

Comments on “Plane Wave Excitation of an Infinite Dielectric Rod”¹

Jian-Guo Ma

In the above paper,¹ the author finds that there are some mistakes in (3), (5), (7), (9), and (10).

Using Maxwell's equations, $H_\theta(r, \theta)$ can be found as

$$H_\theta(r, \theta) = \frac{-j}{k\eta} \frac{\partial E_z}{\partial r} \quad (1)$$

for both regions $r > R$ and $r < R$. Substituting (2), (4), and (6) of above paper into (1) given here, instead of (3), (5), (7) in the original paper, right expressions can be found as

$$H_0^{inc} = \frac{-jE_0}{\eta} \sum_{n=-\infty}^{\infty} (-j)^n J'_n(kr) e^{jn\theta}. \quad (2)$$

$$H_\theta^{scat} = \frac{-j}{\eta} \sum_{n=-\infty}^{\infty} A_n [H_n^{(2)}(kr)]' e^{jn\theta}, \quad (3)$$

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¹R. B. Keam, *IEEE Microwave and Guided Wave Lett.*, vol. 4, no. 10, pp. 326–328, 1994.

$$H_\theta^{rod} = \frac{-j}{\eta} \sqrt{\epsilon_r} \sum_{n=-\infty}^{\infty} B_n J'_n(k^d r) e^{jn\theta}. \quad (4)$$

Then, using boundary condition at $r = c$, instead of the second formula of (8) in the original paper, the right form is

$$E_0(-j)^n J'_n(kr) + A_n [H_n^{(2)}(kr)]' = \sqrt{\epsilon_r} B_n J'_n(k^d r). \quad (5)$$

It is straightforward to get expressions of the coefficients A_n , B_n instead of (9) and (10) in original paper

$$A_n = -E_0(-j)^n \frac{J'_n(kc) J_n(k^d c) - \sqrt{\epsilon_r} J_n(kc) J'_n(k^d c)}{J_n(k^d c) [H_n^{(2)}(kc)]' - \sqrt{\epsilon_r} J'_n(k^d c) H_n^{(2)}(kc)}, \quad (6)$$

$$B_n = E_0(-j)^n \frac{J_n(kc) [H_n^{(2)}(kc)]' - J'_n(kc) H_n^{(2)}(kc)}{J_n(k^d c) [H_n^{(2)}(kc)]' - \sqrt{\epsilon_r} J'_n(k^d c) H_n^{(2)}(kc)}. \quad (7)$$

Using (6) and (7) given here instead of (9) and (10) given in the original paper, the electric field distribution scattered by the rod may be calculated correctly.

Author's Reply by Richard Keam

As noted by Dr. Jian-Guo Ma, there is an error in (3) of the above paper,¹ which resulted in the incorrect omission of a factor of $\sqrt{\epsilon_r}$ in (9) and (10) for the A_n and B_n coefficients. The author would like to thank Dr. Ma for calling attention to this error.

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