3B SCIENTIFIC® PHYSICS

X-Ray Energy Detector   1008629

Instruction manual

05/18 ALF

1   Entry window
2   Detector housing
3   Detector holder
4   USB port

1. Description

The X-ray energy detector allows for the energy spectra of X-ray or gamma-ray radiation in an energy range of between about 2 keV and 60 keV to be recorded.

The X-ray energy detector consists of a Si PIN photodiode built into a metal housing also containing a charge-sensitive pre-amp, a linear master amplifier with pulse shaping and a circuit with a digital signal processor. Power is supplied via a USB port on a PC. Measurement and evaluation of data is handled by the MCALab software running under Windows.

The holder for the detector is particularly suited for insertion into the goniometer arm (jib) of X-ray apparatus (1000657 and 1000660).

2. Scope of delivery

1 X-ray energy detector

1 Detector holder

1 CD with software for measurement and evaluation

1 Instruction manual

3. Probability of detection

The probability of a Si PIN Photodiode detecting an X-ray photon depends on its energy E. At higher energies the probability becomes increasingly less.
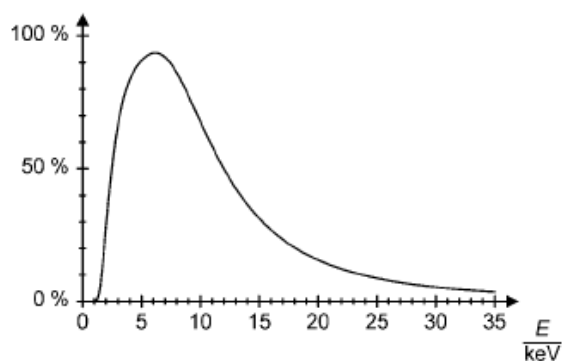

Fig. 1 Probability of detecting X-ray photons

4. Technical data

Energy range:	2 keV to 60 keV approx.
Energy resolution:	0.55 keV (median width) at $E_{FeK\alpha}$ = 6.40 keV
Entry window:	Plastic (absorption equivalent to graphite of thickness d = 40 μm)
Detector:	Si PIN photodiode
Active surface of detector:	0.8 mm diameter
Thickness of detector:	200 μm approx.
Dead time (lag) per pulse:	200 μs approx.
Length of cable:	1.75 m
Connection:	via USB
Dimensions of detector housing:	80 mm × 22 mm diam.
Weight:	150 g

System requirements for MCALab software

Operating system:	Windows 95 or later, Pentium processor of > 200 MHz recommended
Monitor resolution:	1024×768 pixels or higher recommended
For recording spectra:	Sound card with "Line In" input

6. Operation

5.1 Installation of MCALab software

- Install the software for the X-ray energy detector do not yet connect the detector to the PC.
- Place the CD into the appropriate PC drive.
- Run setup_.exe and follow the instructions given by the install wizard.

The installation program allows you to choose between two installation options.
1. Full version: installs both the MCALab software and the hardware drivers for the X-ray energy detector.

2. Compact: installs the MCALab software only. In this case, the hardware drivers are copied to the \Drivers sub-folder, so that they can be installed manually at a later date.

In most cases, it is recommended that the full version be installed, since it reduces the number of steps required to work with the X-ray detector itself to a minimum.

Automatic installation of the drivers is the final step in the installation of the full version. The X-ray energy detector does not need to be connected to a PC. For some system configurations, it is impossible to install drivers automatically. If this is the case, they need to be installed manually.

- Connect the X-ray energy detector to a USB port of a PC.
- When the message "New hardware detected" appears, install the drivers from the folder {path for installation}\Drivers\CDM 2.06.00 WHQL Certified\ftdibus.inf.

A detailed description of how to install the drivers can be found in the \Drivers folder in the form of a PDF file.

5.2 Assembly of X-ray energy detector into X-ray apparatus

- Insert the X-ray energy detector into the magazine of the goniometer arm at the desired distance (see Fig. 2).
- Connect the X-ray energy detector to a USB port of the PC.
- Make sure the cable is connected in such a way that the goniometer arm can pivot to its full extent.
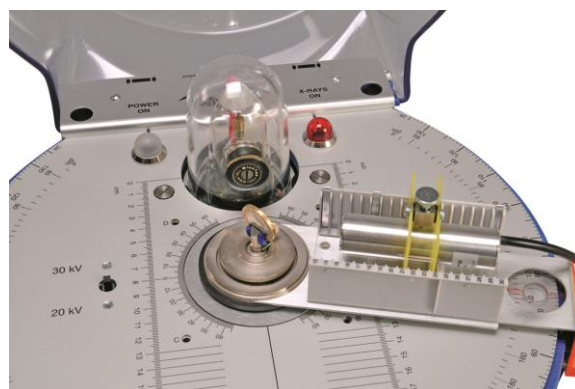

Fig. 2 Inserting the X-ray energy detector into the goniometer arm of the X-ray apparatus

5.3 Example experiment: X-ray fluorescence spectrum of a coin

- Insert the slotted collimator (from basic set 1000665) onto the brass collimator of the lead-glass dome of the X-ray apparatus.
- Clamp the coin into the sample holder of the X-ray apparatus at an angle of about 55°.
- Insert the X-ray energy detector into the magazine on the goniometer arm and connect it to a PC.
- Move the goniometer arm to a 75° angle.
- Run the MCALab software, turn on the X-ray apparatus and carry out the measurement and evaluation.

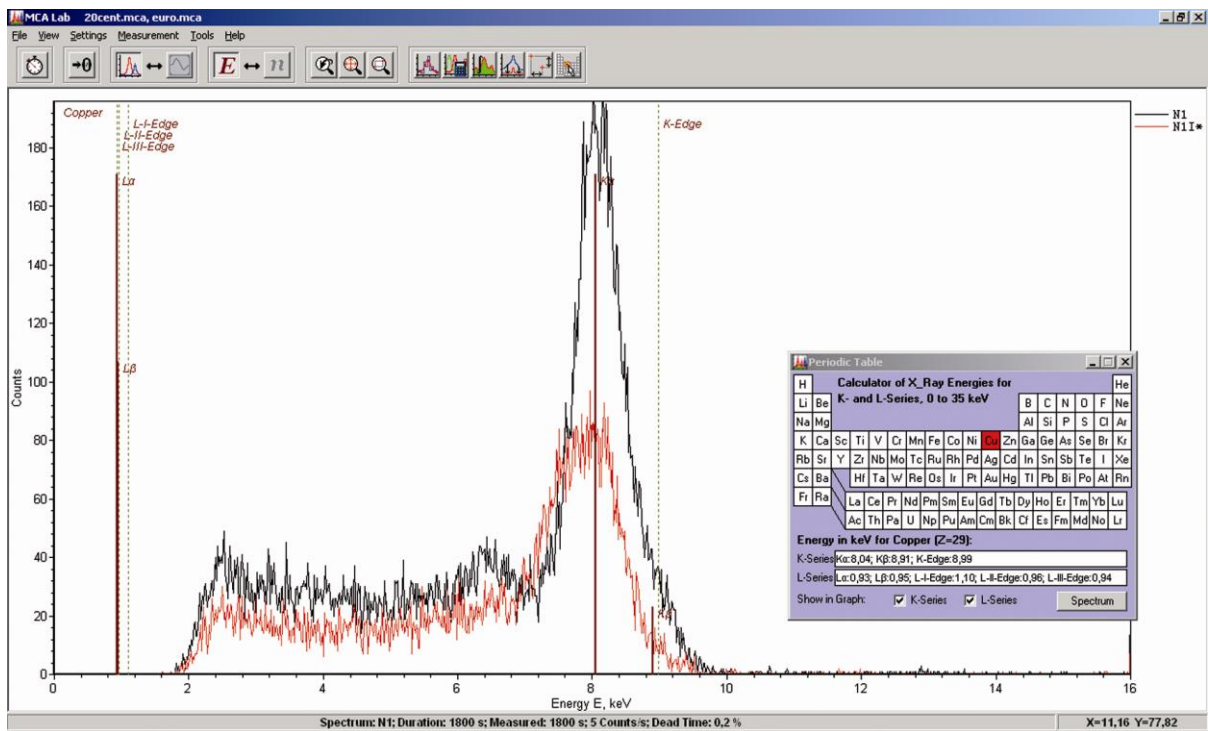A detailed description of the functions available in the software can be found in its help folder.

Fig. 3 Comparison of X-ray fluorescence spectra for two different coins