

MICROWAVE APPARATUS - 2.8cm, mini

Cat: SW2140-001 (with kit of parts)

DESCRIPTION:

The use of Microwave in the school laboratory to replace light for optical experiments provides great convenience to the teacher and gives the students a far better grasp of the principles involved. Blackout conditions or any special light sources are not required. Since Microwave is 'coherent transmission' it behaves as a safe, low frequency 'LASER'. Even though it cannot be seen, it has a greater advantage in that it can be measured and heard in quantitative terms. This is difficult to do with any form of normal visible light.

Since the frequency of Microwave is approximately 5×10^{-4} of that of light, the angles of diffraction. etc., are greatly magnified. Measurements may be made in degrees and centimeters instead of the very small angles and distances involved with visible light. Ordinary classroom metre rules can be used for measurements.

Studies in Microwave cover almost all the usual optical experiments and prove other types of phenomena, such as Radar, Doppler effect, Fresnel Lens, Polarization, Electromagnetic Radiation, Standing Waves, Measurement of Wave Length, Thin Film Interference, Velocity of Light, Bragg Refraction, Michelson's Interferometer, Single, Double and Multiple Slit Diffraction, Interference Patterns, Modulation of Radio Waves and others.

SW2140-001 Microwave apparatus & kit





Our comprehensive experiment manual supplied with the kit covers all these experiments and explains the methods of setting them up. Other advantages of the IEC **Microwave** are:

- Robust and rugged for student use.
- Small, light and portable, easy to use and may be handled and used by students without risk of damage to fragile optical equipment.
- Self contained, no ancillary equipment required.
- Compact size provides easy storage and handling.
- Low power and safe voltages to students to handle.
- Low Price.
- Made in Australia for immediate service and parts supply.
- An experiment manual is provided which is designed for both student and teacher use. It can be used as a text book on optics experiments.

Combined with the IEC 'HODSON' Light Box & Optical Set (HL2060-001), the IEC Microwave Kit provides a very useful 'OPTICAL LABORATORY'.

GENERAL DESCRIPTION OF APPARATUS:

The IEC Microwave Apparatus and complete Kit consists of the following components

- PA2140-040 Transmitter, TX2, with both continuous wave and integral modulation transmission. Including voice transmission. Physical size - 136 x 78 x 70mm.
- PA2140-030 Receiver, RX2AS with integral audio amplifier and analogue signal strength meter. Physical size - 213 x 78 x 70mm.
- PA2140-032 Diode Probe with lead and plug.
- PA2140-013 Microphone and cable.
- PA2140-007 Wax Lens - paraffin wax, mounted in an aluminium frame.
- PA2140-016 Wax Prism - paraffin wax.
- PA2140-015 Plastic Prism (Hollow). Polythene.
- PA2140-009 Reflector Plates - 2 large. Aluminium.
- PA2140-010 Reflector Plate - 1 small. Aluminium.
- PA2140-011 Diffraction Grating. Aluminium.
- PA2140-012 Polarizing Grille. Fibreglass.
- PA2140-014 Partial Reflector. Hardboard.
- PA4096-001 Mains Adaptor 240/12V.AC 200mA.
- PA2140-020 Instructions and Manual of Experiments.
- NOTE: The packaging boxes and styrene foam are used as supports for the transmitter and receiver to align correctly with the wax lens and the reflector plates.

Some versions of the Microwave system may omit some of the kit components.

CAUTION: The IEC system uses a miniature transmitter and receiver for total portability. The low output power (approx. 10 milliwatts) is considered safe to use however looking into the transmitter horn or direct and close aiming of the transmitter towards a person's eyes should generally be avoided.

**TRANSMITTER Model TX2.****OPERATING INSTRUCTIONS**

Power is supplied by either mains adaptor into the socket provided or from low voltage power pack 12V.AC/DC into the 4mm sockets. A 9-12Volt battery may be used providing that 25mA is available.

PROTECTION: Voltages up to 20Volt may be applied without damage. If power dissipation becomes excessive, the internal regulator will shut down for self-protection. The power will reappear automatically as the regulator cools down.

SELECTOR SWITCH POSITIONS:

- 'OFF' Transmitter does not transmit.
- 'CW' Transmits 'Continuous Wave' transmission (not modulated) of 2.8cm. wavelength (or frequency of approximately 10,000MHz.or 10GHz.). As the unit is turned ON, a small red LED indicates that the unit is transmitting.
- 'EXT' A signal from a signal generator may be fed to the 4mm signal input sockets marked 'EXTERNAL MOD'. This signal will modulate the transmission into pulses of CW at the frequency of the applied signal. If the modulating frequency is between 100Hz and 10kHz, the transmission can be heard as audible sound on the receiver.
- '100kHz' The transmission is modulated by an internal oscillator at a fixed frequency of 100kHz. This pulse rate is used for 'speed of light' experiment. Also this can be considered to be a 'carrier frequency' which in turn can be modulated at a lower audio frequency (a frequency that can be heard by the human ear). If the microphone is inserted into 'MIC' socket, voice can be transmitted in this mode.
- '1kHz' Transmission is modulated by fixed internal oscillator at a frequency of 1kHz. This setting is used for most experiments that require audible detection.
- '100Hz' As above but at a low 100Hz frequency.

SOCKETS:

- 'MIC' Socket to accept the crystal microphone or other audio input signal to modulate the 100kHz carrier wave.
- 'EXTERNAL MOD' Sockets to accept an external modulating signal from a pulse source or signal generator to modulate the CW directly.

**RECEIVER Model RX2AS:**

The receiver has an internal dry cell battery (9V type 216) and is fully portable. The receiver may also be operated from 12V.AC/DC mains adaptor or a low voltage power pack at 12V.AC/DC. The receiver incorporates 4x levels of amplification to suit various transmission distances, depending on the experiment in progress. Reception strength is indicated on the integral meter over a scale of zero to 10 divisions. Audio modulation is detected by the inbuilt amplifier and speaker. No ancillary equipment is required and no inter-connecting leads are required.

SELECTOR SWITCH POSITIONS:

- 'OFF'
- 'BATTERY TEST' If battery is operative, the small 'BATT. TEST' light will glow. If battery is flat, replace the battery (9V. type 216) or use alternative power source.
- 'GAIN 1-4' Select suitable level of gain to provide about half scale reading on the meter during an experiment.
- 'VOLUME CONTROL' When the signal is modulated so it can be heard, adjust to the desired volume of audio reception. The sensitivity of the audio alters with the gain setting.

SOCKETS:

- 'OUTPUT' Received signal may be fed to an oscilloscope or to another device.
- 'DIODE PROBE' When the Diode Probe is plugged in, the receiver in the horn is isolated and the reception indicated on the receiver is from Diode Probe only. For some experiments finding nodal points or standing waves etc., the **omnidirectional** probe is more suitable for detection than the directional receiver horn.

For detailed use of the kit components and for operating techniques, refer to the handbook of experiments supplied with each kit.

Always return equipment to your supplier should repairs become necessary.

Designed and manufactured in Australia