Jules' Workshop

Standard

Unit 16 – Answers

Q1 What is the role of an antenna?

An antenna converts alternating voltage electrical signals into electromagnetic fields for transmission and converts electromagnetic fields to alternating voltage electrical signals for reception.

Q2 What are the three main groupings of antennas?

1. **Directional – This antenna can direct the signal in one direction e.g., Yagi.**
2. **Semi-directional - This antenna can direct the signal in two dominant directions e.g., dipole.**
3. **Omni-directional - This antenna is not able to direct the signal and radiates in all directions e.g., vertical whip.**

Q3 What is an isotropic antenna?

The ideal antenna by which all antennas are compared, is called the isotropic antenna. The isotropic antenna is a theoretical antenna that radiates equally in all directions - horizontally and vertically with the same intensity. The antenna has a gain of 1 (0 dB) in the spherical space all around it and has an efficiency of 100%.

Q4 Name five types of antennas?

- **Dipole**
- **Folded dipole**
- **Yagi**
- **Vertical**
- **Trapped dipole.**
- **Inverted V**

Q5 Complete the following table.

Antenna	Input Impedance	Balanced / Unbalanced	Grouping
Half wave dipole	72 Ω	Balanced	Semi directional
Folded dipole	**300 Ω**	**Balanced**	**Semi directional**
Inverted V	**50 Ω**	**Balanced**	**Semi directional**
End fed half wave	**2500 Ω**	**Unbalanced**	**Semi directional**
Quarter wave Vertical	**35 Ω**	**Balanced**	**Omnidirectional**
Yagi	**70 Ω**	**Balanced**	**Directional**
Trapped dipole	**72 Ω**	**Balanced**	**Semi directional**

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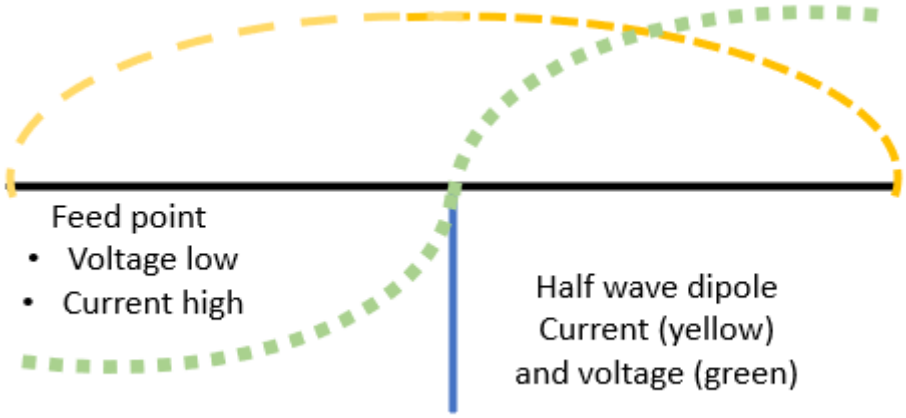
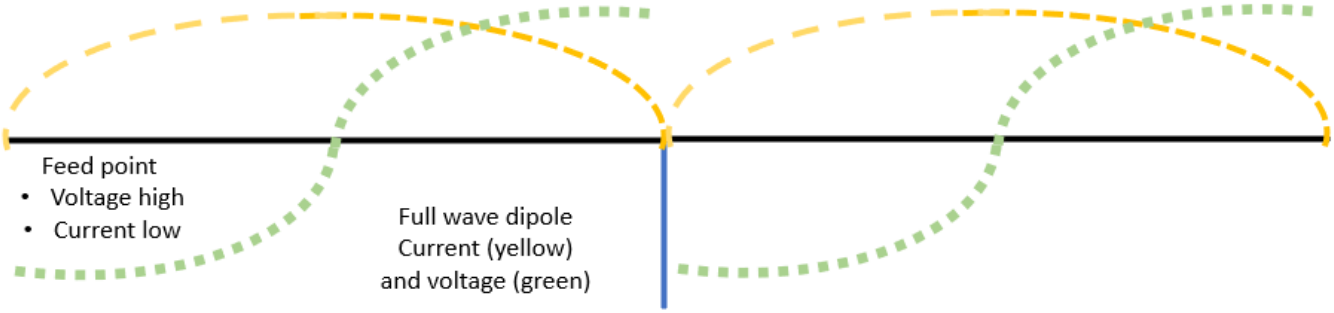
Q6 Draw the current and voltage field on a half wave dipole.



Q7 Draw the current and voltage field on a full wave dipole.



Q8 What are the three methods of polarising and antenna?

- **Horizonal - the electric field will move sideways in a horizontal plane.**
- **Vertical - the electric field will oscillate up and down in a vertical plane.**
- **Circular - the polarisation represented by the E-field rotates as the signal propagates. Signals rotating to the right are referred to as right-hand circular polarization (RHCP). Signals rotating to the left are referred to as left-hand circular polarization (LHCP)**

Q9 Why is the height of an antenna important for an amateur operator?

Placing the horizontal antenna as high as possible above ground give the antenna the lowest take of angle.

Q10 Explain how an antenna can have Gain and efficiency.

The gain of an antenna is the ratio of the radiation intensity compared to the radiation intensity if the antenna were an isotropic antenna. Gain is defined by the letter G and is a unitless measure that combines an antenna's radiation efficiency and directivity.

The efficiency of an antenna is determined by estimating the total loss of energy at the input terminals of the antenna. This includes mismatch losses and the dielectric/conduction losses.

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Q11 What is the difference between ERP and EIRP?

Effective Radiated Power (ERP) – ERP is the combination of the power emitted by the transmitter and the ability of the antenna to direct that power in a given direction. The input power to the antenna multiplied by the gain of the antenna.

Effective Isotropic Radiated Power (EIRP) – EIRP is the hypothetical power that would have to be radiated by an isotropic antenna to give the same signal strength as the actual source antenna in the direction of the antenna's strongest beam.

Q12 RF EMR is one hazard when working with antennas. What is the other just as important hazard?

As antennas are located above ground, the additional risk is falls from working at heights. In 2020-2021, 42% of hospitalised injury cases and 40% of accidental injury deaths in Australia were due to falls. Falls resulted in 243,000 hospitalisation cases in Australia in the same period. This means that around 950 people per 100,000 population were hospitalised due to falls. 26 Apr 2023

Q13 If an antenna undertest resonates at a higher frequency than expected, is the antenna to short or too long?

Too short

Q14 The antenna in Q13 resonates at a frequency higher than expected, is capacitive reactance or the inductive reactance highest?

Capacitive

Q15 What is a capacitance hat on an antenna?

Capacitance Hat - Where short masts must be used, a capacitive top load (also known as top hat or capacitance hat) is sometimes added at the top of the mast to increase the radiated power. Since the top load acts electrically like an additional length of mast, this is called "electrically lengthening" the antenna.

Q16 Polarisation of an antenna is related to voltage field or the magnetic field?

The voltage or E field

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