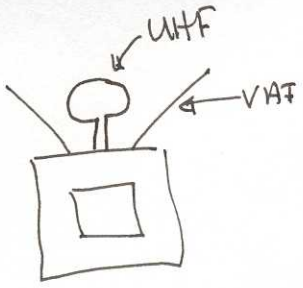
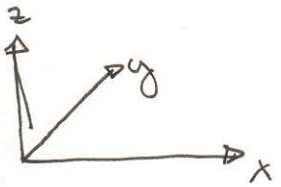
Quiz 4 (Sec 0101)



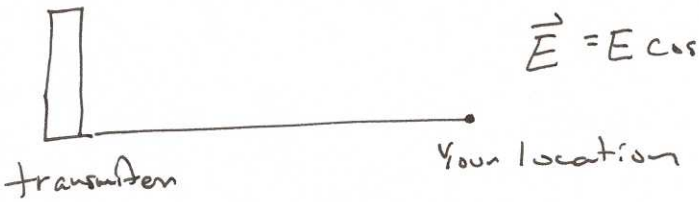
The UHF antenna work via Faraday's Law. A changing magnetic flux through the loop creates an induced emf. The frequency of the incoming wave determines how rapidly the magnetic flux changes, and thereby strongly affects the signal.

The dipole antenna, on the other hand, works via the Lorentz force law. The electrons in the antenna are driven by the electric field, but in this case it is the <u>amplitude</u> that is more important, not the frequency.

Quiz 4 (Sec 0104)



$$\vec{B} = B\cos(kx-\omega t)\,\hat{y}$$
$$\vec{E} = E\cos(kx-\omega t)\,\hat{z}$$



UHF antennae (loop antennae) work via Faraday's law. (See answer to Sec 0101 quiz.) To maximize magnetic flux, orient the loop in the xz plane (or with normal pointing along $\pm\hat{y}$).

Quiz 4 (Sec 0105)

(a) $F = \frac{P}{c}$ and $F = ma \Rightarrow a = \frac{P}{Mc}$.

General equation of motion: $x(t) = x_0 + v_0 t + \frac{1}{2}at^2$ (*)

Here (*) implies $d = \frac{1}{2}\frac{Pt^2}{Mc} \Rightarrow \boxed{t = \sqrt{\frac{2dMc}{P}}}$

(b) By conservation of momentum $Mv_{astro} - mw = 0 \Rightarrow v_a = \frac{mw}{M}$

So (*) $\Rightarrow$ $d = \frac{mwt}{M} \Rightarrow \boxed{t = \frac{Md}{mw}}$

Note: This was essentially 34.61, which was one of the recommended exercises.