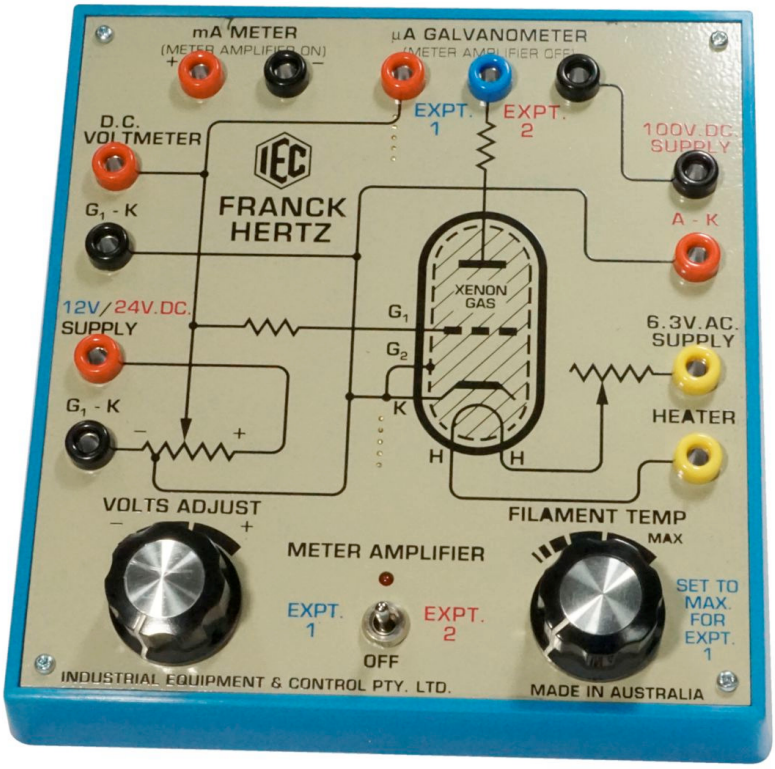
Franck Hertz Experiment Set
Xenon Gas



AP1870-001 Franck Hertz … with Inbuilt Amplifier

Description:

The **IEC Franck Hertz** Experiment Board consists of an Electron Valve configured to behave as a miniature laboratory to detect the behaviour of Xenon gas atoms when bombarded with electrons.

The two rotary controls provide the following adjustments:

'VOLTS ADJUST' controls the voltage on the Control Grid from slightly negative to the Cathode up to positive to the Cathode.

Experiment #1 requires up to 12V.DC. at the Grid and Experiment #2 requires up to 24V.DC. on the Grid.

This Grid voltage controls the flow of electrons from the Cathode to the Anode (or Plate).

'FILAMENT TEMP' controls the voltage to the heater which controls the heating of the Cathode and controls the quantity and energy of the electrons 'boiled off' the surface of the Cathode.

Length: 160mm	Width: 170mm	Height: 45mm	Weight: 340g

The Theory:

Rutherford's Theory of the atom structure was that atoms were like small spheres with spaces between them. Bohr's Theory demands a modification to Rutherford's theory. Bohr states that the atom consists of a relatively massive nucleus surrounded by orbiting electrons in various configurations and with various energy levels (or shells).

We know that if we fix the ends of a vibrating string or wire or fix the length of a resonating column of air or make waves in water in a restricted space, the result is the production of `standing waves'. We assume therefore that, under physically limiting conditions, there are only certain frequencies of vibration that are possible.

It is believed that orbiting electrons in the structure of the atom are limited by their orbits to certain frequencies and energy levels. Also, if they are bombarded by projectile electrons (like bullets), or energised in any other way (eg. X-ray bombardment), the orbital electrons can accept only sufficient energy to raise them to exactly the next or some higher energy level.

If the energy supplied by the external energy source is not sufficient to raise the orbiting electron to a higher level, then no energy at all is absorbed in the collision.

This type of collision is called an 'elastic collision', since MOMENTUM and ENERGY are both conserved.

The aim of this experiment is to determine if there are such discrete ENERGY LEVELS and also to find what energy of bombardment will lift an orbiting XENON electron to a higher level. This means to its **'First Excitation Level'.** This apparatus is to demonstrate this phenomenon.

A second experiment performed proves the 'Ionisation Potential of Xenon Gas"

The various socket terminals permit the following connections:

- HEATER power source for the heater (typ. 6.3V.AC.)
- 12V/24V.DC. SUPPLY G1-K power source for the Grid (typ. 0-24V.DC.)
- 100V.DC. SUPPLY power source for the Anode (typ. 0-100V.DC.)
- DC VOLTMETER G1-K connection for a Voltmeter to measure voltage set between Cathode and Control Grid.
- uA GALVANOMETER connection for a sensitive Galvanometer to measure very small currents flowing in the anode circuit for either Experiment #1 or Experiment #2. These terminals are used ONLY when the inbuilt DC Amplifier is switched OFF. Very small current to be detected is about 1 or 2 microamps.
- mA METER connection for a normal student milliammeter or multimeter if a sensitive Galvanometer is not available. These terminals are active ONLY when the inbuilt DC Amplifier is switched ON.
- METER AMPLIFIER switch to operate the optional inbuilt DC Amplifier in either Experiment #1 or Experiment #2 mode. When selected, the correct connections are automatically made for the Anode circuit and no connections are required at the Anode terminals. A red LED indicates that the Amplifier is switched ON.

Designed and manufactured in Australia