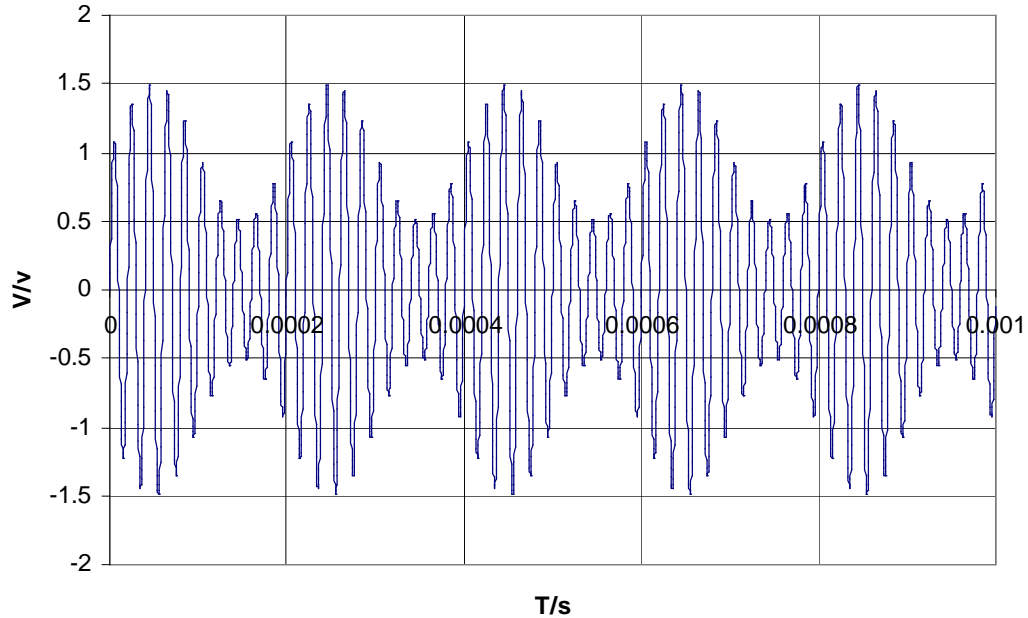


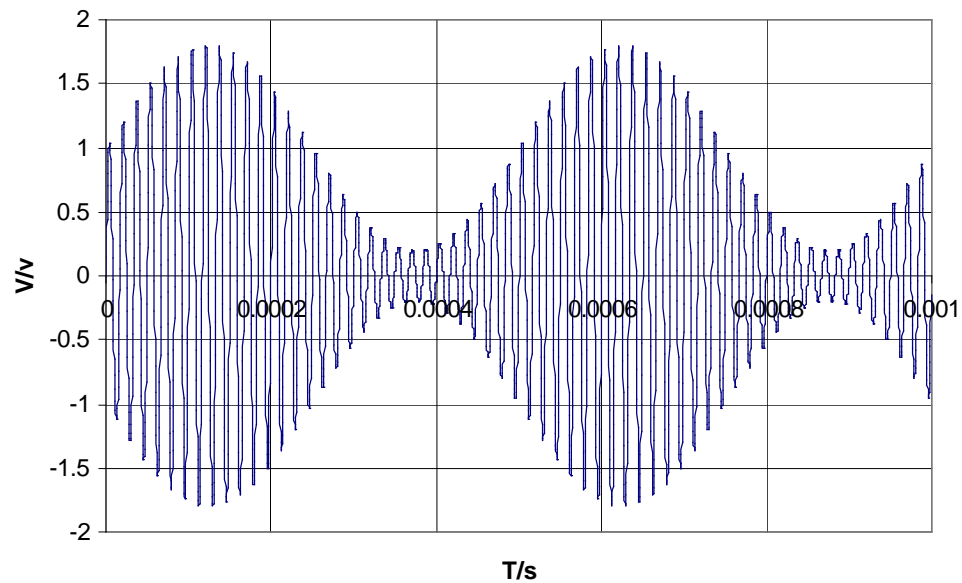
## AM modulation

1. Here is an am radio signal



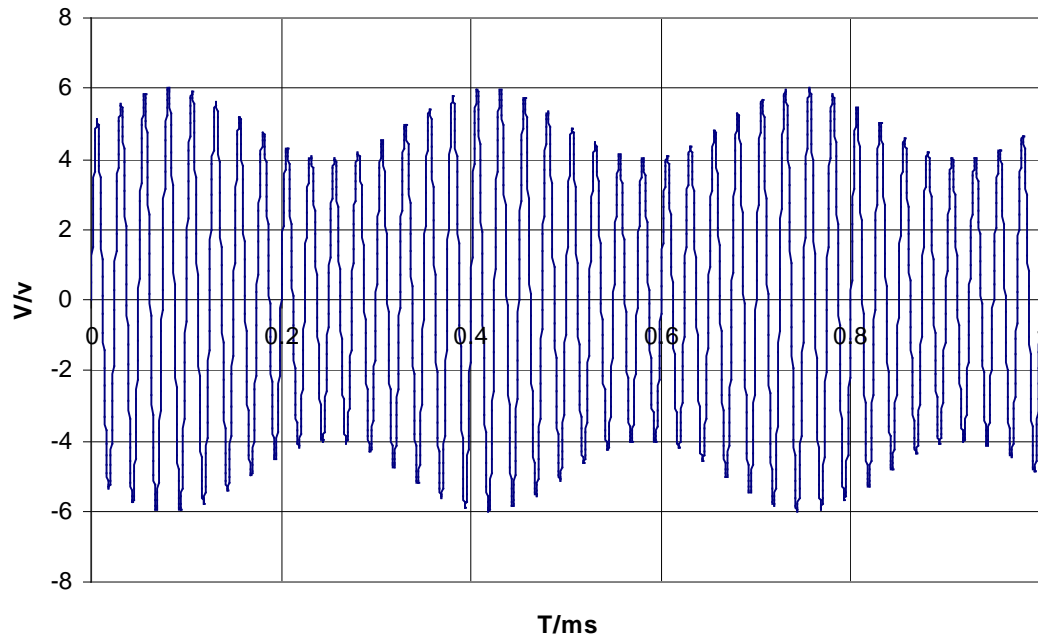
- a) What is the frequency of the carrier wave?
- b) What is the frequency of the modulating wave?
- c) What is the depth of modulation?
- d) Draw the spectrum of this signal.
- e) What is the bandwidth of this signal?

2. Here is an am radio signal



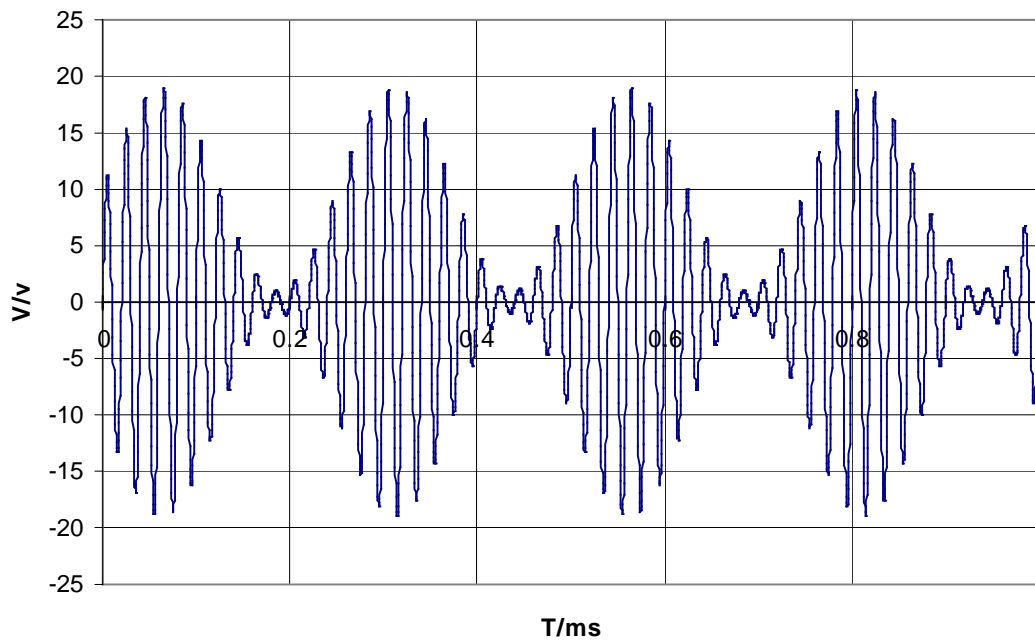
- What is the frequency of the carrier wave?
- What is the frequency of the modulating wave?
- What is the depth of modulation?
- Draw the spectrum of this signal.
- What is the bandwidth of this signal?

3. Here is an am radio signal



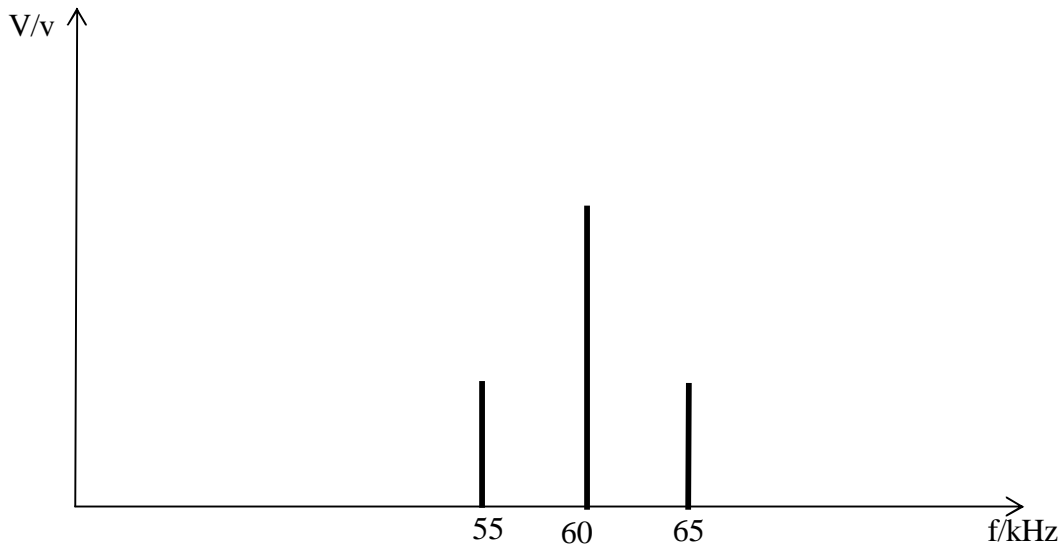
- What is the frequency of the carrier wave?
- What is the frequency of the modulating wave?
- What is the depth of modulation?
- Draw the spectrum of this signal.
- What is the bandwidth of this signal?

4. Here is an am radio signal



- What is the frequency of the carrier wave?
- What is the frequency of the modulating wave?
- What is the depth of modulation?
- Draw the spectrum of this signal.
- What is the bandwidth of this signal?

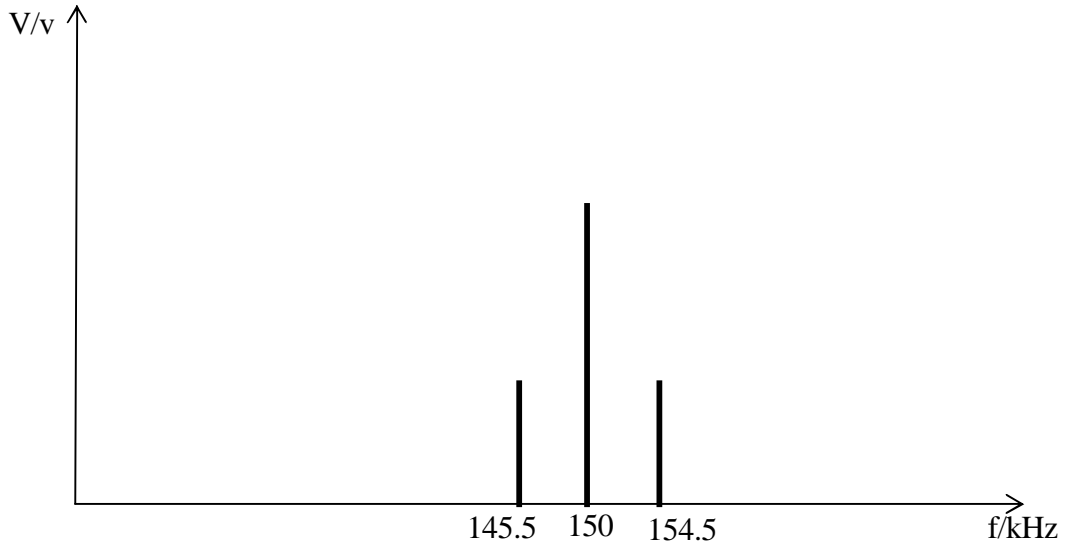
5. Here is the spectrum of an am radio signal



- What is the frequency of the carrier wave?
- What is the frequency of the modulating wave?
- What is the bandwidth of this signal?

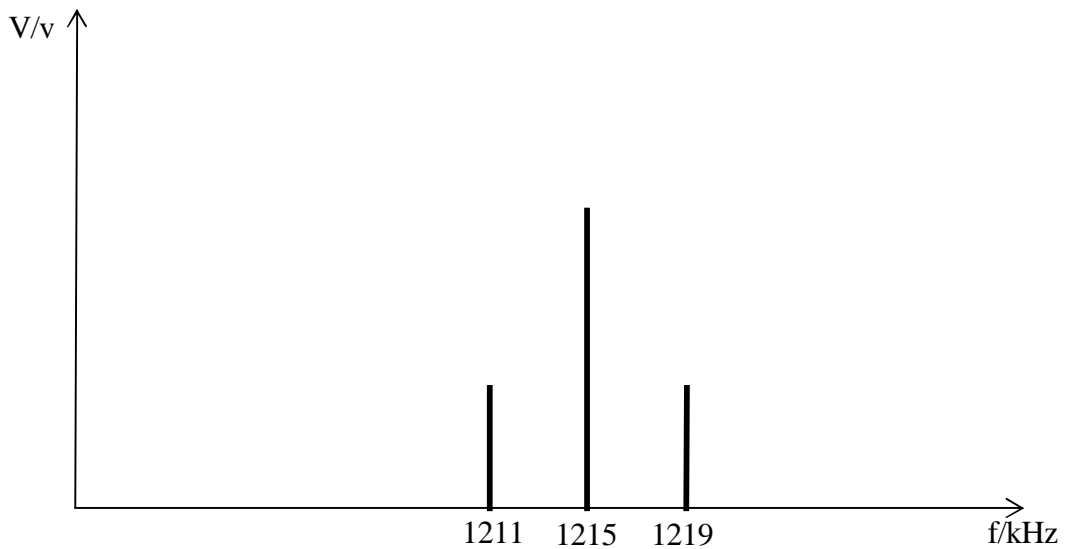
d) Sketch a graph of voltage against time for this signal

6. Here is the spectrum of an am radio signal



- a) What is the frequency of the carrier wave?
- b) What is the frequency of the modulating wave?
- c) What is the bandwidth of this signal?
- d) Sketch a graph of voltage against time for this signal

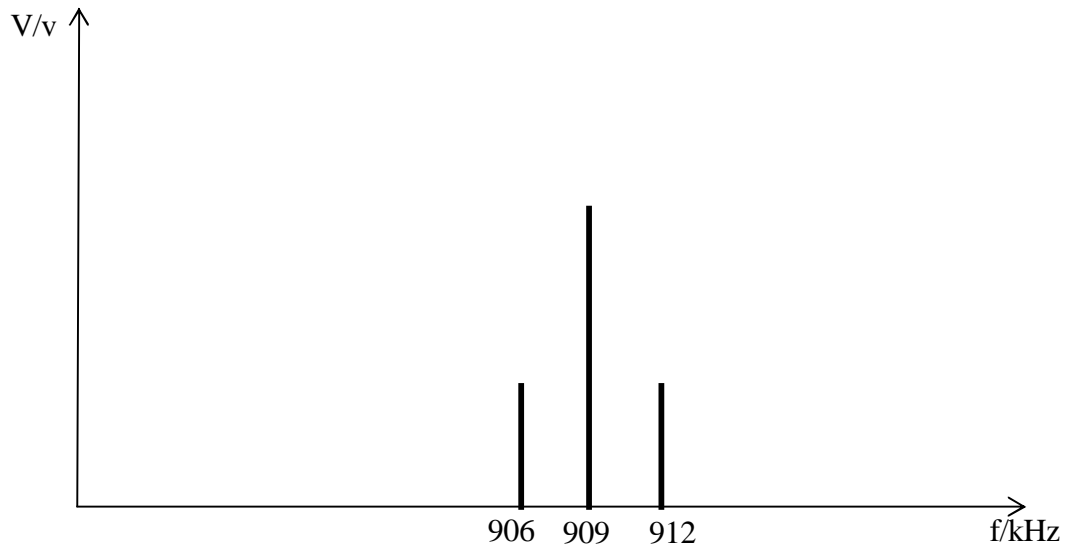
7. Here is the spectrum of an am radio signal



- a) What is the frequency of the carrier wave?

- b) What is the frequency of the modulating wave?
- c) What is the bandwidth of this signal?
- d) Sketch a graph of voltage against time for this signal

8. Here is the spectrum of an am radio signal



- a) What is the frequency of the carrier wave?
- b) What is the frequency of the modulating wave?
- c) What is the bandwidth of this signal?
- d) Sketch a graph of voltage against time for this signal

9. The maximum frequency used in broadcast am radio station is 4.5kHz.

- a) What is the bandwidth of a broadcast am radio station?
- b) What is the channel bandwidth of the MF band 540kHz to 1600kHz
- c) What is the maximum number of broadcast radio station that can fit into the MF band
- d) What is the channel bandwidth of the LF band 145kHz to 280kHz
- e) What is the maximum number of broadcast radio station that can fit into the LF band

10. A remote control system transmits controls using am modulation with sine waves of 2kHz.

- a) What is the bandwidth of the remote control signal?
- b) The transmitter uses the channel between 45.05MHz and 45.10MHz, what is the channel bandwidth?
- c) What is the maximum number of different remote controls that can be used at the same time?

11. A telephone system uses am modulation to send many phone signals down one piece of wire. The maximum frequency of sound that can be sent is 3400Hz. The signals are all in a band between 80MHz and 220MHz.

- a) What is the name of this technique for getting lots of different signals through the same medium?
- b) What is the maximum bandwidth of a telephone signal?
- c) What is the bandwidth of the channel?
- d) How many telephone signals can be sent down the wire at the same time?

12. A company uses a set walkie-talkies operating on a channel between 415.25MHz and 415.35MHz. The company needs to be able to transmit 100 different radio signals at a time.

- a) What is the bandwidth of the channel available to the company?
- b) What is the maximum bandwidth available for each walkie-talkie signal?
- c) What is the maximum frequency that a walkie-talkie can transmit?

13. A remote control car alarm operates in a channel between 735.02MHz and 735.04MHz. There needs to be 40 different carrier frequencies for the remote controls to operate on.

- a) What is the bandwidth of the channel available for the car alarms?
- b) What is the maximum bandwidth available for each car alarm remote control?
- c) What is the maximum modulating frequency that a car alarm remote control can use if the signal is amplitude modulated?

14. A cordless phone uses amplitude modulation to transmit voice signals. There are 12 different carrier frequencies that can be used between 432.95MHz and 433.05MHz.

- a) What is the bandwidth of the channel available for the cordless phones?
- b) What is the maximum bandwidth available for each cordless phone?
- c) What is the maximum frequency of sound that the cordless phone can transmit or receive?