



Technician License Course



Technician License Course

Chapter 2

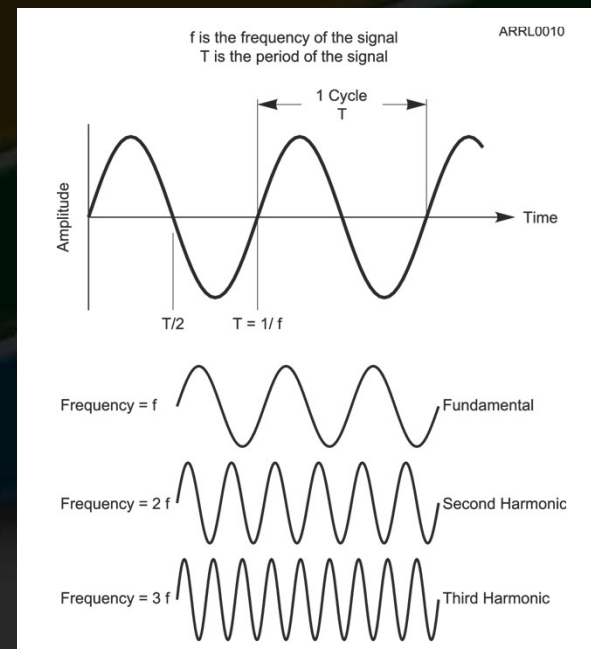
Lesson Plan Module - 2

Radio Waves & Signals

Wave Vocabulary

Before we study radio,
we need to learn some
wave vocabulary.

- Amplitude
- Frequency (hertz, Hz)
- Period (seconds, s)
- Fundamental
- Harmonics





Electromagnetic Waves

- Electromagnetic waves are made up of electric and magnetic energy. (fields)
- The electric and magnetic fields vary in the pattern of a sine wave.
- Electromagnetic waves travel at the speed of light.



Electromagnetic Waves

- Moving electrons in an antenna take the place of the moving magnet.
- A signal from a transmitter can make the electrons in an antenna move, transferring energy from the signal to electromagnetic waves.



Electromagnetic Waves

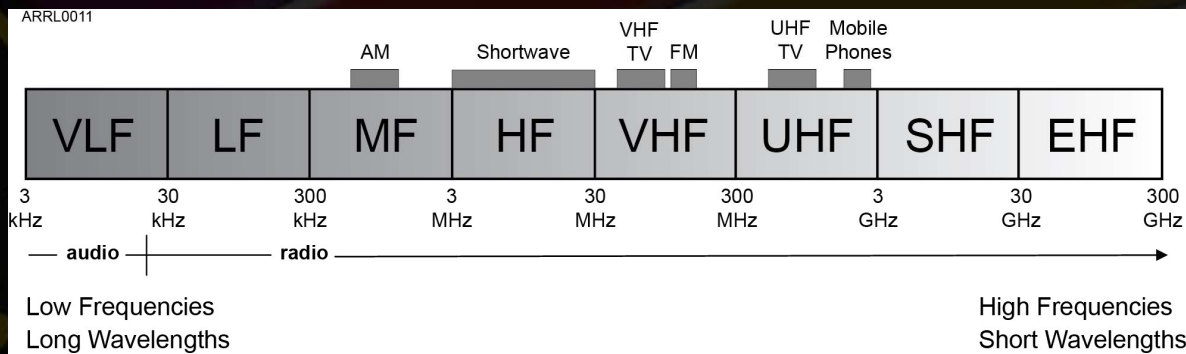
- The same process works “backwards” too.
- Electromagnetic waves encountering an antenna make its electrons move in sync with the wave.
- Electromagnetic energy is transferred from the wave to the electrons.
- The moving electrons create a signal that can be detected by a receiver.



Electromagnetic Spectrum

- The electromagnetic spectrum is divided into ranges of frequencies in which electromagnetic waves behave similarly.
- Each range or segment has a different name.
- Waves with a certain range of frequencies which can be used for communication are called radio waves.

Radio Spectrum



- The part of the electromagnetic spectrum
Composed of radio waves is called the *Radio
Frequency* or *RF* spectrum

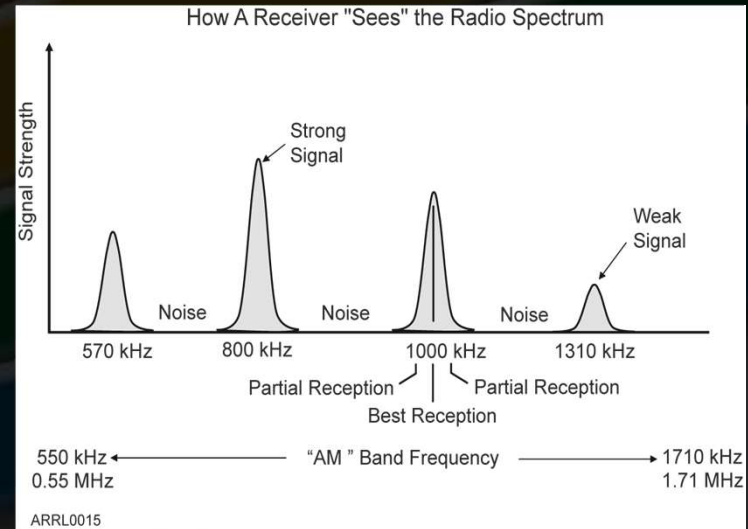


Radio Spectrum

- Parts of the spectrum allocated for a common purpose are called a *band*, such as the “AM Band” or “CB Band”.
- Signals in these bands are usually of the same for commercial purposes.
- Hams share the band across many signals of different types.

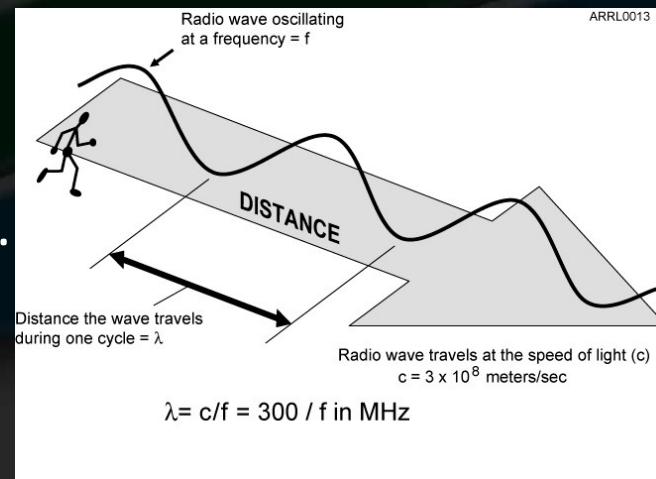
Radio Signals

- A radio wave carrying information is a *radio signal*.
- Each signal occupies a range of frequencies.
- Receivers “tune in” a signal by listening at the signals frequency.



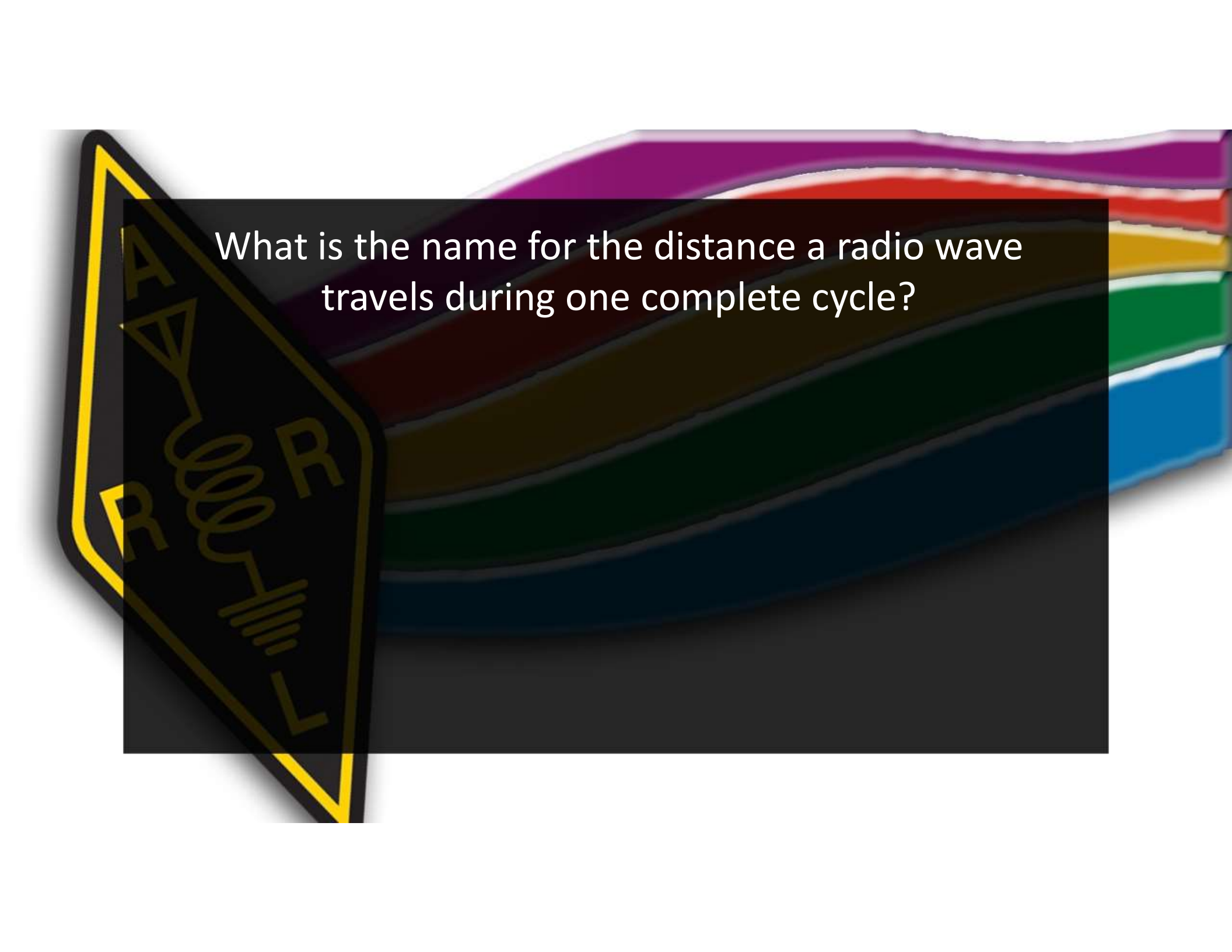
Wavelength

- *Wavelength* is the distance a radio wave travels during one cycle of the wave's electric and magnetic fields.
- λ (lambda) is the symbol for wavelength.
- Waves travel at the speed of light, c .
- Hams can refer to bands by frequency (50MHz) or wavelength (6 meters).

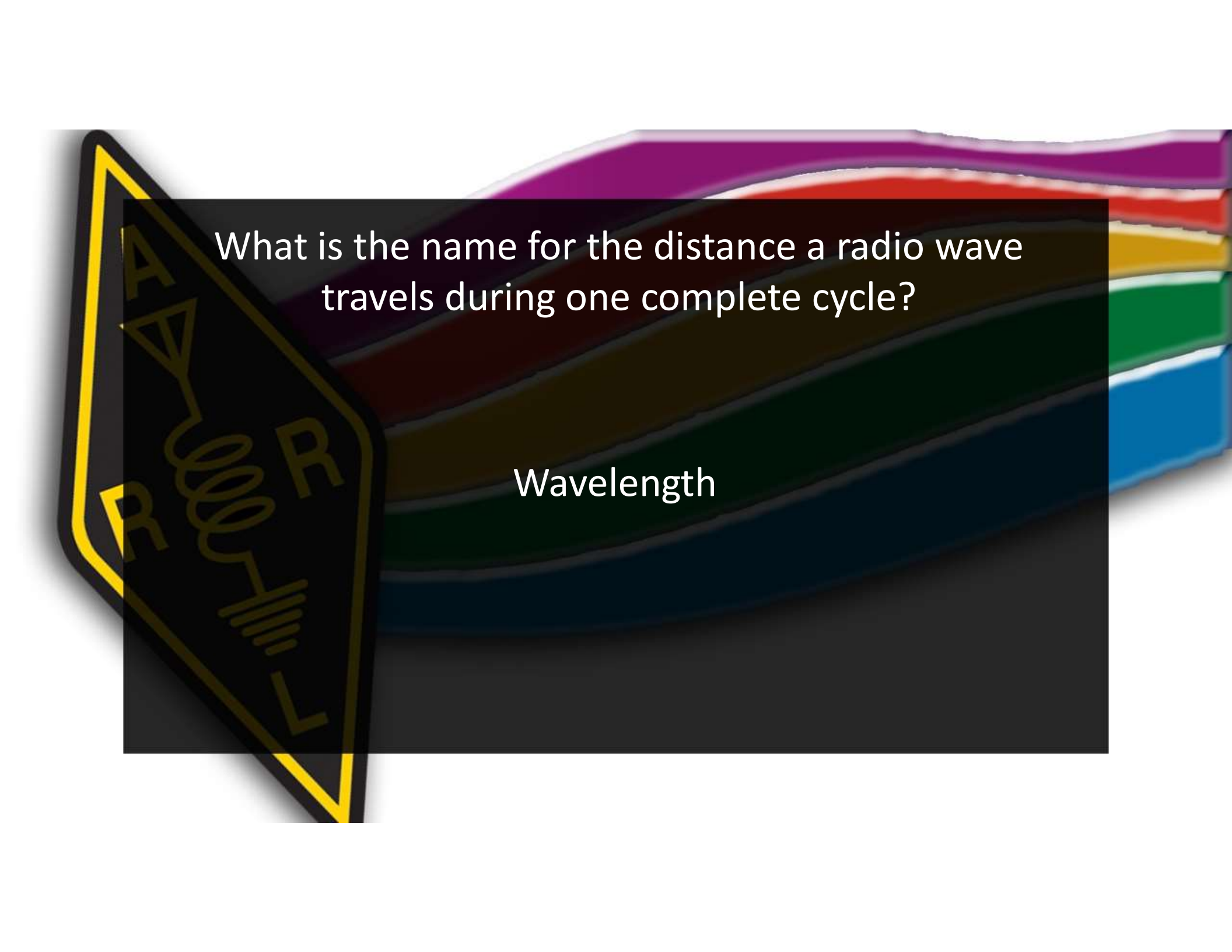




Practice Questions

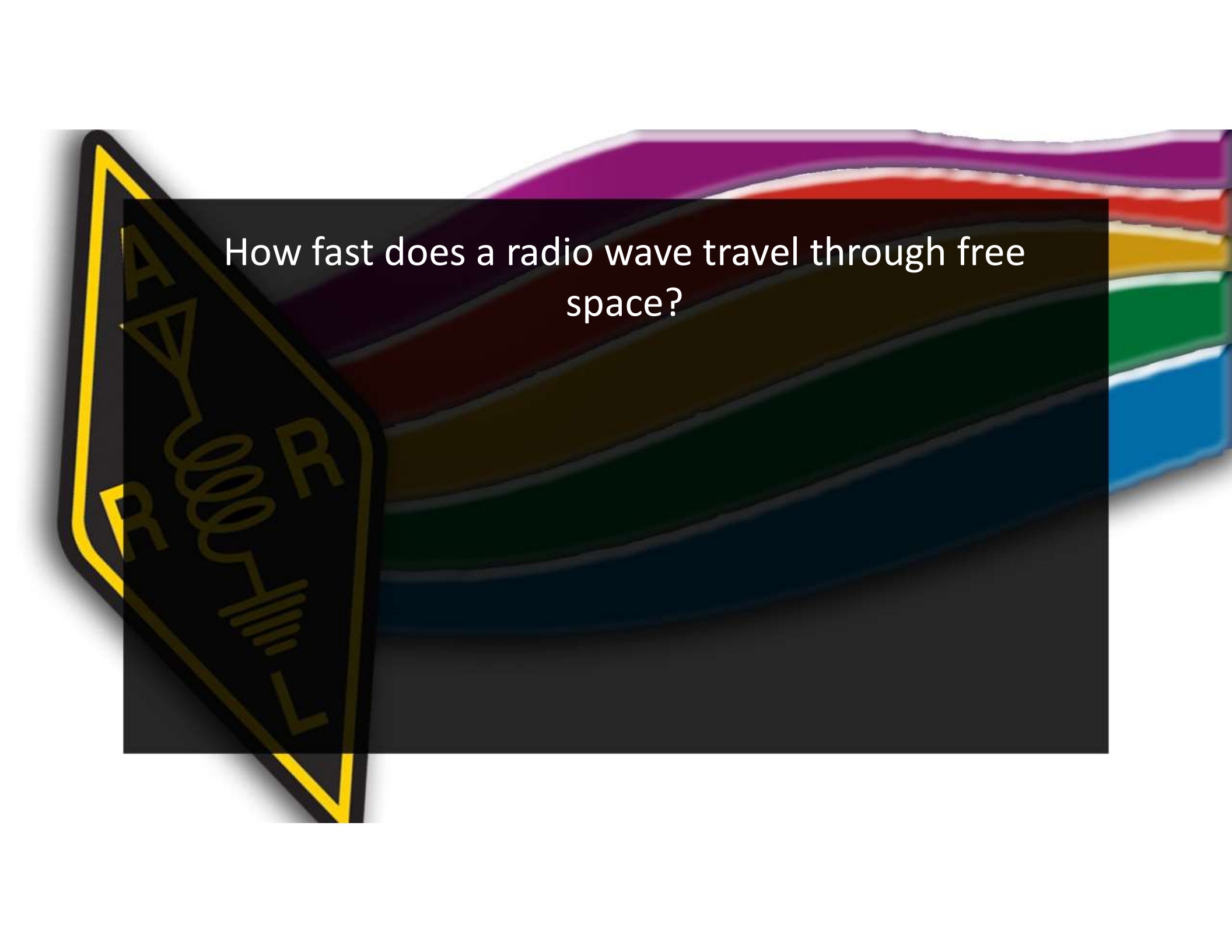
The image features a horizontal rainbow spectrum of colors (purple, red, orange, yellow, green, blue) on the right side. On the left side, there is a black triangular shape with a yellow border, containing a circuit diagram with a resistor (R), an inductor (L), and a capacitor (C) connected in a loop. The text is centered over the spectrum.

What is the name for the distance a radio wave travels during one complete cycle?

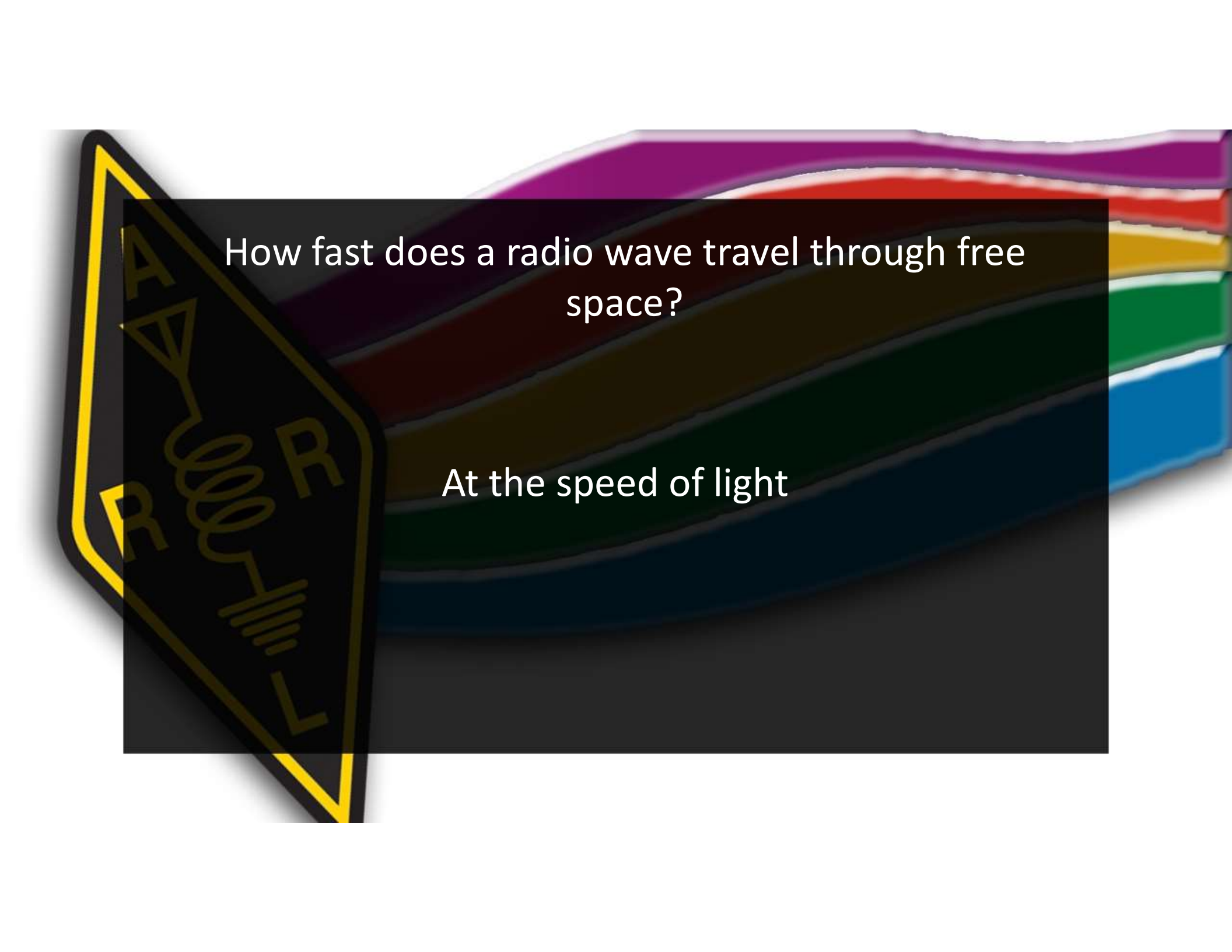
A rainbow spectrum of light waves is shown, with colors transitioning from purple at the top to red, orange, yellow, green, and blue at the bottom. The waves are depicted as curved lines. A dark, semi-transparent rectangular box is overlaid on the center of the spectrum. On the left side of this box, there is a yellow-outlined circuit diagram. The diagram includes a battery at the bottom, a resistor (represented by a zigzag line) on the right, and a coil (represented by a series of loops) on the left. The letters 'A' and 'R' are placed near the top and right of the circuit, respectively. The text of the question is centered within the dark box.

What is the name for the distance a radio wave travels during one complete cycle?

Wavelength

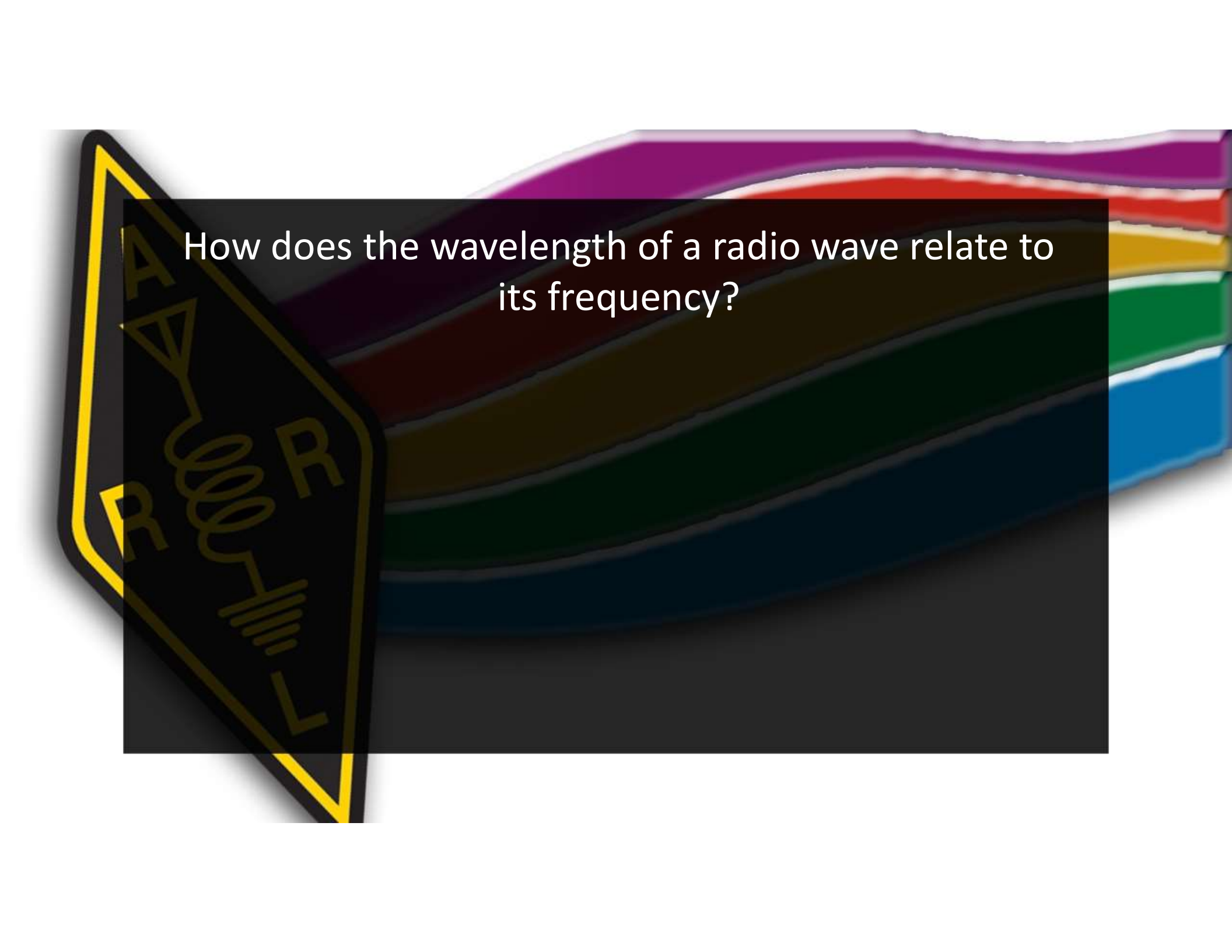
A diagram illustrating the propagation of radio waves. On the left, a yellow-outlined triangle contains a circuit diagram with a battery at the bottom, a resistor labeled 'R', an inductor labeled 'L', a capacitor labeled 'C', and an antenna labeled 'A'. From the right side of this triangle, a series of colored bands representing electromagnetic waves extend to the right. The colors from top to bottom are purple, red, orange, yellow, green, and blue. A semi-transparent black rectangular box is overlaid on the center of the image, containing the text 'How fast does a radio wave travel through free space?'.

How fast does a radio wave travel through free space?

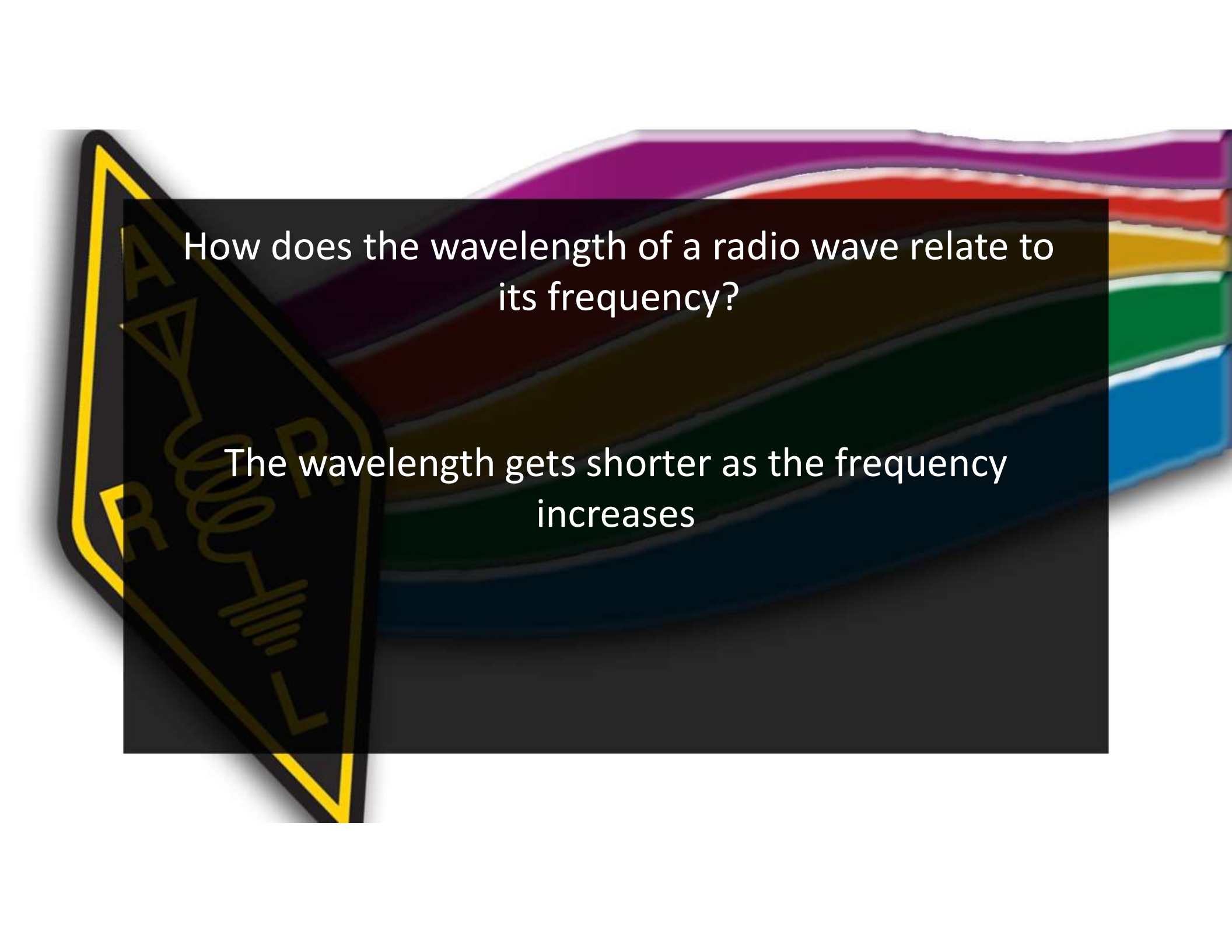
The image features a background of a rainbow spectrum of light waves, with colors transitioning from purple at the top to blue at the bottom. On the left side, there is a yellow-outlined diamond-shaped graphic containing a circuit diagram with a resistor, an inductor, and a capacitor, and the letters 'A', 'R', and 'R' positioned around it. A dark grey rectangular box is overlaid on the center of the image, containing two lines of white text.

How fast does a radio wave travel through free space?

At the speed of light

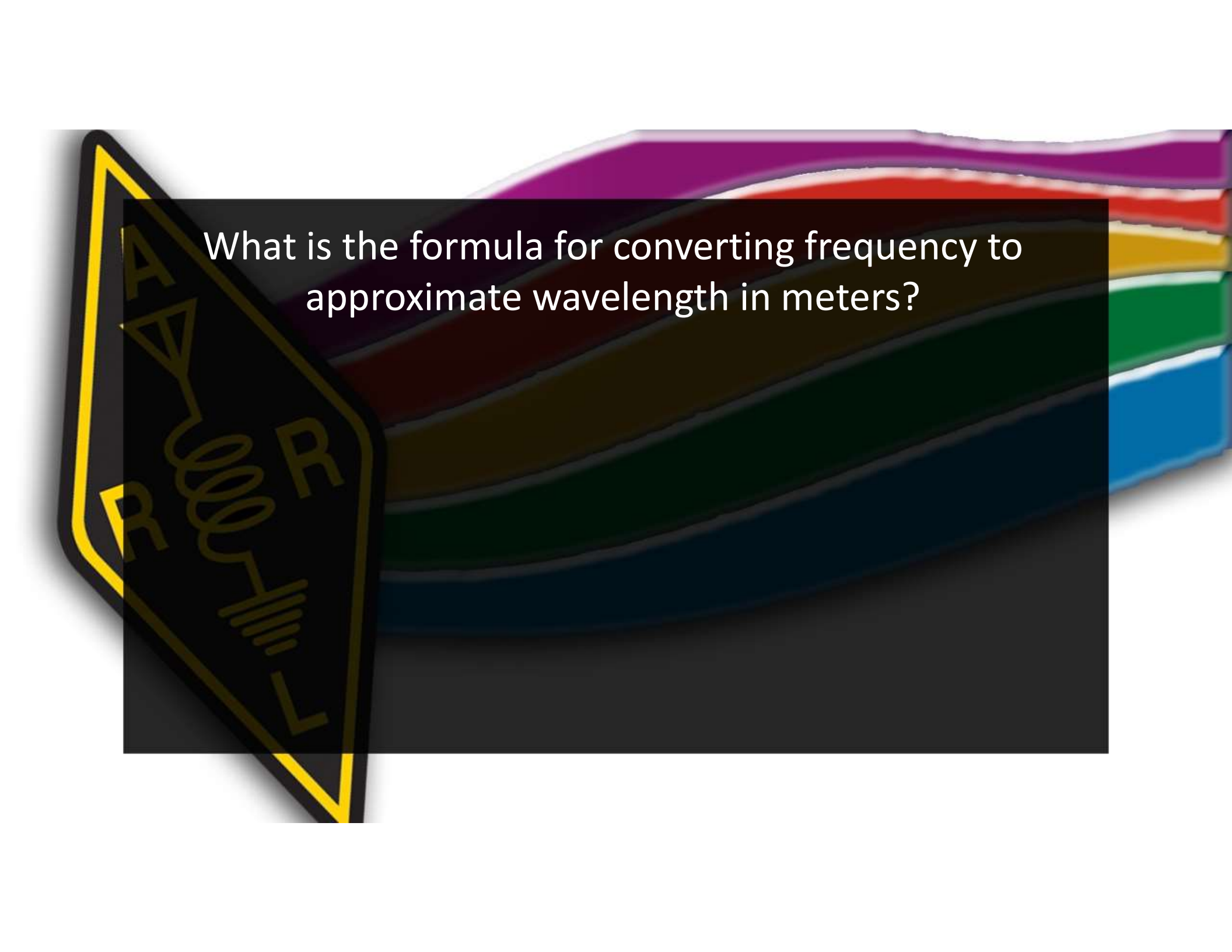
A rainbow spectrum of light waves is shown, with colors transitioning from purple at the top to red, orange, yellow, green, and blue at the bottom. The waves are depicted as curved lines. A dark grey rectangular box is overlaid on the center of the spectrum, containing the text 'How does the wavelength of a radio wave relate to its frequency?'. On the left side of the box, there is a yellow-outlined circuit diagram. The diagram is a diamond shape with a yellow border. Inside, it shows a battery at the bottom, a resistor labeled 'R' on the right, an inductor labeled 'L' at the top, and another resistor labeled 'R' on the left. The letters 'A' and 'R' are also present near the top and bottom of the diamond respectively.

How does the wavelength of a radio wave relate to its frequency?

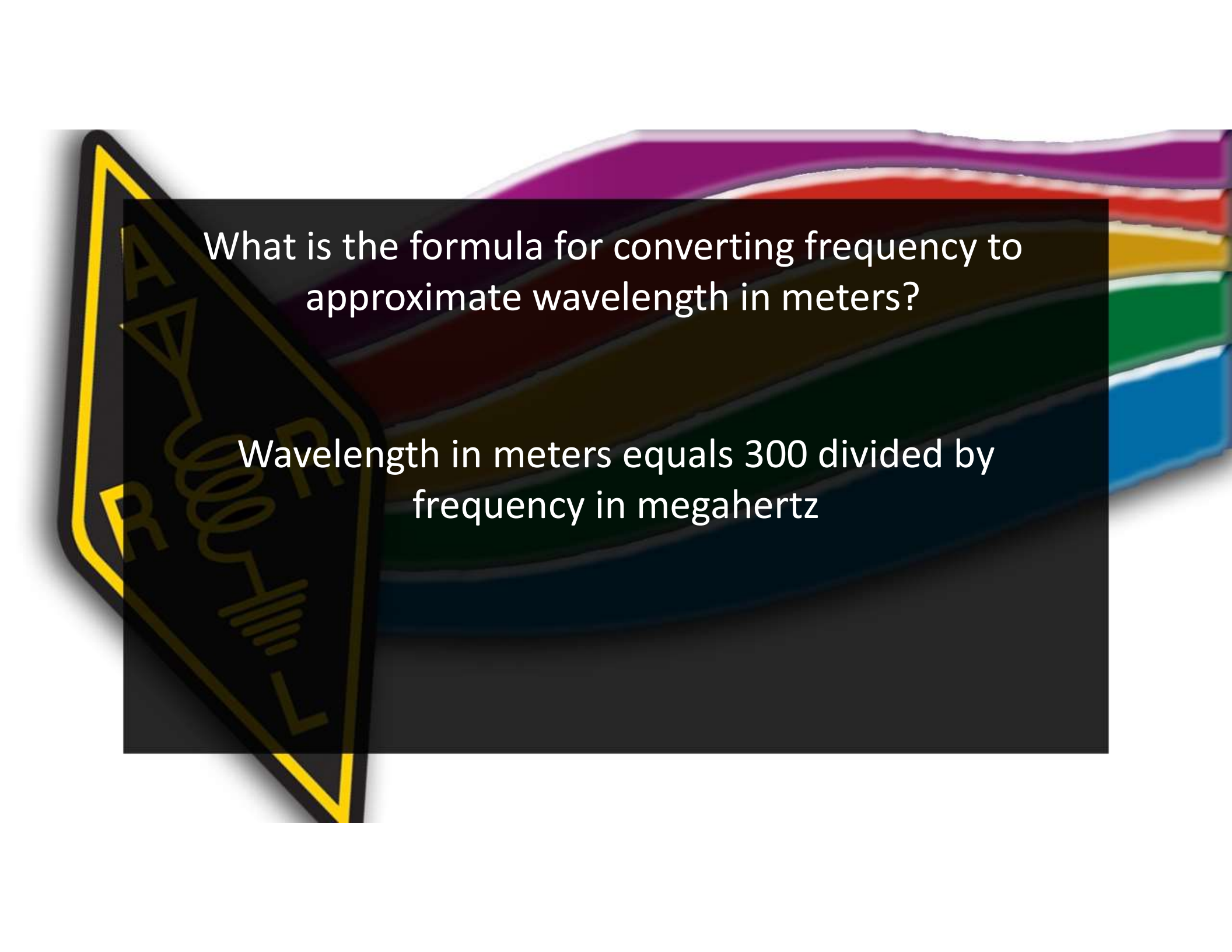


How does the wavelength of a radio wave relate to its frequency?

The wavelength gets shorter as the frequency increases


A stylized rainbow spectrum is shown, with colors transitioning from purple at the top to blue at the bottom. Overlaid on the left side is a circuit diagram within a yellow-bordered shape. The diagram includes a battery symbol at the bottom, a resistor symbol labeled 'R' on the left, a resistor symbol labeled 'R' on the right, and a central component represented by a coil of wire. The text 'What is the formula for converting frequency to approximate wavelength in meters?' is centered over the spectrum.

What is the formula for converting frequency to approximate wavelength in meters?

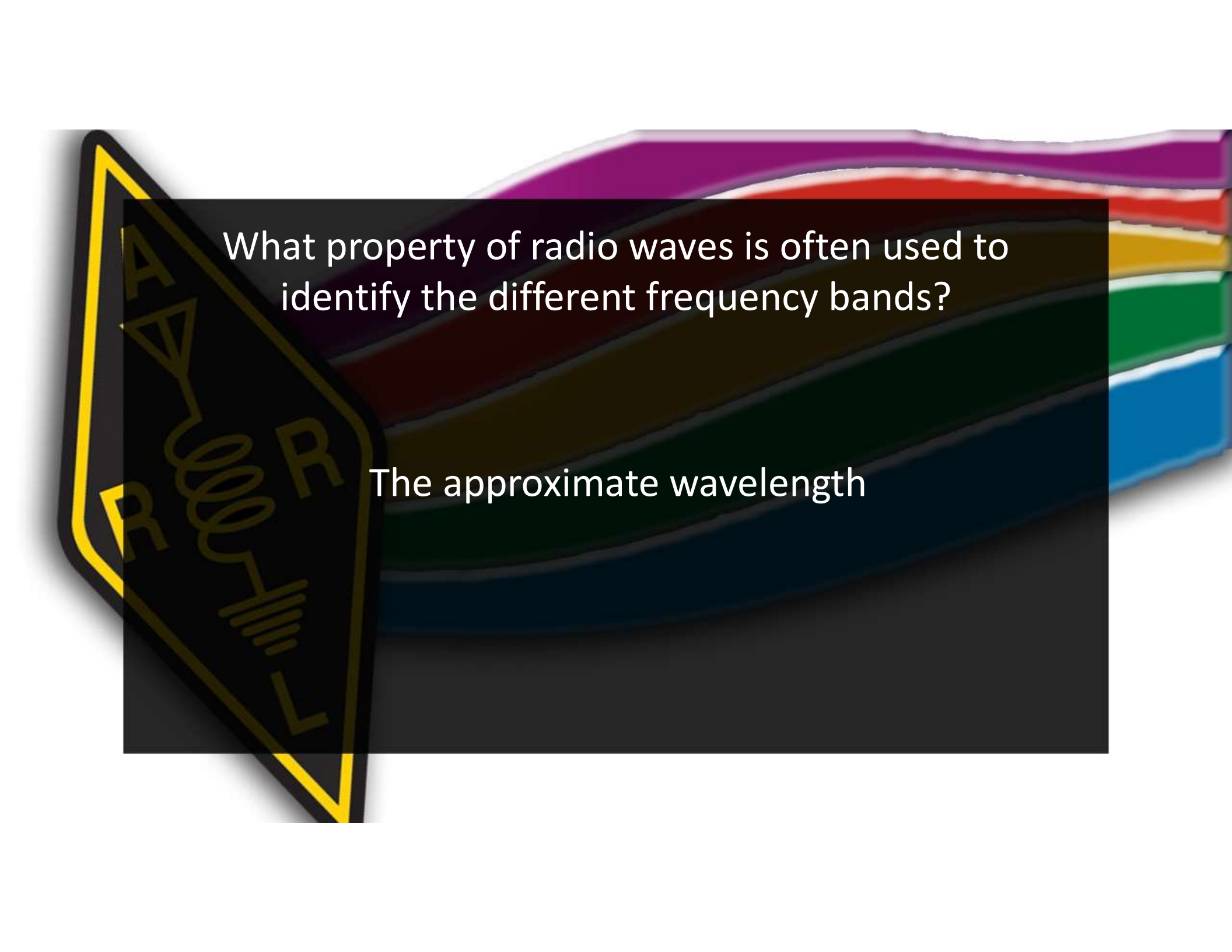


What is the formula for converting frequency to approximate wavelength in meters?

Wavelength in meters equals 300 divided by frequency in megahertz

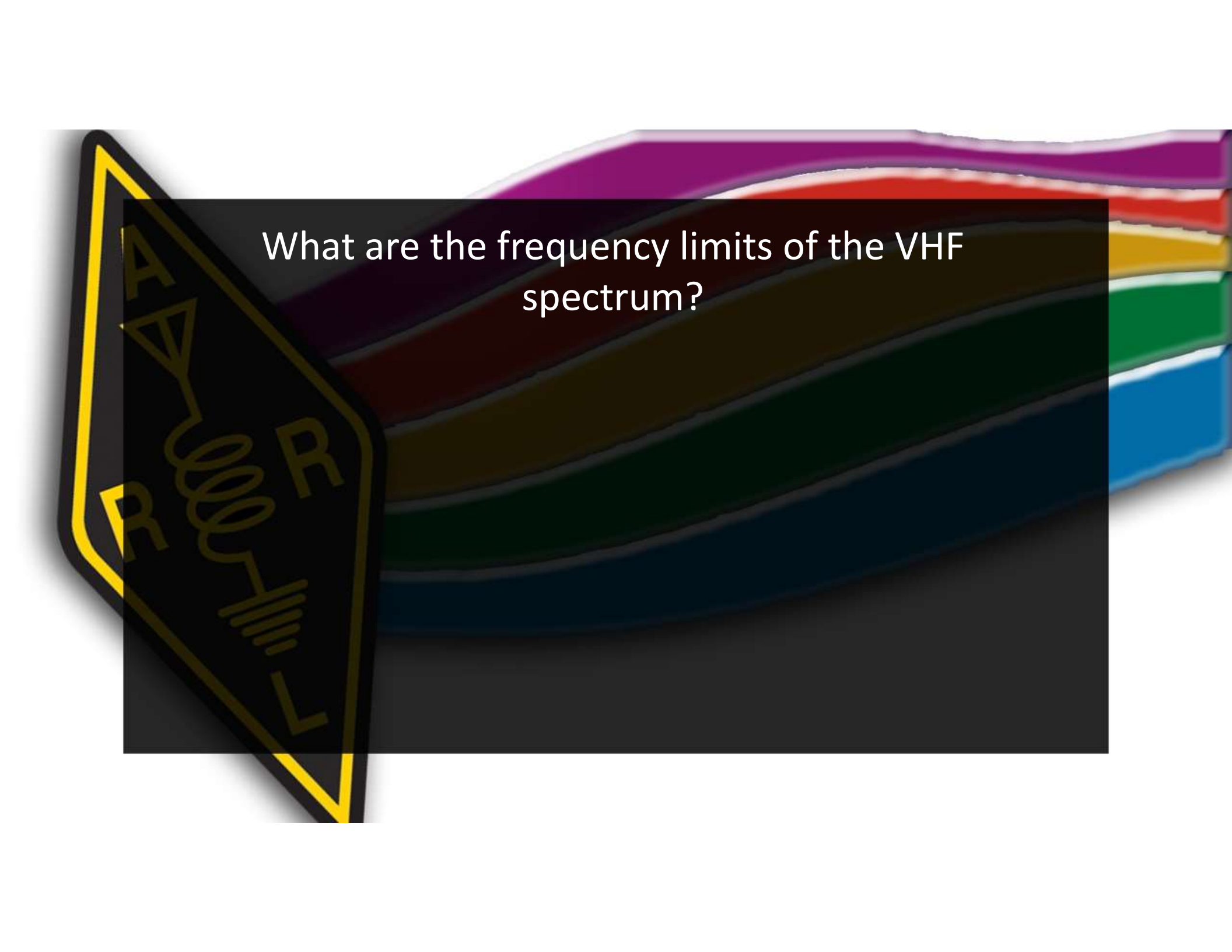


What property of radio waves is often used to identify the different frequency bands?



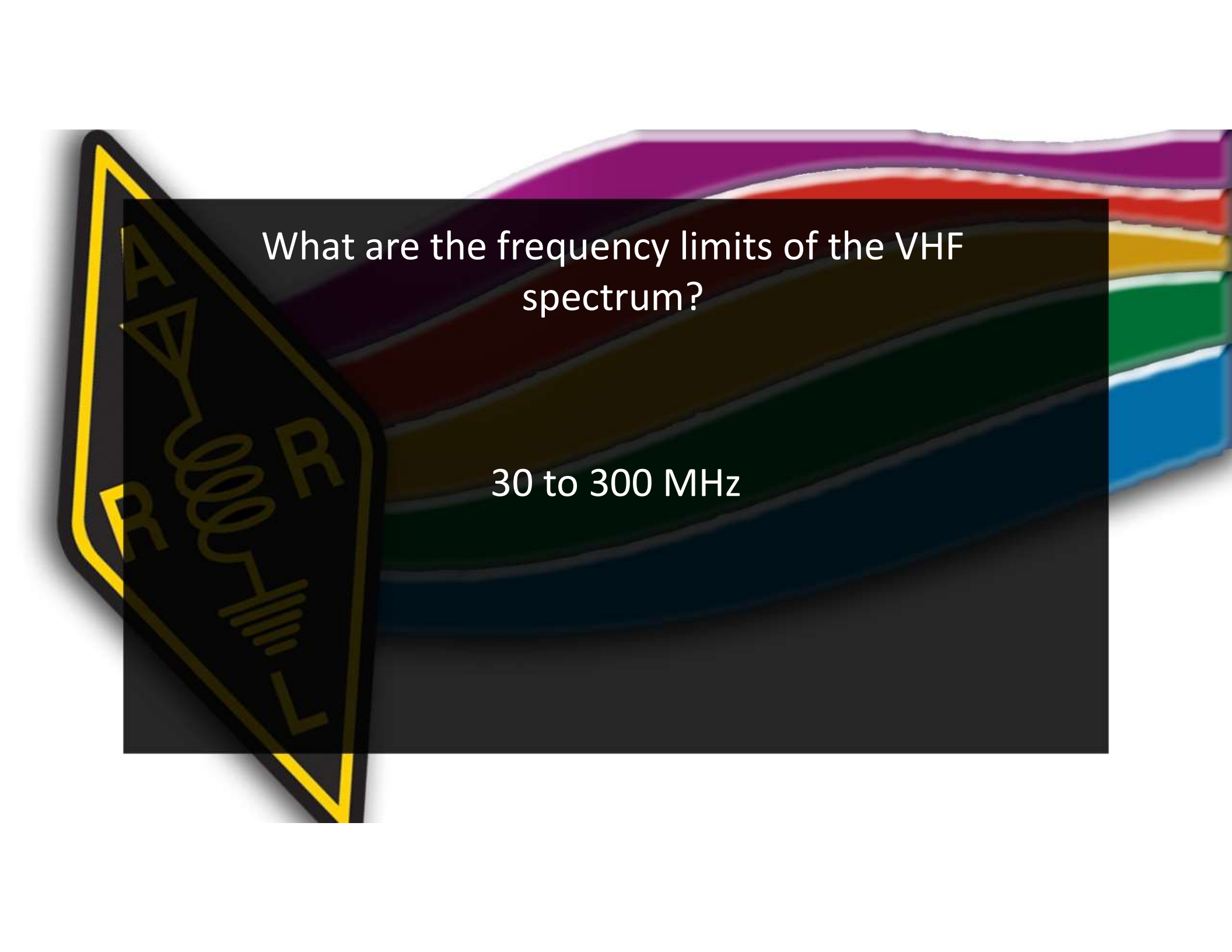
What property of radio waves is often used to identify the different frequency bands?

The approximate wavelength



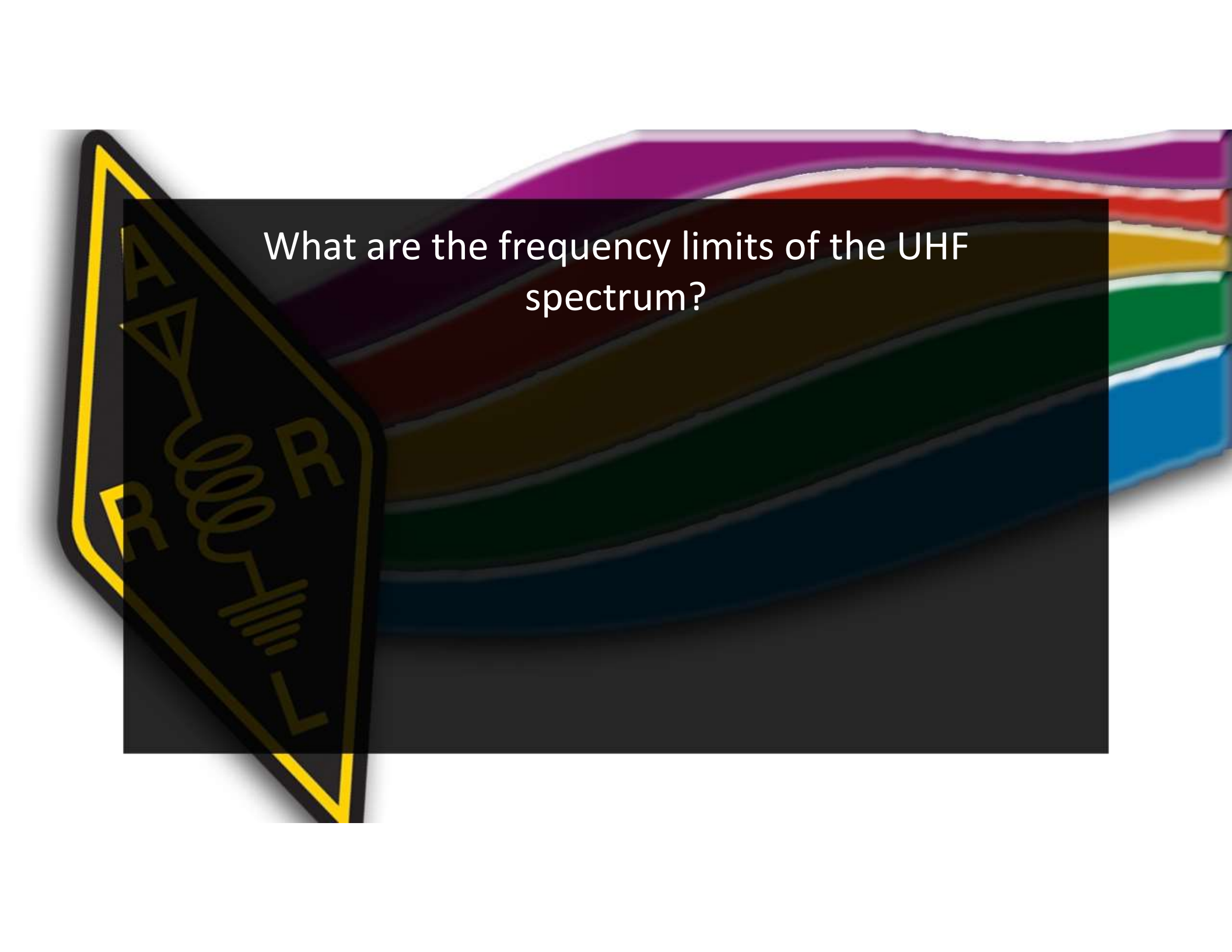
What are the frequency limits of the VHF spectrum?



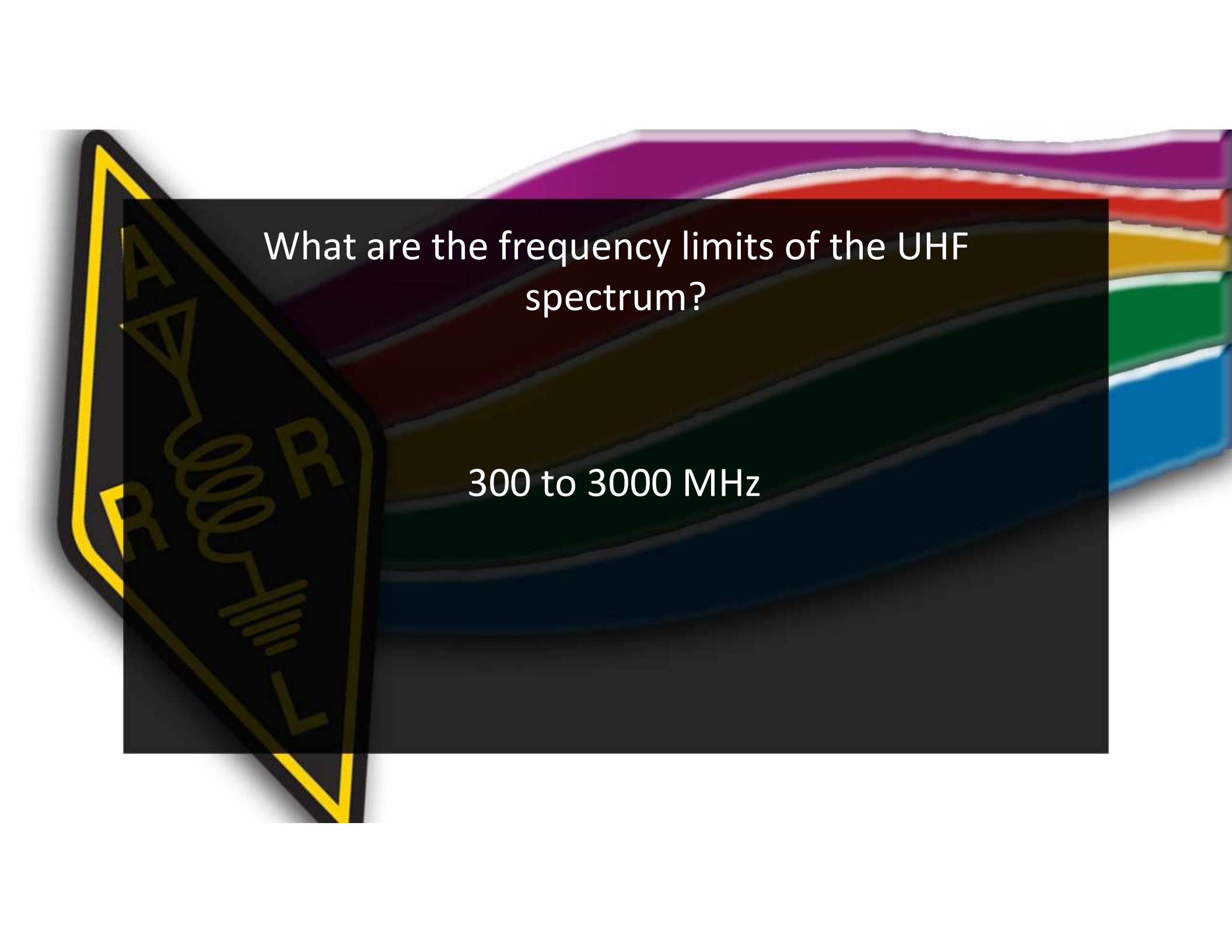


What are the frequency limits of the VHF spectrum?

30 to 300 MHz



What are the frequency limits of the UHF spectrum?



What are the frequency limits of the UHF spectrum?

300 to 3000 MHz

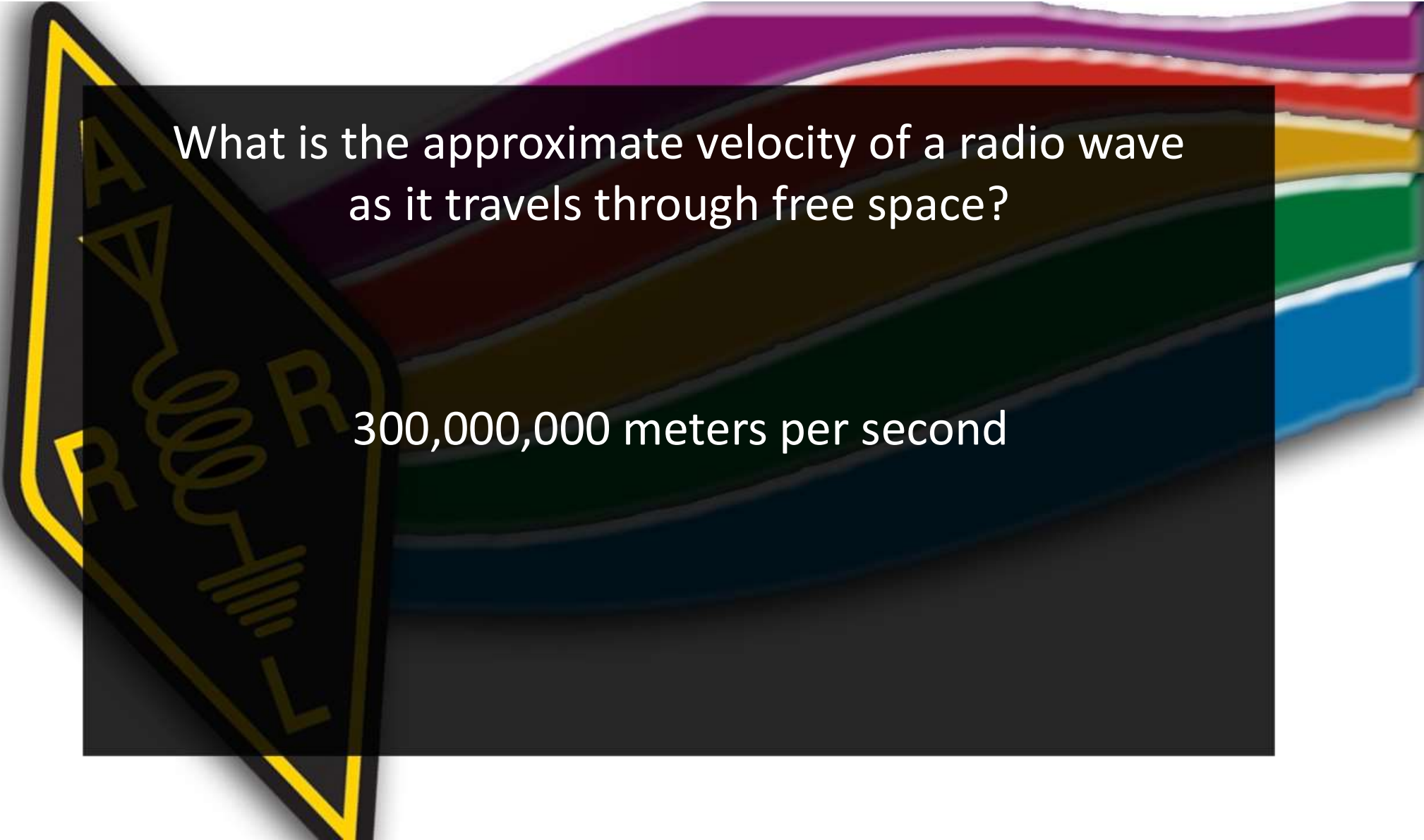


What frequency range is referred to as HF?



What frequency range is referred to as HF?

3 to 30 MHz



What is the approximate velocity of a radio wave
as it travels through free space?

300,000,000 meters per second



What is the unit of frequency?



What is the unit of frequency?

Hertz

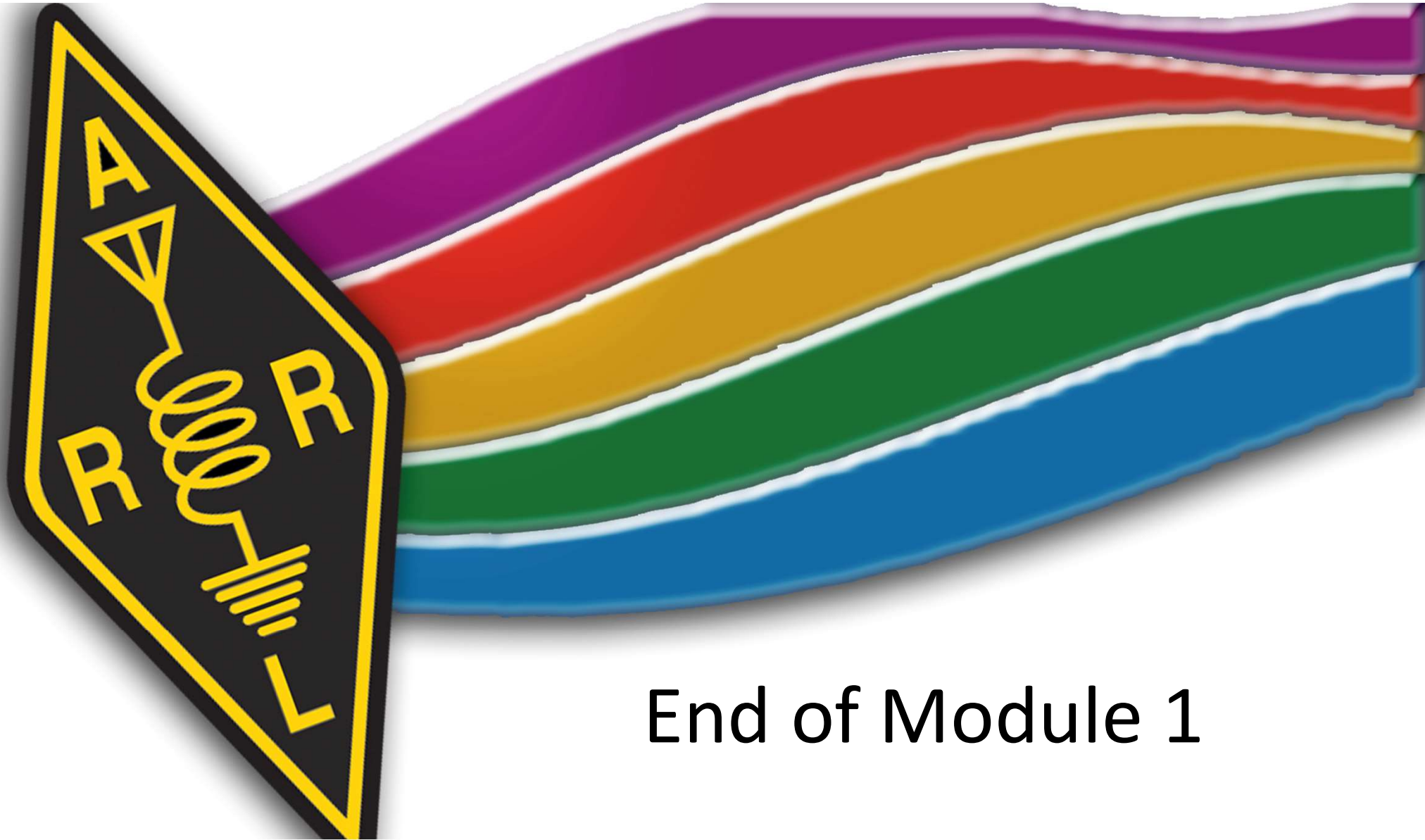
What does the abbreviation "RF" refer to?





What does the abbreviation “RF” refer to?

Radio frequency signals of all types



End of Module 1