Answer on question #57678, Physics / Electromagnetism

Question (a) What is the wavelength of 90.0 MHz radio waves used in an MRI unit?

(b) If the frequencies are swept over a 2.00% range centered on a 90.0 MHz, what is the range of wavelengths broadcast?

Solution (a)Wavelength λ and frequency ν are related as

$$\lambda = \frac{c}{\nu}$$

where c is speed of light. So, wavelength is

$$\lambda = \frac{3 \cdot 10^8}{90 \cdot 10^6} \approx 0.33 \cdot 10^1 = 3.3\, m$$

(b)range of wavelength is

$$\frac{\Delta\lambda}{\lambda} = \frac{\frac{c}{0.98\nu} - \frac{c}{1.02\nu}}{\lambda} \approx 0.04$$

Range is 3.3 ± 0.06