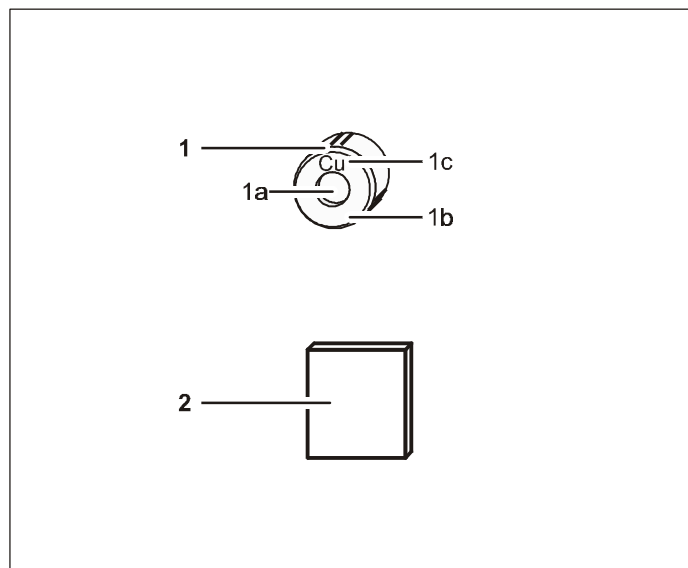# Leybold Didactic GmbH
Lehr– und Didaktiksysteme

**Instruction sheet 554 836**

Compton Accessory X-ray (554 836)

**1  Copper filter**
Cu foil (1a), foil support (1b), symbol of element (1c)

**2  Aluminum scattering body**

## 1  Description

The Compton accessory X-ray is used to investigate the Compton effect with the X-ray apparatus (554 811) by determining the change in the wavelength from the wavelength-dependent transmission of the copper filter either in front of or behind an aluminum scattering body.

## 2  Scope of supply

1 Aluminum scattering body
1 Copper filter

## 3  Technical data

**Aluminum scattering body:**

Dimensions:                    25 mm × 25 mm × 4 mm
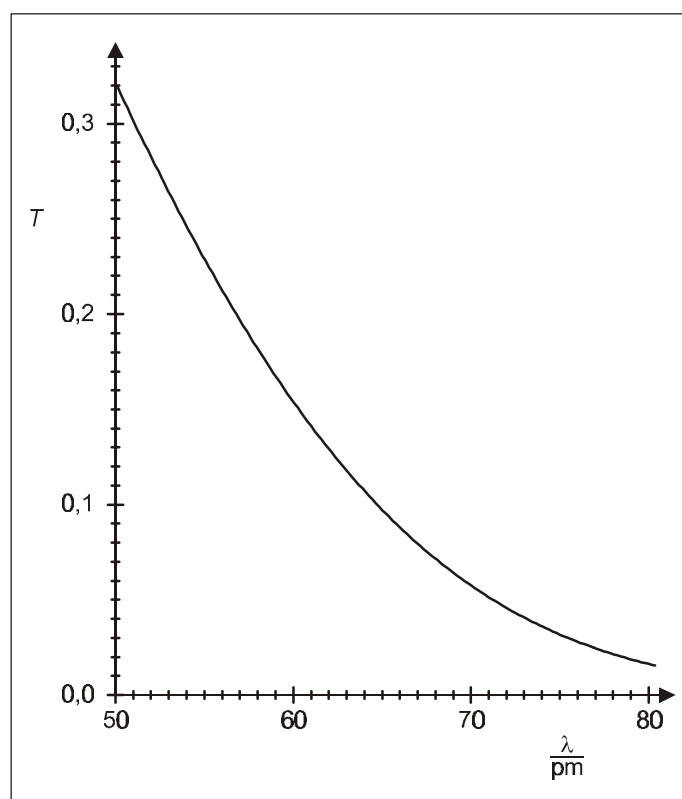
**Copper filter:**

Dimensions of frame:      24 mm dia. × 11 mm
Diameter of foil:             10 mm
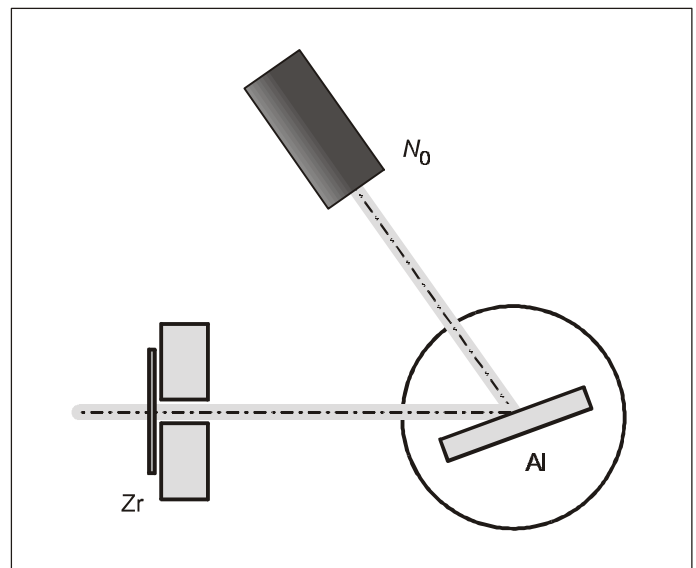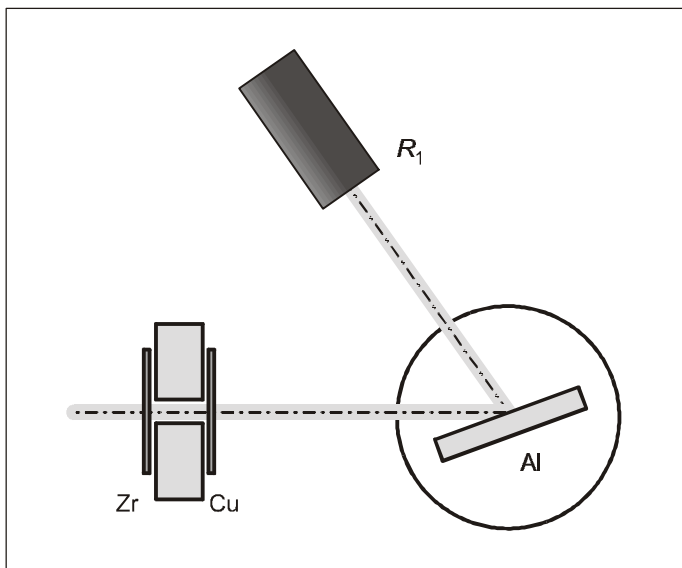Thickness of foil:            0.07 mm
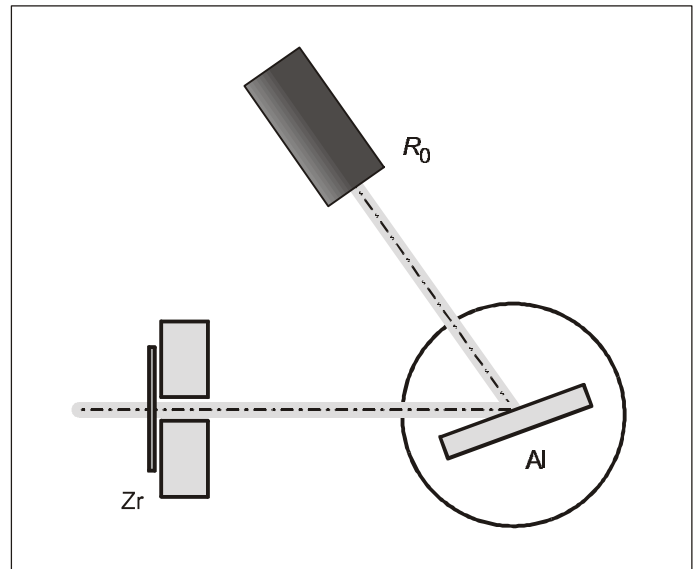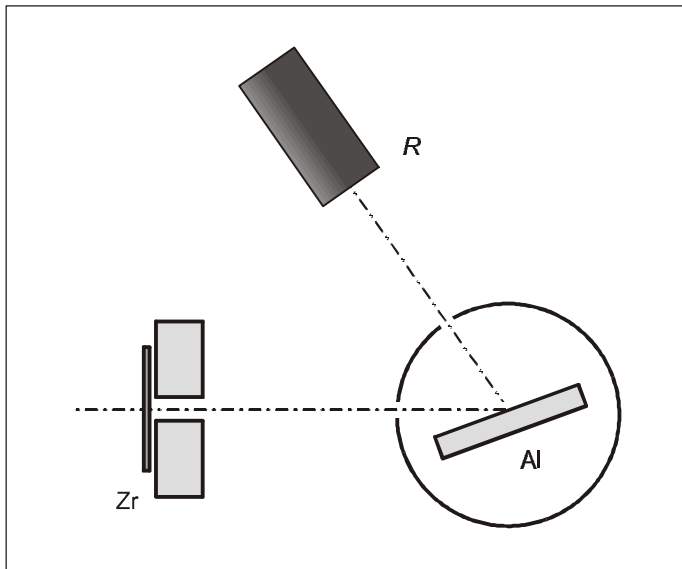
## 4  Transmission of copper foil

**Measuring Result:**



**Parameterization:**

$$T = \exp\left(-a \cdot \left(\frac{\lambda}{100 \text{ pm}}\right)^{n}\right) \text{ with } a = 7.6 \text{ and } n = 2.75$$

## 5    Carrying out the experiment



- Mount the zirconium filter in front of the collimator of the X-ray apparatus (554 811).
- Place the aluminum scattering body on the target stage of the goniometer (554 83).
- Attach the sensor.
- Position the target arm at 20° and the sensor arm at 145°.

- Determine the background rate $R$ without X-rays.

  As the differences in the counted rates are low, the individual counting rates should be measured with a statistical error less than 2%. To achieve this, set the measuring time $\Delta t$ so that each measurement comprises at least 2500 total events.

- Set the tube high voltage $U = 35.0$ kV and the emission current $I = 1$ mA.
- Measure the rate $R_0$ and calculate $R_0{}^* = R_0 - R$.

- Mount the copper foil behind the collimator.
- Measure the rate $R_1$ and calculate $R_1{}^* = R_1 - R_0$.

- Mount the copper foil on the sensor seat.
- Measure the rate $R_2$ and calculate $R_2{}^* = R_2 - R_0$.

- Determine the transmission values $T_1 = R_1{}^* / R_0{}^*$ and $T_2 = T_2{}^* / R_0{}^*$.

The transmission value $T_1$ for the unscattered X-rays is larger than the value $T_2$ for the scattered X-rays. With respect to the transmission curve of the copper foil, this shows that the X-rays have a longer wavelength (smaller energy) after scattering than before.

The actual evaluation reveals deviations from the wavelength change to be expected from theory, as the coherent scattering must also be taken into account in addition to the incoherent Compton scattering.

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