

4. Operational Instructions

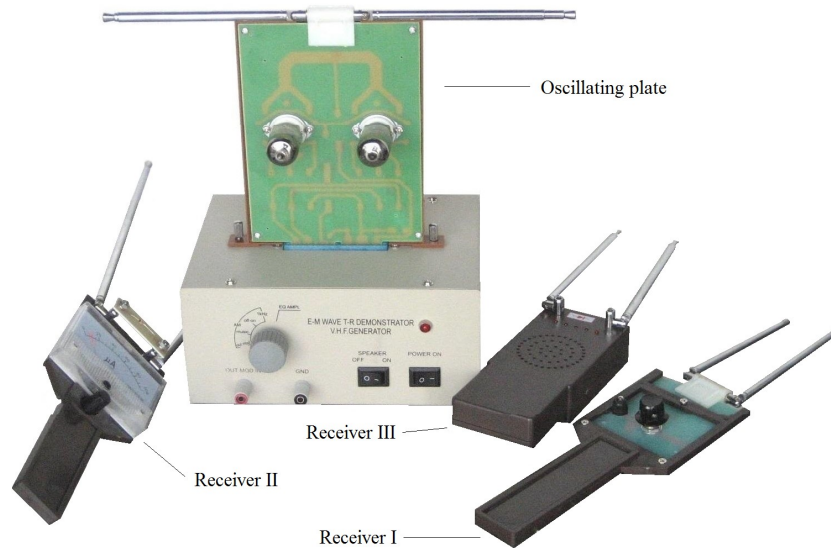


Figure 1 Photo of apparatus

1) Pre-operation preparations

Install the two electronic tubes (6N3) onto the oscillating plate, then insert the oscillating plate into the slot on the top of the power supply & modulator unit, and finally fasten the oscillating plate using the two fixing screws. Place an element antenna on the oscillating plate, now the high frequency generator is ready to use.

2) Transmission of electromagnetic waves

Adjust the length of the element antenna to approximately 60 cm (pull out three segments of each side), set the signal modulation mode of the high frequency generator to “EQ-AMPL,” turn on the power of the high frequency generator, the red LED indicator on the panel should be on, and the filaments of the two electronic tubes emit red light too. After pre-warming, the high frequency generator starts to transmit electromagnetic waves in space.

3) Reception of electromagnetic waves

A. Reception of electromagnetic waves using Receiver I

Put the element antenna to the plate of Receiver I (the tuning receiver), adjust the length of the element antenna to approximately 60 cm (pull out the three segments of each side), position Receiver I in front of the high frequency generator at a distance of approximately 0.1~0.2 m, rotate the knob on the plate of Receiver I in clockwise direction gradually, and the LED indicator emits light from dim to bright, demonstrating that electromagnetic waves are being received.

B. Reception of electromagnetic waves using Receiver II

Adjust the knob on Receiver II in counterclockwise direction all the way to the end, adjust the length of the element antenna to approximately 60 cm, insert the two pins of a diode plate to the two sockets of the element antenna with correct polarity (**note:** one may need to plug one pin of the diode plate first to one socket, then press the other side of the diode plate hard to plug the second pin to the other socket), position receiver II in front of the high frequency generator at a

distance of roughly 1 m, rotate the knob on the plate in clockwise direction gradually, the dial of the current meter should turn accordingly, demonstrating that electromagnetic waves are being received.

C. Reception of electromagnetic waves using Receiver III

Adjust the length of the element antenna to approximately 60 cm, insert the two pins of a diode plate to the two sockets of the element antenna with correct polarity (**note:** one may need to plug one pin of the diode plate first to one socket, then press the other side of the diode plate hard to plug the second pin to the other socket), position Receiver III in front of the high frequency generator at a distance of approximately 1 m, turn the adjusting wheel of Receiver III to switch it on, and rotate the adjusting wheel in the same direction gradually, the five indicating LEDs should emit red light, demonstrating that electromagnetic waves are being received.

Switch the signal mode selector on the panel of the high frequency generator to “1k Hz”, “off-on” and “music”, respectively, and turn the volume adjusting knob of Receiver III gradually, audio signals of “1k Hz”, “off-on” and “music” can be heard from the Receiver, demonstrating that electromagnetic waves of different forms are being received. Note, external signal (e.g. radio or computer audio signal) can be connected to the input terminals and switch the mode selector to external signal position, corresponding voice can be heard from the receiver.

4) Observation of transmitting efficiency of antenna

Rotate the adjusting knob on Receiver II in counterclockwise direction to the end, adjust the length of the element antenna to approximately 60 cm, insert the two pins of a diode plate to the two sockets of the element antenna with correct polarity, position Receiver II in front of the high frequency generator at a distance of approximately 2 m, rotate the knob on the plate in clockwise direction gradually, the dial of the current meter should turn accordingly from left to right. Then remove the antenna from the oscillating plate, the dial of the meter should fall to zero indicating that the transmitting efficiency of the electromagnetic waves from the high frequency generator is too weak to be received by Receiver II without a transmitting antenna.

5) Demonstration of resonance and tuning

A. Observe resonance of two resonance circuits

Remove both element antennas from the oscillating plate of the high frequency generator and the plate of Receiver I, then position Receiver I in front of the high frequency generator at a distance of approximately 0.15 m, rotate the knob on the plate of Receiver I in clockwise direction gradually, the LED indicator emits light from dim to bright, demonstrating that the two resonance circuits are in resonance.

B. Observe tuning reception of electromagnetic waves

Rotate the knob on the plate of Receiver I in clockwise direction gradually, the LED indicator emits light from dim to bright demonstrating the process of tuning reception of electromagnetic waves.

6) Demonstration of amplitude modulation, demodulation and detection

Switch the signal mode selector on the panel of the high frequency generator to “EQ-AMPL”, the high frequency generator now transmits electromagnetic waves at equal amplitude. Insert

the two pins of a diode plate to the two sockets of the element antenna of Receiver III (**note:** one may need to plug one pin of the diode plate first to one socket, then press the other side of the diode plate hard to plug the second pin to the other socket), position the Receiver in front of the high frequency generator at a distance of approximately 1 m, rotate the adjusting wheel gradually, the five indicating LEDs should emit red light, but no sound is heard from the speaker. Then switch the mode selector of the high frequency generator to “1kHz”, “off-on” or “music”, respectively, and hence amplitude-modulated signals are being transmitted. Rotate the volume adjusting wheel gradually, the five indicating LEDs should emit red light demonstrating that amplitude-modulated electromagnetic waves are received. If the plate of diode is removed from the element antenna of Receiver III, the five indicating LEDs should turn off immediately as the received amplitude modulated waves by Receiver III are no longer amplitude-demodulated. Switch the mode selector of the high frequency generator to “EQ-AMPL”, the five indicating LEDs does not emit light, as the received amplitude modulated waves by Receiver III are not detected by the diode.

- Note:
1. After experiments, remember to switch off receiver III to avoid running out batteries.
 2. Replace batteries installed in receiver III if necessary.
 3. After experiments, store the parts in a cool, dry and well-ventilated place.