

Electric dipole radiation:

$$r_+ = \sqrt{\left(r\cos\Theta - \frac{d}{2}\right)^2 + (r\sin\Theta)^2}$$
$$= \sqrt{r^2\cos^2\Theta + \frac{d^2}{4} - 2r\cos\Theta \frac{d}{2} + r^2\sin^2\Theta}$$
$$= \sqrt{r^2(\cos^2\Theta + \sin^2\Theta) + \frac{d^2}{4} - rd\cos\Theta}$$
$$= \sqrt{r^2 + \frac{d^2}{4} - rd\cos\Theta}$$

$$r_- = \sqrt{(r\sin\Theta)^2 + \left[d + (r\cos\Theta - \frac{d}{2})\right]^2}$$
$$= \sqrt{r^2\sin^2\Theta + \left[\frac{d}{2} + r\cos\Theta\right]^2}$$
$$= \sqrt{r^2\sin^2\Theta + \frac{d^2}{4} + r^2\cos^2\Theta + 2\frac{d}{2}r\cos\Theta}$$
$$= \sqrt{r^2(\sin^2\Theta + \cos^2\Theta) + \frac{d^2}{4} + dr\cos\Theta}$$
$$= \sqrt{r^2 + \frac{d^2}{4} + rd\cos\Theta}$$

(3)

