Radiology Techniques Department, College of Medical Technology, The Islamic University, Najaf, Iraq

Theoretical Radiation Physics

Third stage- Radiology Techniques Department

Lecture 4

By

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Radiation Physics precise specialization

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The wave velocity :

The magnitude of the wave velocity is the distance traveled by the disturbance per unit time (sec).

Therefore ,the magnitude of the wave velocity represents the distance traveled by the compression per unit time ,or the distance traveled by rarefaction per unit time ,or the distance traveled by compression and rarefaction per unit time , the same is the distance traveled by a one wave cycle in a unit time .

So if we symbolize to the magnitude of the wave velocity with the symbol(v), and the length of one wave cycle is (λ),and the frequency of one wave cycle is(f) , then the magnitude of the wave velocity can be found from the following mathematical relationship

$V = \lambda * f$

If (λ) is measured in centimeter(cm), and (f) is measured in hertz(HZ), and where (HZ=1/sec), so the unit of measurement (v) is(cm/sec) .

If (λ) is measured in meter(m) , and (f) is measured in hertz(HZ), and where (HZ=1/sec), so the unit of measurement (v) is(m/sec).

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Important note:

The magnitude of the velocity of the audible sound wave , the magnitude of the velocity of the ultrasound wave ,the magnitude of the velocity of a diagnostic ultrasound wave ,and the magnitude of the velocity of infrasound wave , in the air at (0°C) equal to (331m/sec) .

Ex(1):

Calculate the length of the ultrasound wave in air at (0°C) ,in which has a frequency of (30000HZ).

Ex(2):

Calculate the length of the audible sound wave in air at (0°C) ,in which has a frequency of (20000HZ).

Ex(3):

Calculate the length of the audible sound wave in air at (0°C) ,in which has a frequency of (20HZ).

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Ex(4):
Calculate the length of the infrasound wave in air at (0°C) ,in which has a frequency of (10HZ).

Ex(5):
Calculate the length of a diagnostic ultrasound wave in air at (0°C) ,in which has a frequency of (1MHZ).

A question :
What do you conclude after solving these examples .

The periodic time:
It is the time required to occur one wave cycle , or the time required to occur one compression and rarefaction ,and denoted by the symbol(T).
And whereas
$T=1/f$
The unit of measurement of periodic time (T) is the reciprocal of the unit of measurement of frequency ,that is the unit of measurement of periodic time is the second (sec).

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Ex(1):
If the frequency of the diagnostic ultrasound wave is (1MHZ),calculate the periodic time of the wave.

Ex(2):
If the frequency of the ultrasound wave is (40000HZ),calculate the periodic time of the wave.

Ex(3):
If the frequency of the audible sound wave is (20000HZ),calculate the periodic time of the wave.

Ex(4):
If the frequency of the infrasound wave is (10HZ),calculate the periodic time of the wave.

A question :
What do you conclude after solving these examples .