

# Measurement of volt-ampere characteristics of semiconductor detectors

Slovak University of Technology in Bratislava, Exercise STU-03

**Main topic:** Semiconductor detectors

**Keywords:** Semiconductor detectors, volt-ampere characteristics, working region calibration

**Purpose:** The experiment demonstrates the application of semiconductor devices as detectors. The Shockley-Ramo theorem is practically shown by experiment. Within the experiment, students go through the basics of the interaction of radiation with matter, gamma detection and principles of diodes. Inherent part of the experiment is to measure the volt-ampere characteristics of multiple semiconductor detectors in forward conduction and reverse blocking regions. The students compare different types of the semiconductor detectors and determine their working regions.

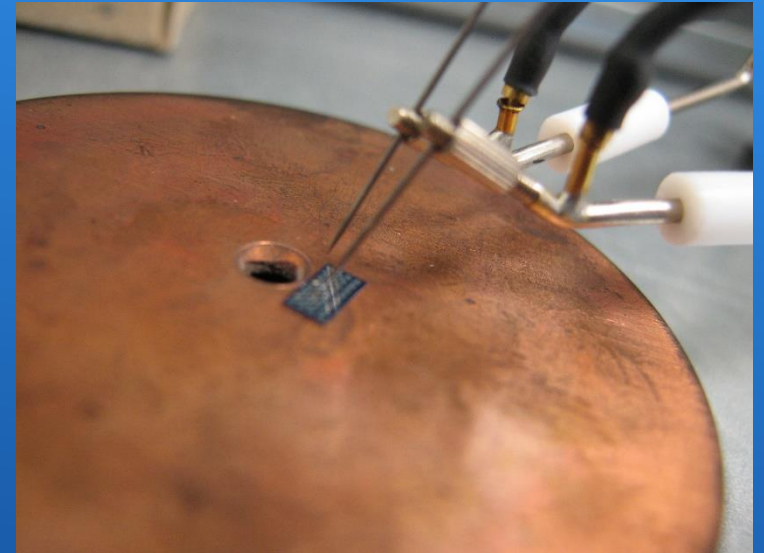
**Level of exercise:**  Basic  Advanced  Complex  
**Level of education:**  BSc  MSc  PhD

## What you will learn:

The students will learn how to determine correct operational parameters of multiple semiconductor detectors.

## Important information:

- Minimal size of student group: 1
- Maximal size of student group: 2
- Overall duration of the experiment (in wall clock hours): 2



## Slovak University of Technology in Bratislava, Exercise STU-03

**Possibility to perform experiment on demand:**  Yes  No

**Frequency of occurrence:** 2-3 times per year

**Examination modalities:** report

**Teaching languages:** English, Slovak

**Pre-knowledge required:** radioactive decay law, types, sources and interaction of radiation with matter, basics in electronics, detector and measurement techniques and evaluation of uncertainties

### Instruments required for exercise:

- Measurement circuit
- Dark chamber
- GaAs, SiC and Si detectors
- VA characteristics analyzer

### Execution:

- The detector is placed into the dark chamber and connected to the measurement circuit
- The current and voltage thresholds are set up and the forward conduction region is determined
- The voltage is continuously increased up to the chosen threshold and the current is analysed
- The reverse blocking region and the location of avalanche break down physical parameters are determined
- Based on the results from experiments, various detector materials are evaluated

### Limitations:

Pregnant and breastfeeding women are not allowed to enter the controlled radiation area. Legal age (18) is required. For more information please visit <http://www.ujfi.fe.i.stuba.sk/kontakt.php>

