$$\frac{\partial \bar{A}(r,\Theta,t)}{\partial t} \quad \text{at} \quad d \ll \frac{c}{w} = \frac{\lambda}{2\pi} \ll r$$

$$\frac{\partial \bar{A}(r,\Theta,t)}{\partial t} = \frac{\partial}{\partial t}\left[-\frac{\mu_0}{4\pi} p_0 \frac{w}{r} \sin\left(w\left(t+\frac{r}{c}\right)\right) \hat{z}(t)\right]$$

$$= \frac{\partial}{\partial t}\left[-\frac{\mu_0}{4\pi} q_0 d \frac{w}{r} \sin\left(w\left(t+\frac{r}{c}\right)\right) \hat{r}(t) \cos\Theta(t)\right]$$

$$= -\frac{\mu_0}{4\pi} q_0 d \frac{w}{r}\left[\frac{\partial}{\partial t}\left(\sin\left(w\left(t+\frac{r}{c}\right)\right)\right) \underbrace{\hat{r}(t)\cos\Theta(t)}_{\hat{z}(t)} + \sin\left(w\left(t+\frac{r}{c}\right)\right) \frac{\partial}{\partial t}\vec{z}(t)\right]$$

$$= -\frac{\mu_0}{4\pi} q_0 d \frac{w}{r}\left[\frac{\partial \sin\left(w\left(t+\frac{r}{c}\right)\right)}{\partial\left(w\left(t+\frac{r}{c}\right)\right)} \frac{\partial\left(w\left(t+\frac{r}{c}\right)\right)}{\partial t} \hat{r}(t)\cos\Theta(t) + \sin\left(w\left(t+\frac{r}{c}\right)\right) \frac{\partial}{\partial t}\overbrace{\left(\hat{r}\cos\Theta(t)\right)}^{\hat{z}(t)}\right]$$

$$= -\frac{\mu_0}{4\pi} q_0 d \frac{w}{r}\left[\cos\left(w\left(t+\frac{r}{c}\right)\right) w\, \hat{r}(t)\cos\Theta(t) + \sin\left(w\left(t+\frac{r}{c}\right)\right)\left(\frac{\partial}{\partial t}\hat{r}(t)\cos\Theta(t) + \frac{\partial}{\partial t}\cos\Theta(t)\,\hat{\Theta}\right)\right]$$

$$= -\frac{\mu_0}{4\pi} q_0 d \frac{w}{r}\left[w\cos\left(w\left(t+\frac{r}{c}\right)\right)\cos\Theta(t)\,\hat{r}(t) + \sin\left(w\left(t+\frac{r}{c}\right)\right)\left(\cos\Theta(t)\frac{\partial}{\partial t}\hat{r}(t) + \frac{\partial\cos\Theta(t)}{\partial\Theta}\frac{\partial\Theta}{\partial t}\hat{\Theta}\right)\right]$$

$$= -\frac{\mu_0}{4\pi} q_0 d \frac{w}{r}\left[w\cos\left(w\left(t+\frac{r}{c}\right)\right)\cos\Theta(t)\,\hat{r}(t) + \sin\left(w\left(t+\frac{r}{c}\right)\right)\left(\cos\Theta(t)\frac{\partial}{\partial t}\hat{r}(t) - \sin\Theta(t)\, w\, \hat{\Theta}\right)\right]$$

$$\left.\begin{array}{l} \frac{\partial}{\partial t}\hat{r}(t) = 0 \\ \sin\left(w\left(t+\frac{r}{c}\right)\right) \simeq \cos\left(w\left(t+\frac{r}{c}\right)\right) \end{array}\right\} \text{For large } r$$

$$\frac{\partial \bar{A}(r,\Theta,t)}{\partial t} = -\frac{\mu_0}{4\pi} q_0 d \frac{w}{r}\left[w\cos\left(w\left(t+\frac{r}{c}\right)\right)\cos\Theta(t)\,\hat{r}(t) + \cos\left(w\left(t+\frac{r}{c}\right)\right)\left(-\sin\Theta(t)\, w\, \hat{\Theta}\right)\right]$$

$$= -\frac{\mu_0}{4\pi} q_0 d \frac{w^2}{r}\cos\left(w\left(t+\frac{r}{c}\right)\right)\left[\cos\Theta(t)\,\hat{r}(t) - \sin\Theta(t)\,\hat{\Theta}\right]$$