INNOVATION & TECHNOLOGY TRANSFER

3D Performance Maps

Tomographic method and apparatus of determining a 3D map of a charge collection efficiency

Reference No. P 156

BACKGROUND

In many semiconductor devices like photovoltaic solar cells, CMOS detectors or power electronics, the charge-collection efficiency is a critical metric to evaluate the local electrical performance. There are multiple methods for examining the overall device performance. However, obtaining electrical information in 2D or even 3D is not trivial, and the quantification of charge-collection efficiency based on 2D measurements is prone to errors due to the lack of depth information. There are currently no non-destructive methods available for evaluating charge-collection efficiency in 3D.

SOLUTION

The problem is solved by tomographically determining the charge-collection efficiency in a volume inside of a fully assembled device. The method includes scanning the sample to measure the X-ray beam induced current and/or voltage, and applying a tomographic image reconstruction algorithm to generate a 3D representation of the charge-collection efficiency. The greatest spatial resolution is obtained at accelerator-based X-ray sources, and table-top X-ray instruments enable in-house accessibility of the measurement technology.

ADVANTAGES

- 3D analysis of the device performance
- Non-destructive measurement method
- Compatibility with table-top instruments and synchrotrons
- Performance measurement even underneath electrical contacts and in encapsulated devices.

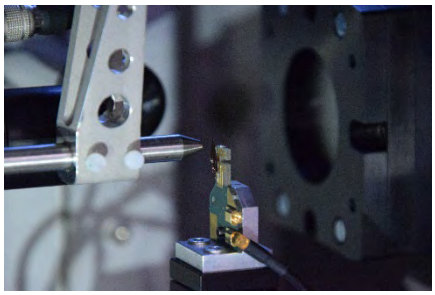

Fig. 1: An electrically contacted sample is measured in a laboratory X-ray device with a focused X-ray beam.

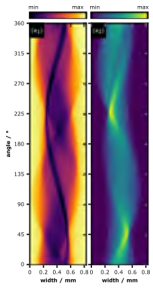

Fig. 2: Sinograms of transmission and the electrical signal.

APPLICATION FIELDS

Measuring 3D device performance

- Semiconductor industry
- Photovoltaic solar cells
- X-Ray detectors
- UV/VIS/IR cameras

PROPERTY RIGHTS

EP 4006530 A1
US 11461939 B2

POSSIBILITIES OF COOPERATION

- Licensing
- R&D Cooperation

CONTACT

Lan Fimmen
DESY Innovation and Technology Transfer
E-Mail: lan.fimmen@desy.de
Tel. +49 (0)40 8998 1748
innovation.desy.de