Franck-Hertz Ne-tube with housing

09105.40

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CE The unit complies with the corresponding EC guidelines.

Operating Instructions

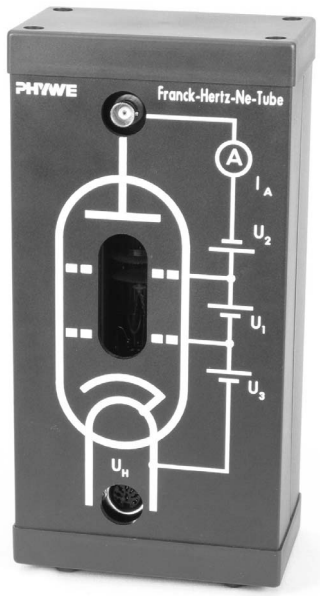

Fig. 1: Franck-Hertz Neon Tube with housing

1 SAFETY PRECAUTIONS

- Please read these operating instruction carefully before putting the tube into operation, to protect yourself and to prevent damage to your instrument.
- Only use the instrument in dry rooms in which there is no risk of explosion.
- Only use the instrument for the purpose for which it was designed.
- Only use the Franck-Hertz Neon Tube with the control unit 09105.99.

2 PURPOSE AND DESCRIPTION

The Franck-Hertz NeonTube with housing (see Fig. 1) are instruments that have been developed specifically for use in demonstrations and practical work in the teaching of Physics in schools and colleges. The dependence of the anode current on the applied acceleration voltage proofs the existence of discrete energy states of Neon atoms when free electrons collide with those atoms. The excitation energies of Ne atoms can be determined from the spectra recorded. The shell model of the atom postulated by Bohr was experimentally confirmed in 1913/14 by means of Franz-Hertz experiments (named after James Franck and Gustav Hertz).

3 HANDLING

3.1 Franck-Hertz Neon Tube

The Franck-Hertz Neon tube (electron collision tube) is a tube with plane, parallel electrodes (see Fig. 2): an indirectly heated oxidecoated cathode **C,** two grid-shaped accelerating electrodes **A1**, **A2** and a collecting electrode **S**. The distance between the cathode and the grid **A2** is large compared with the mean free wavelength of the electrodes in Neon gas at the operating temperature so that the impact probability is as high as possible. In contrast, the distance between the grid **A2** and the collecting electrode is short. A protective resistance is included in the grid lead.

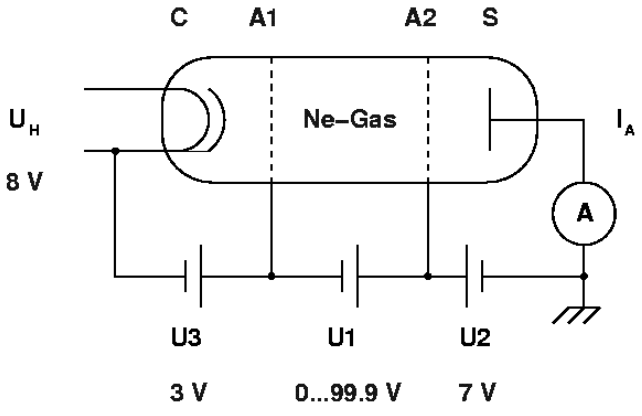

Fig. 2: Schematic view of a Neon four electrodes tube

As a consequence of the Neon ions produced during the operation of the Franck-Hertz tube ignition is observed in the form of a glow discharge at a critical acceleration voltage. The collection current then suddenly increases and can exceed the highest current measurement range on the amplifier. Therefore, when the discharge occurs, the acceleration voltage should be immediately reduced until the discharge disappears. If Franck-Hertz Control Unit is used then the tube power supply is switched of automatically after 7 sec. to avoid the discharges.

Following parameters are strictly recommended:
- U_H = (8.0 ± 0.5) V;
- U1 = 0 ... 99.9 V;
- U2 = (7.0 ± 0.5) V;
- U3 = (3.0 ± 0.5) V;

Don't set the heating voltage U_H too high to avoid the discharges and the damage of the Neon tube.

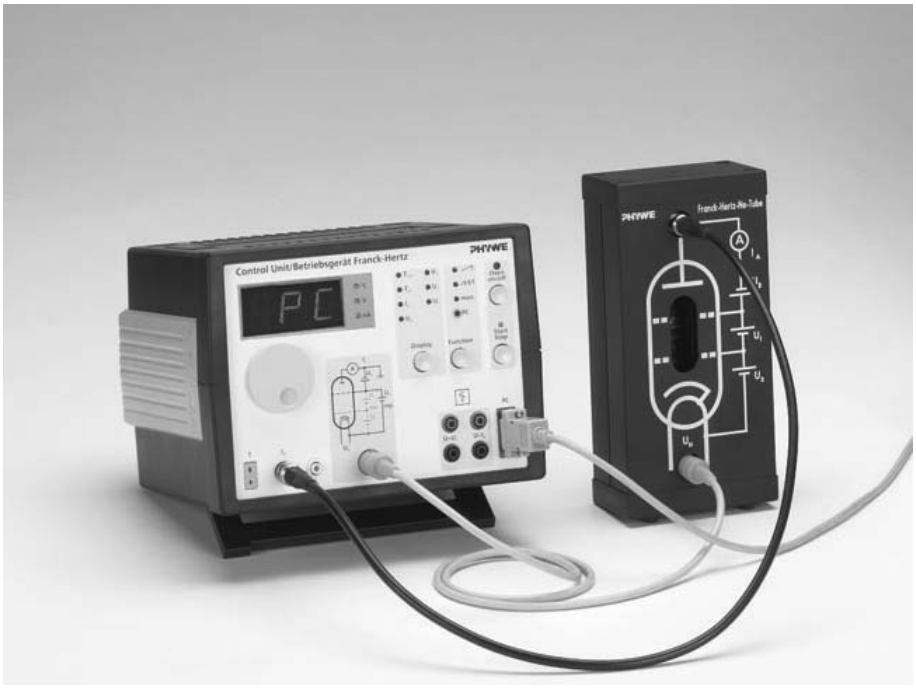

Fig. 3: Experimental set up of the Franck-Hertz experiment with Neon tube

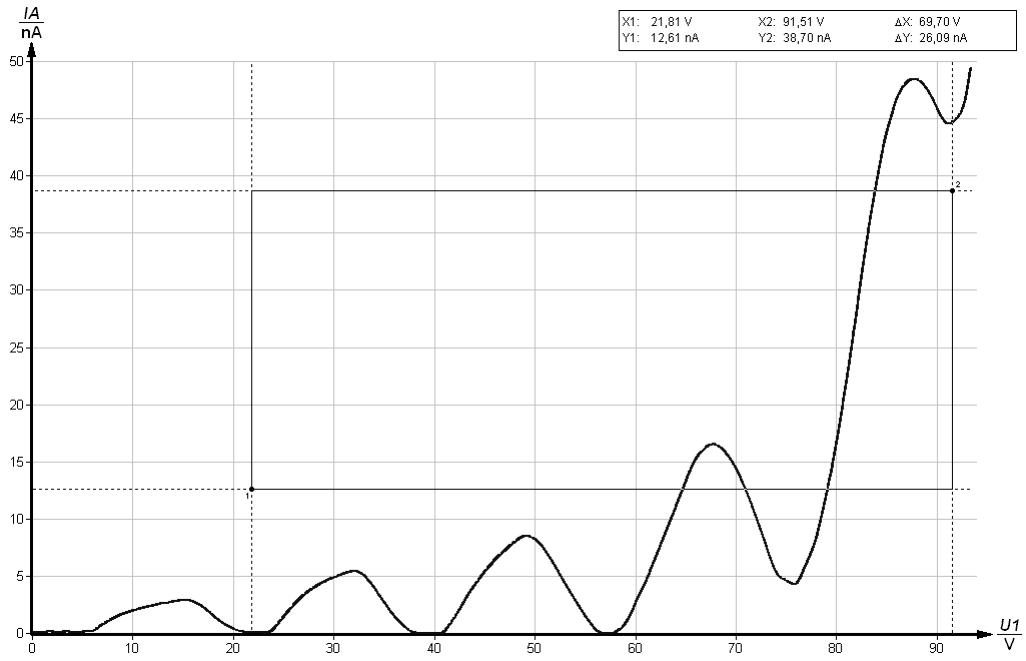

Fig. 4: Characteristic Franck-Hertz Spectrum for Neon tube

4 NOTES ON OPERATION

This high-quality instrument fulfils all of the technical requirements that are compiled in current EC guidelines. The characteristics of this product qualify it for the CE mark.

This instrument is only to be put into operation under skilled supervision in a controlled electromagnetic environment in research, educational and training facilities (schools, universities, institutes and laboratories).

This signifies that no mobile phones etc. are to be used in the immediate vicinity of such an environment. Individual connecting leads must not be longer than 2 m.

Electrostatic charges and other electromagnetic phenomena (HF, bursts, indirect discharge of lightning etc.) can have such an influence on the instrument that it no longer functions within the given technical specifications. Carry out the following measures to reduce or do away with disturbing effects:

Avoid fitted carpets; ensure potential equalization; carry out experiments on a conductive, earthed surface, use screened cables, do not operate high-frequency emitters (radios, mobile phones) in the immediate vicinity. Following a blackout failure, operate the on/off switch for a reset.

The Operating Instructions for the Franck-Hertz Control Unit 09105.99 are to be carefully followed whenever this unit is used in the experiment..

5 TECHNICAL SPECIFICATIONS (typical for 25 °C)

Operating temperature range	5 ... 40 °C,
Relative humidity	< 80 %

Franck-Hertz Neon tube

Voltage U1	0 ... 99.9 V
Voltage U2	0 ... 8 V
Voltage U3	0 ... 4 V
Voltage U_H	0 ... 9 V;
Output current	max. 10 µA

6 LIST OF EQUIPMENT

A. For Franck-Hertz experiment with Ne-tube, without a PC

Franck-Hertz Control Unit	09105.99
Franck-Hertz Ne-tube	09105.40
5-pin connecting cable for Ne-tube	09105.50
Shielded BNC cable, l = 750 mm	07542.11

B. For Franck-Hertz experiment with a PC

As in A. above, and additionally:

RS 232 data cable	14602.00
Franck-Hertz Measure software	14522.61

7 NOTE ON THE GUARANTEE

We guarantee the instrument supplied by us for a period of 24 month for the countries of the European Union and 12 months for other countries. This guarantee does not cover natural wear nor damage resulting from improper handling.

The manufacturer can only be held responsible for the function and safety characteristics of the instrument, when maintenance, repairs and changes to the instrument are only carried out by the manufacturer or by personnel who have been explicitly authorized by him to do so.

8 WASTE DISPOSAL

The packaging consists predominately of environmental compatible materials that can be disposed of via the local waste recycling service. Please contact your municipal administration for information on the disposal of worn out instruments.