Proposers of the Tutorial
Viacheslav Kazmiruk and Mikhail Barabanenkov
Institute of Microelectronics Technology RAS
142432 Chernogolovka,
Moscow region
Russia

Tutorial Title

E-beam and new optical methods for wafer and modern patterned material inspection

The aim of this Tutorial is to introduce interested scientists from Academia and Industry in the facilities of electron or light beams as well as possible advantages delivered by a combination of these two methods potentials for nondestructive real time inspection of wafers with defects or periodically patterned possible multilayered surfaces.

Tutorial content:

Currently presented tutorial consists of two inwardly connected but at the same time self-dependent topics. Namely, (1) electron beam methods for surface inspection, and (2) light scattering on complicated surfaces including novel electromagnetic materials. Therefore, we will begin with e-beam problems followed by electromagnetic wave scattering on the state-of-the-art structures, and to the end we give our conclusions of advantages of possible combination of these two testing methods.

A Table of Contents of the topics covered in the tutorial is outlined below:

1. Electron beam systems for wafer defect inspection (WDI) and for die-to-database verification (DDV). (delivered by V.Kazmiruk).
    a. Defects revealed by WDI and DDV. Inspection and review stage.
    b. Comparison of WDI and DDV systems with those based on light optics.
    c. The main requiremnts to parameters of WDI and DDV. Factors limiting the facilities of electron optical part of the system for wafer defect inspection.
    d. Methods of improvement of WDI and DDV electron optics system.
    e. Methods of improvement WDI and DDV systems at whole.
2. Optical monitoring and microphotonic components (delivered by M.Barabanenkov).
    a. Disadvantages of the electromagnetic wave multiple scattering theory in application to the artificial electromagnetic materials.
    b. Transfer relations - new exact unified approach with given accuracy to the theory of multiple scattering of wave fields in inhomogeneous media.
    c. Reflection and transmission spectra of diffraction grating and two dimensional photonic crystals.
    d. Mechanisms of an opaque band formation in the transmission spectra of photonic crystals. Some examples of microphotonic components on the basis of two dimensional photonics crystals.
    e. Nanoshape control of diffraction grating in the far optical zone.
    f. Two scenarios of evanescent wave spatial spectroscopy (near optical zone) for accessing optical details beyond the diffraction limit.