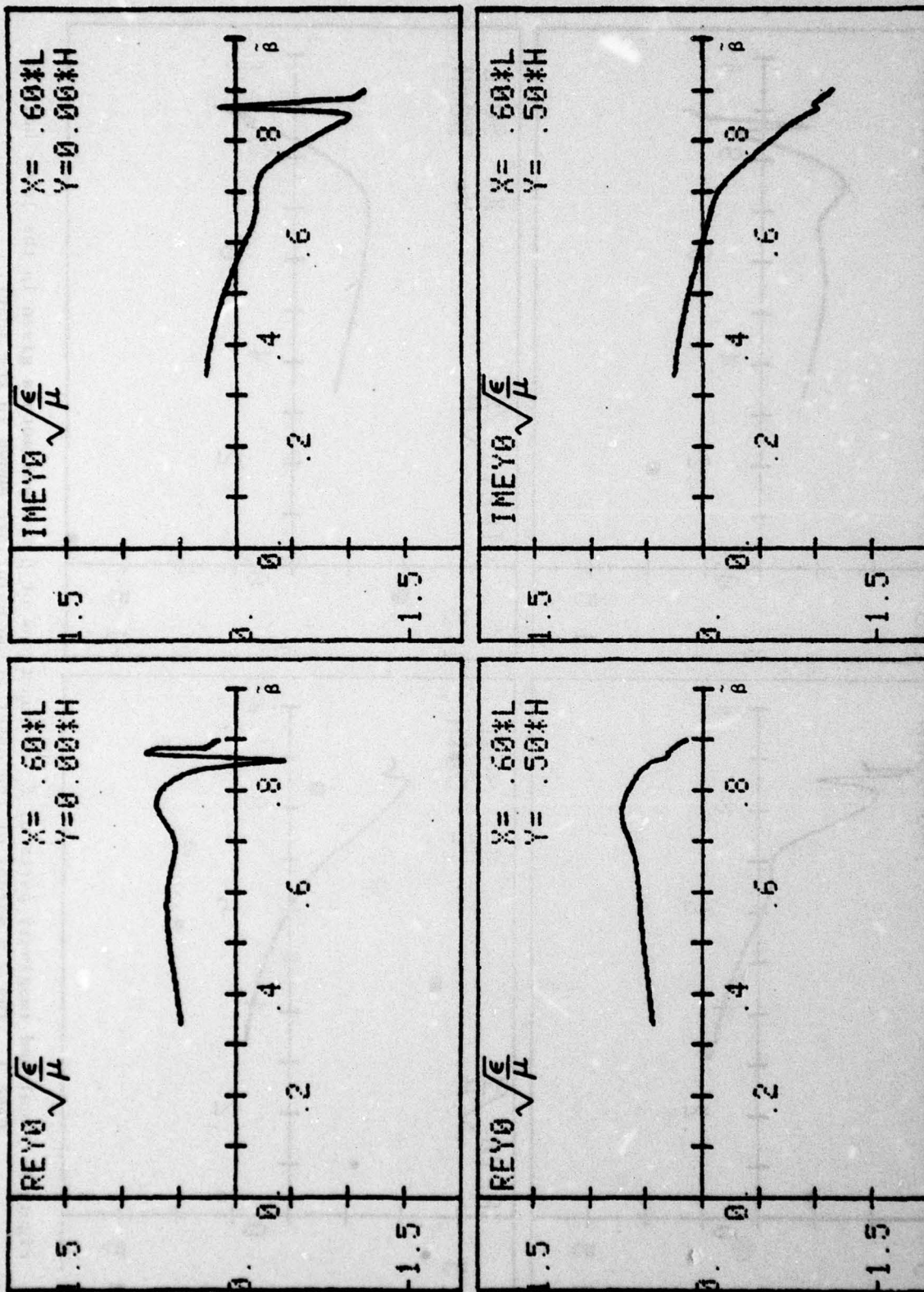


Figure 7. Real and imaginary parts of E as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

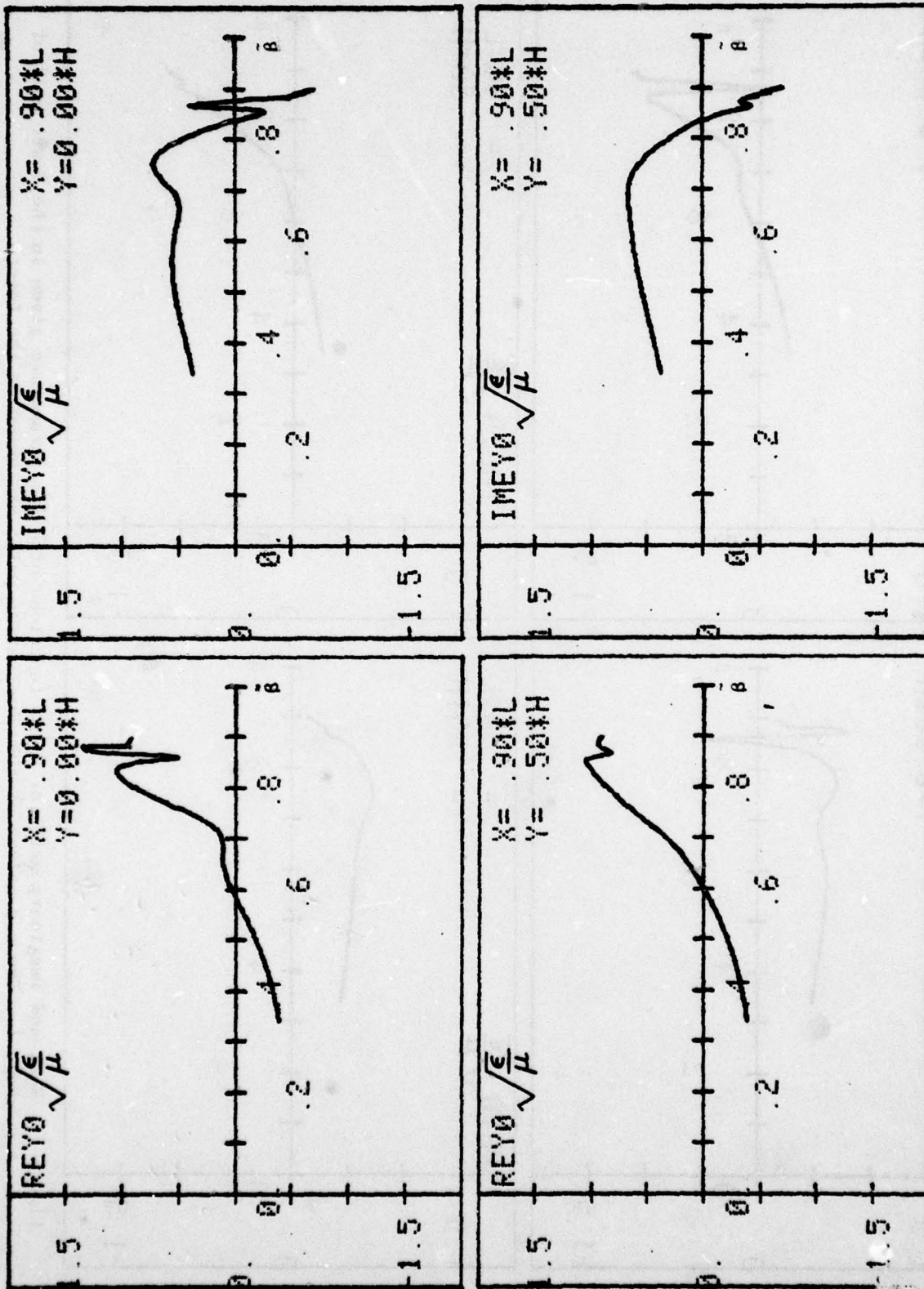


Figure 8. Real and imaginary parts of E_x as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

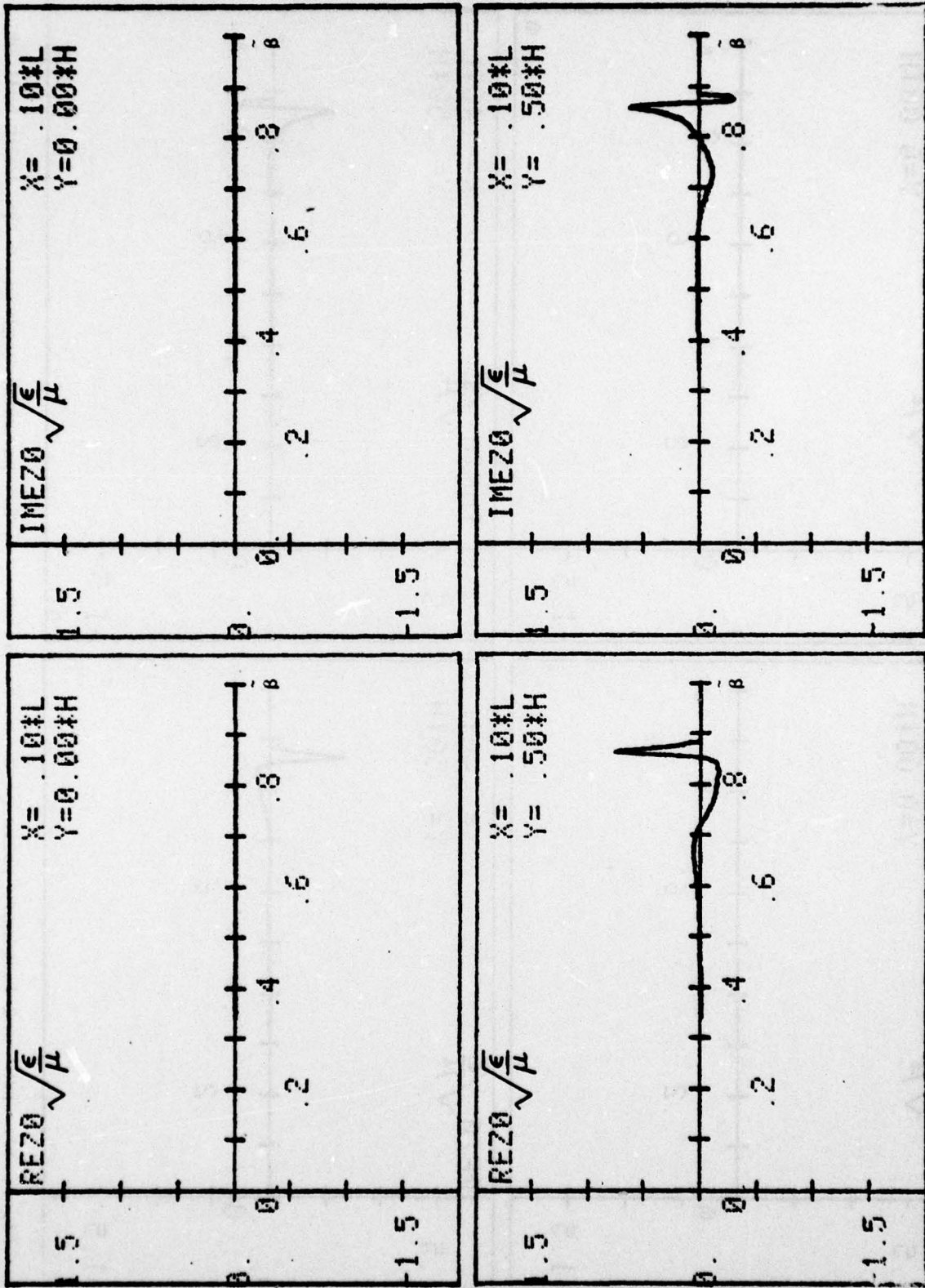


Figure 9. Real and imaginary parts of E_x as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

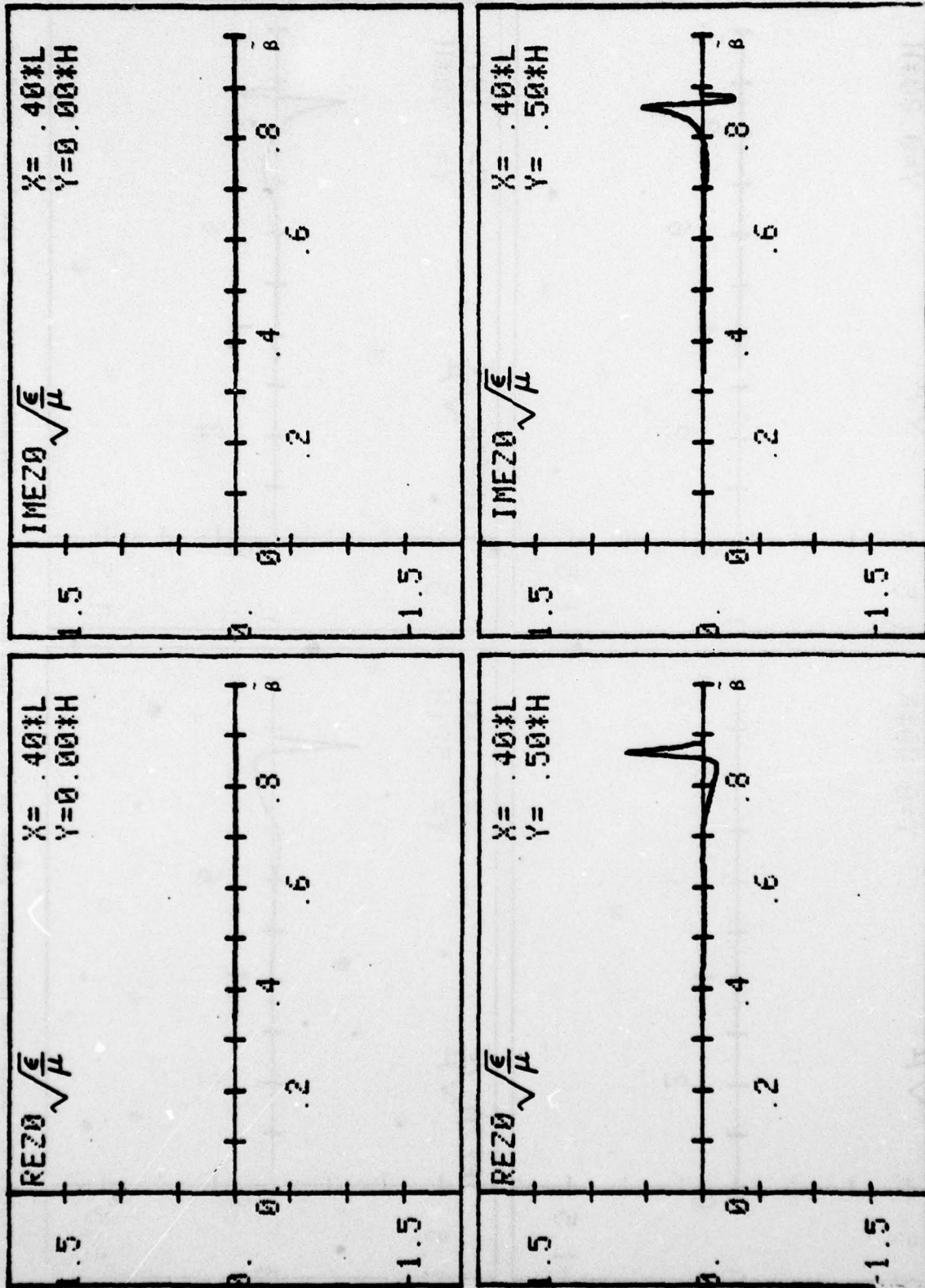


Figure 10. Real and imaginary parts of E_x as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

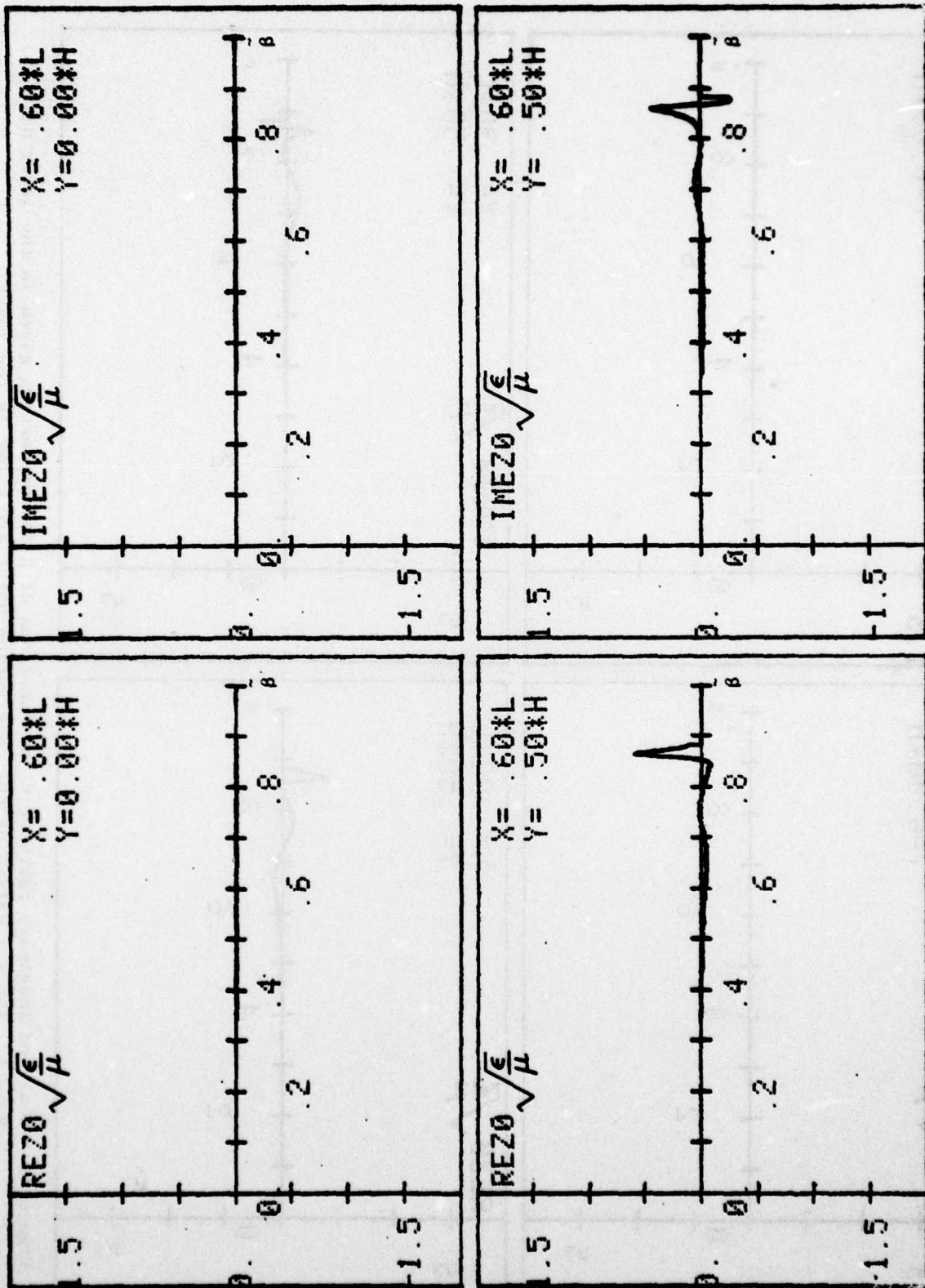


Figure 11. Real and imaginary parts of E_x as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

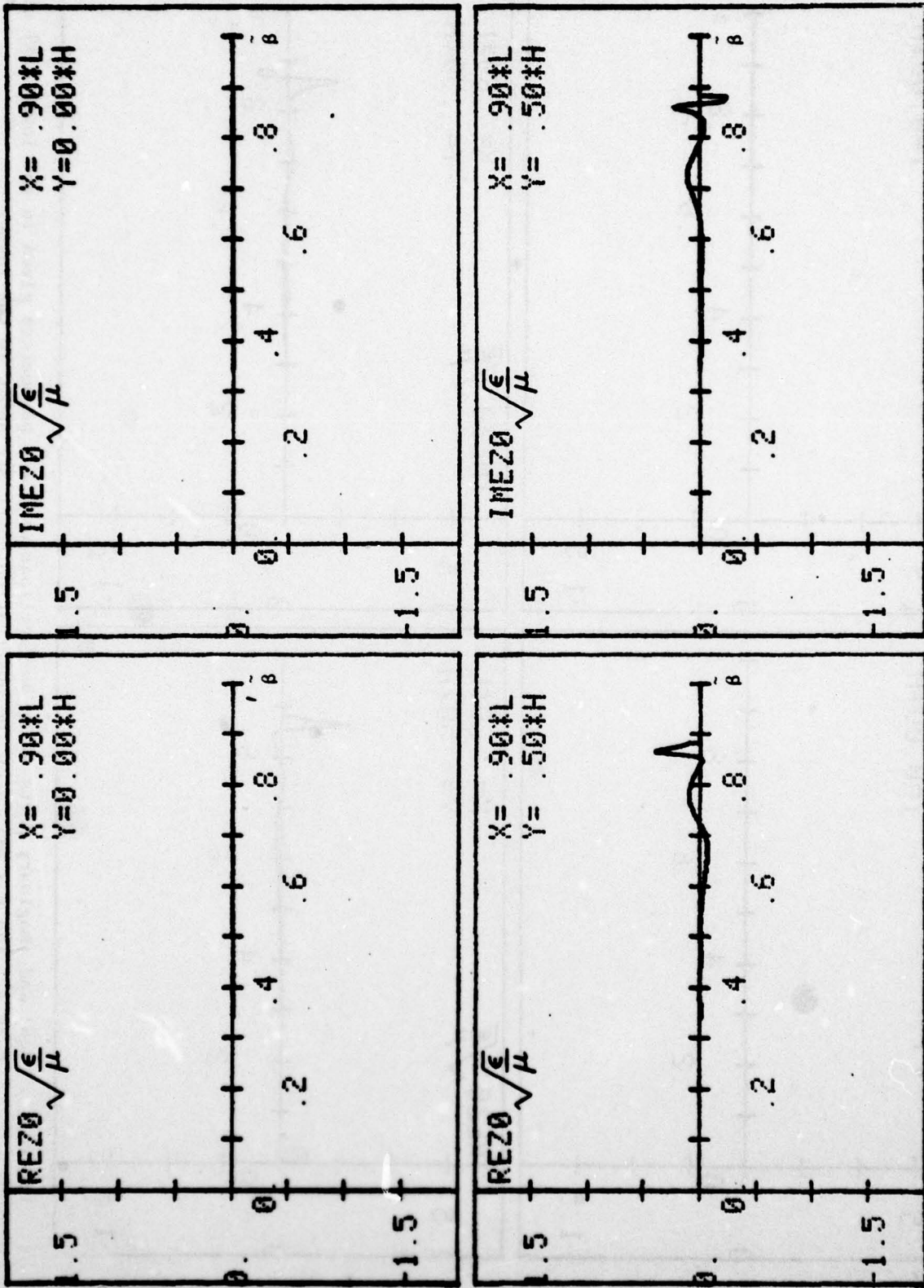


Figure 12. Real and imaginary parts of E_x as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

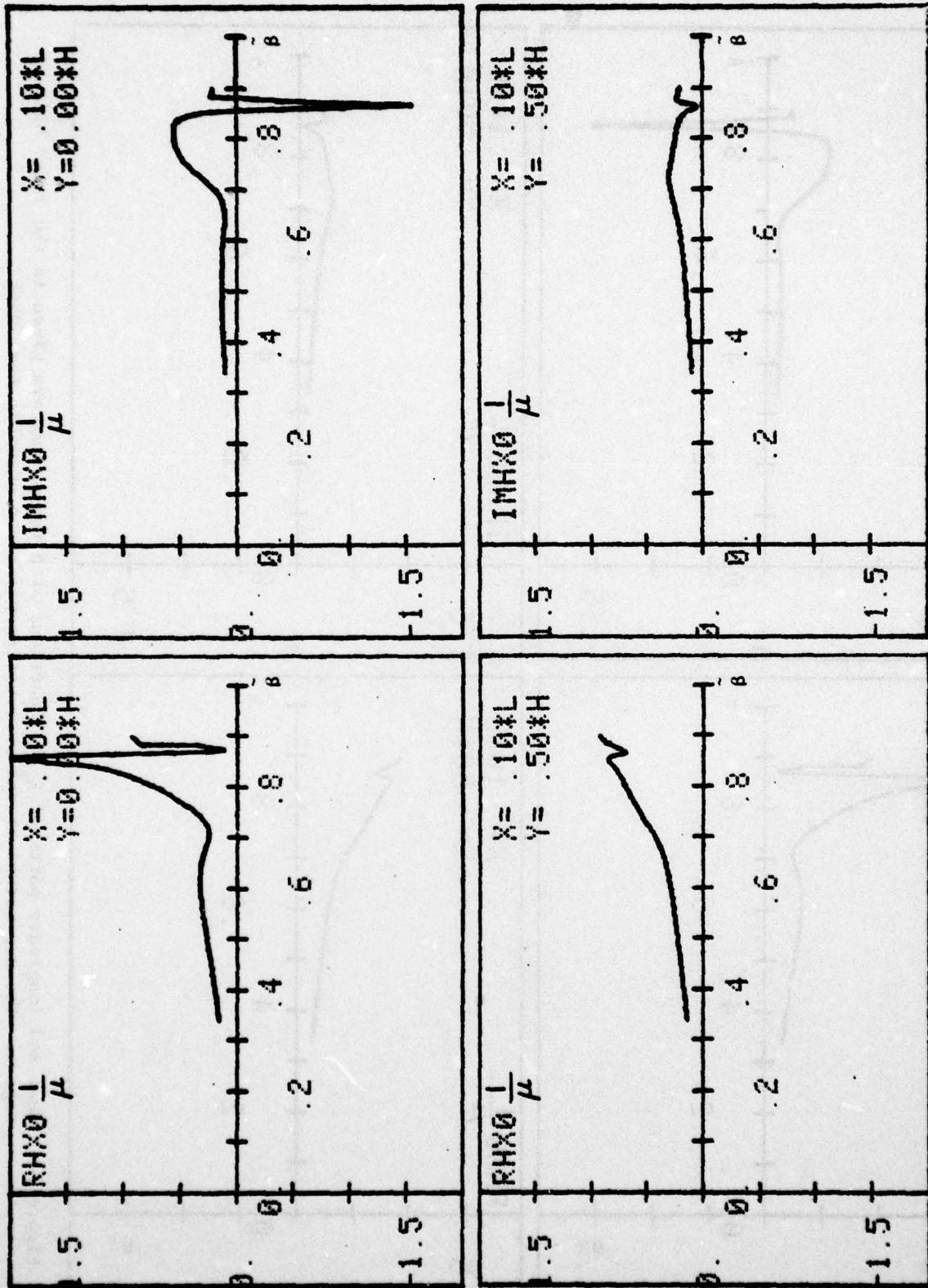


Figure 13. Real and imaginary parts of E_x as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

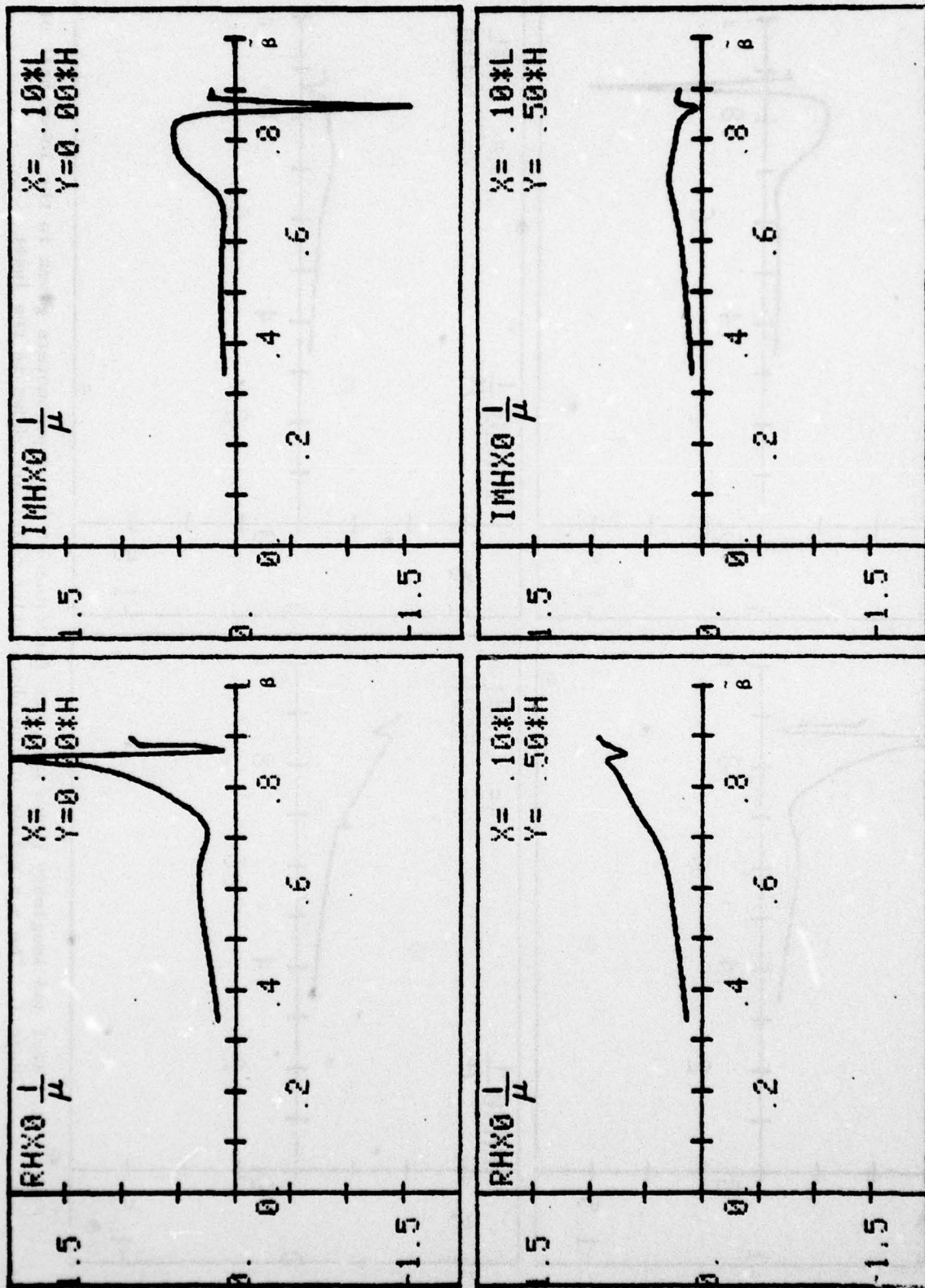


Figure 14. Real and imaginary parts of E_x as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

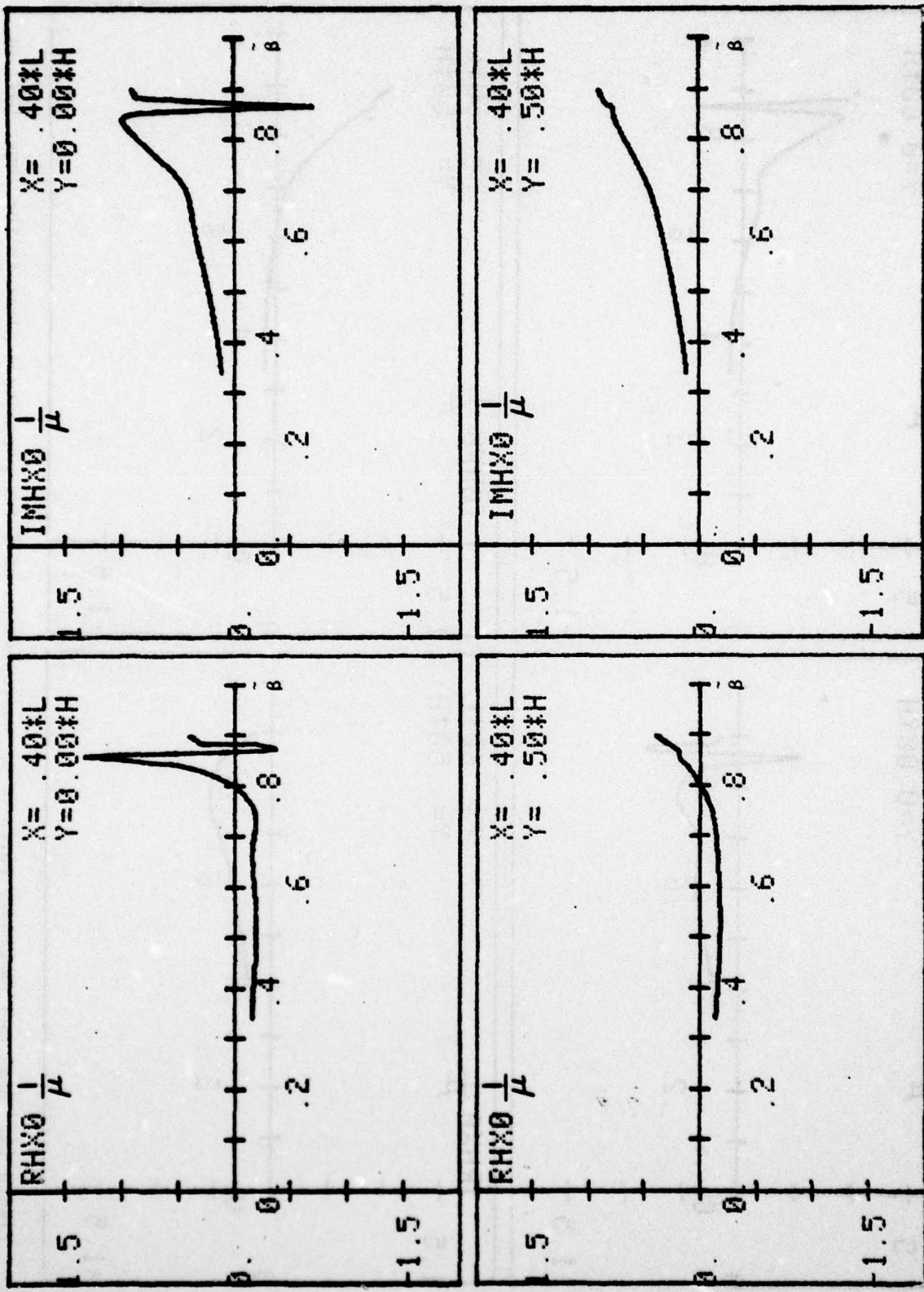


Figure 15. Real and imaginary parts of E as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

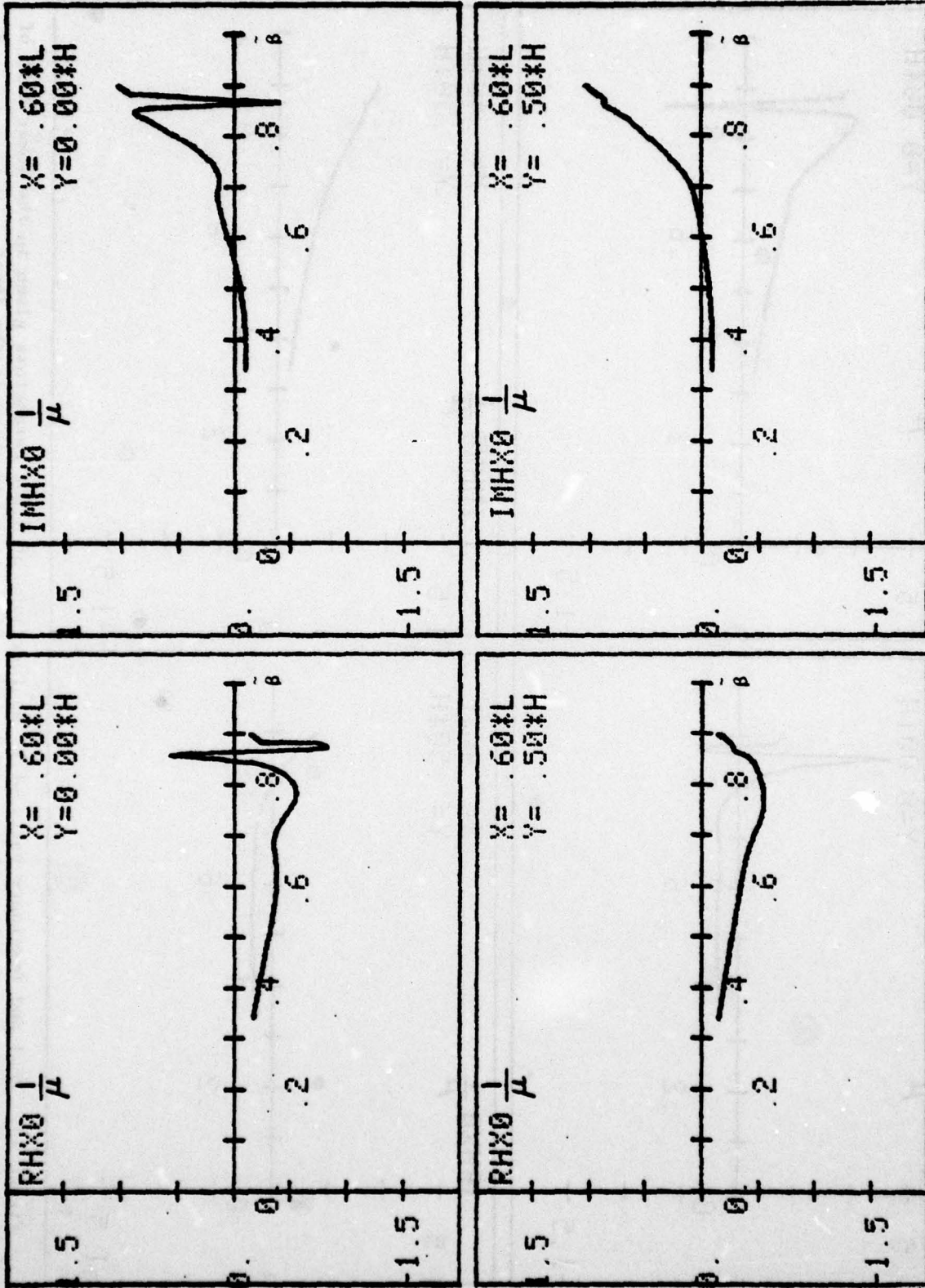


Figure 16. Real and imaginary parts of E , as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

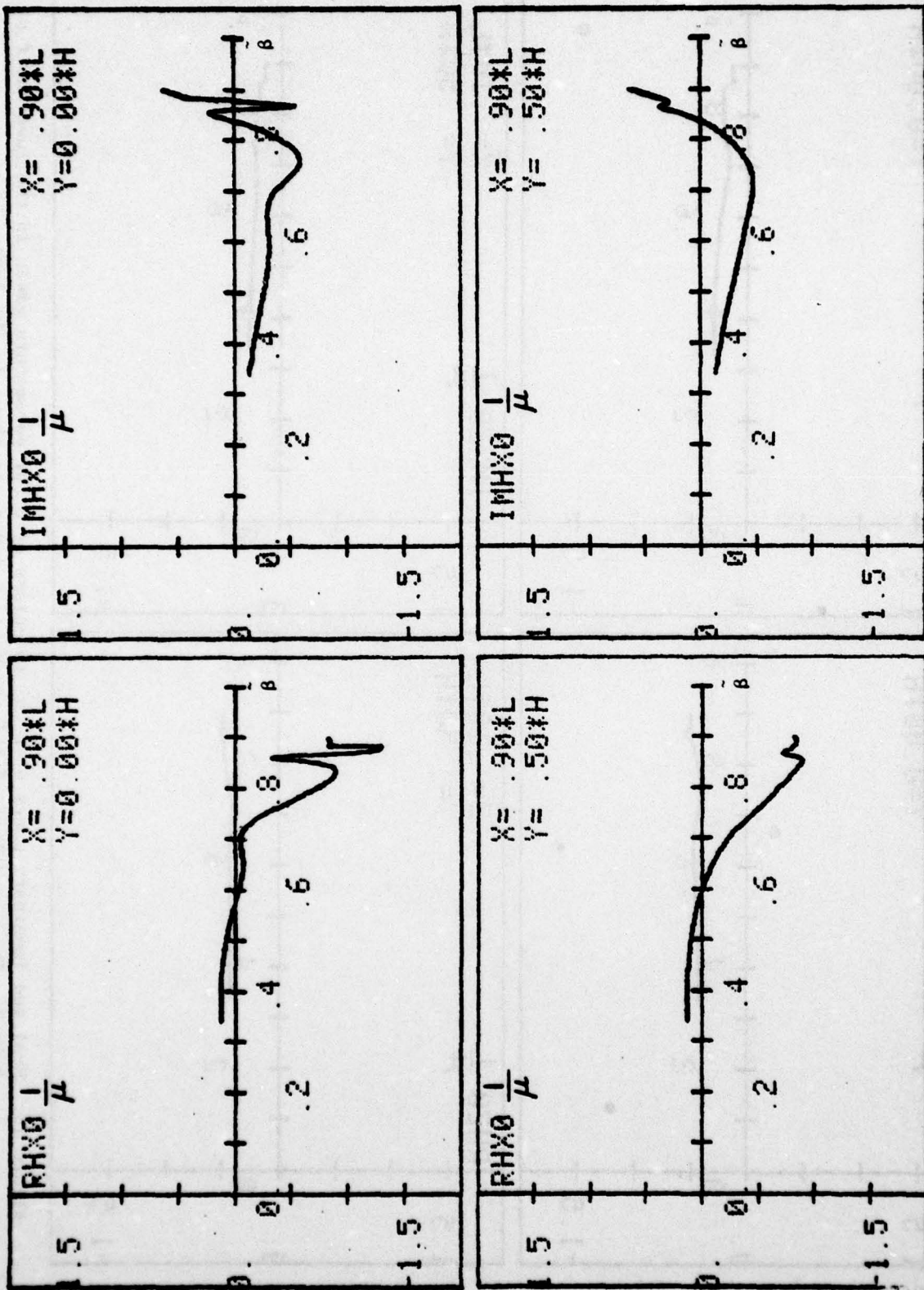


Figure 17. Real and imaginary parts of E as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

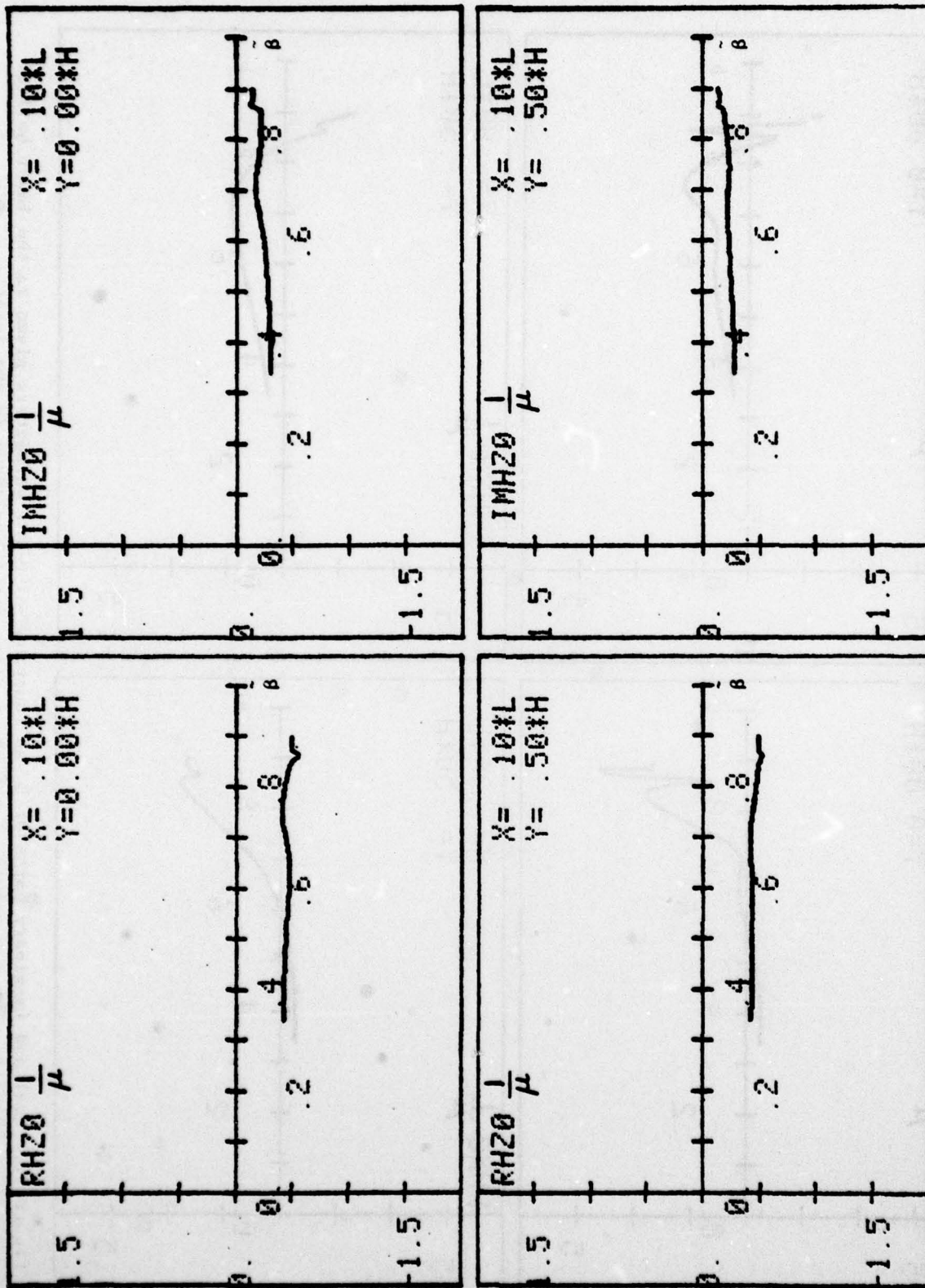


Figure 18. Real and imaginary parts of E as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

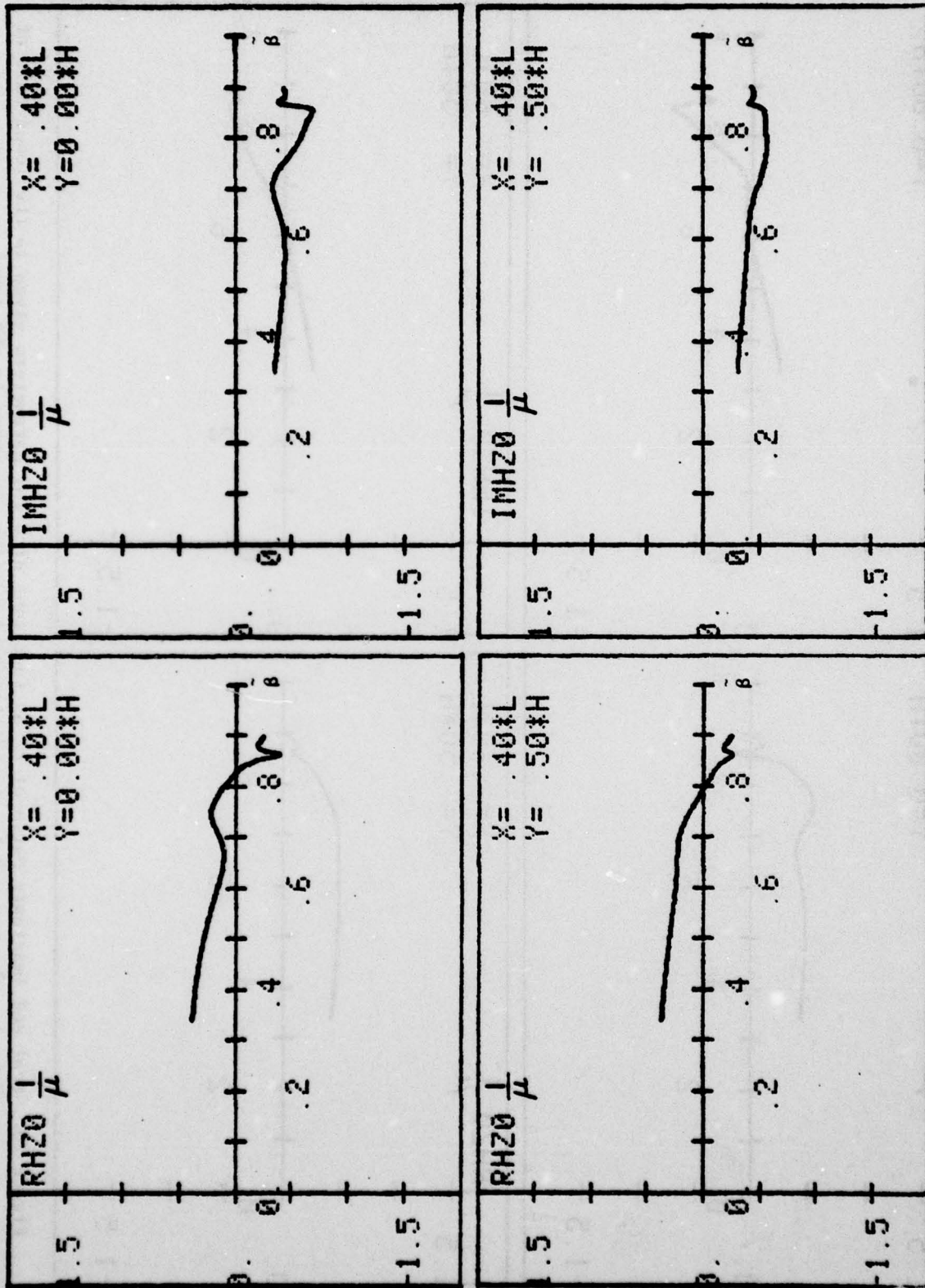


Figure 19. Real and imaginary parts of E_x as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

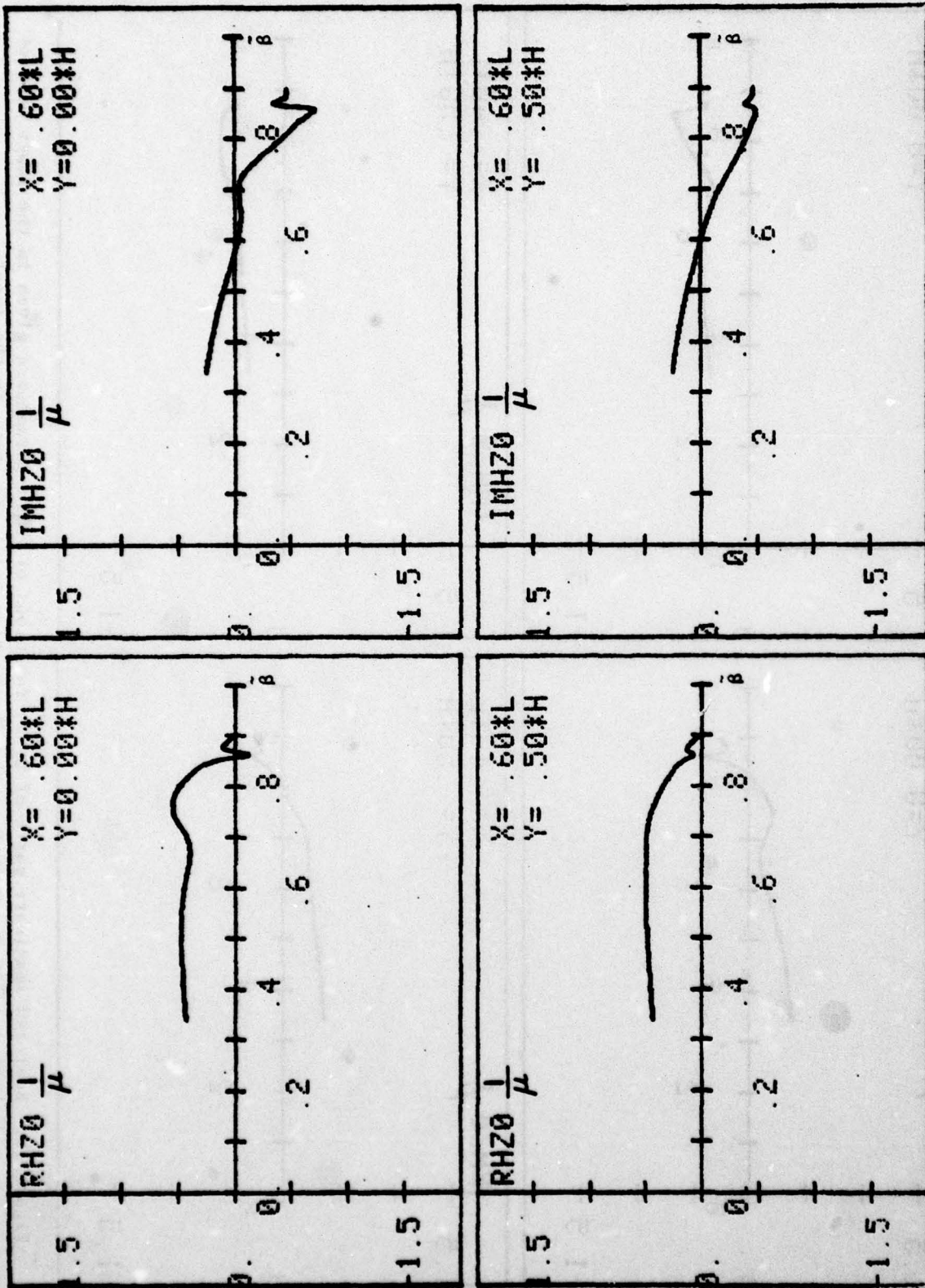


Figure 20. Real and imaginary parts of E_x as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.

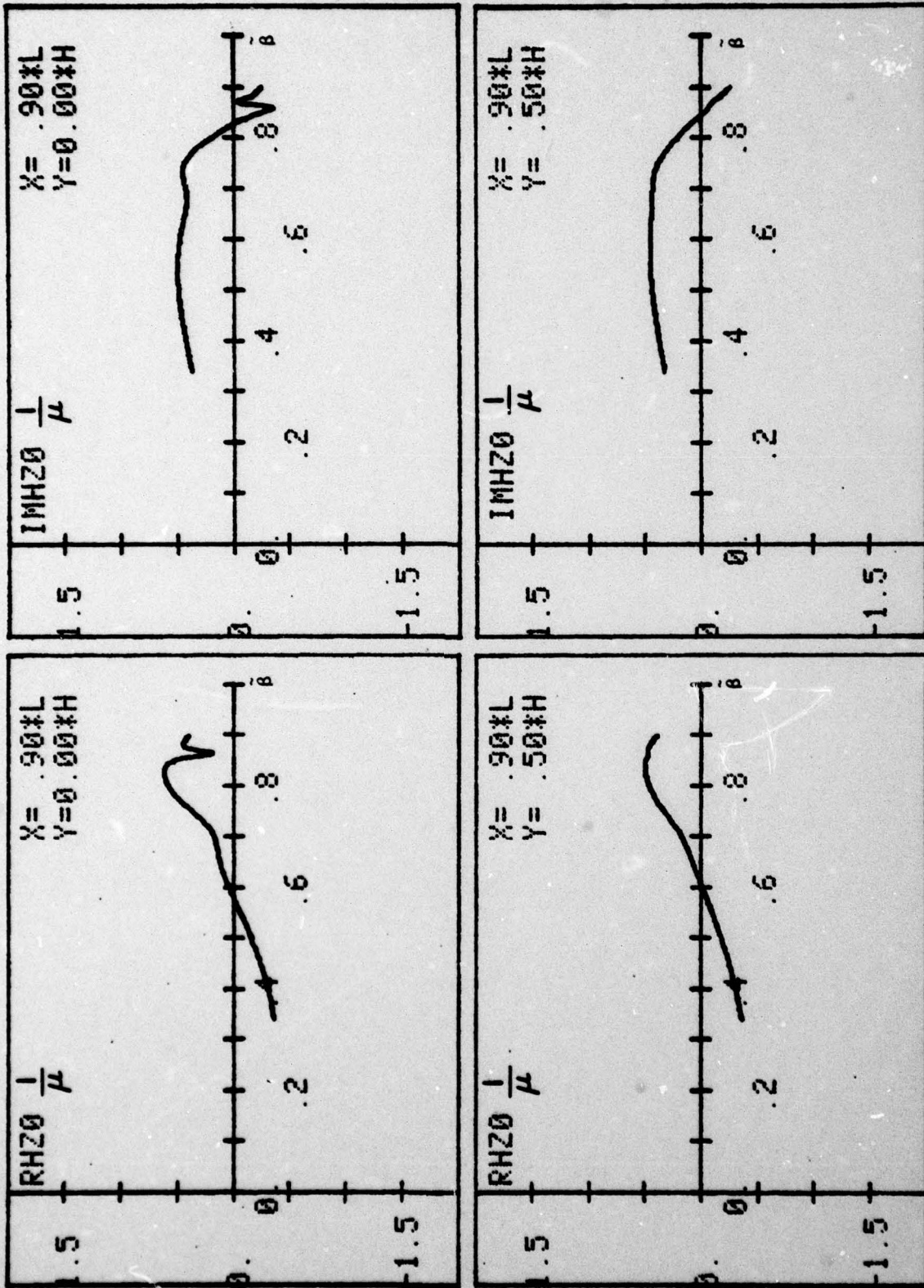


Figure 21. Real and imaginary parts of E_x as functions of β for parameters given in the lower half of Page 1. The x, y values of the observation point are shown in the inset.