of practically unimportant details. Sometimes the simplified description is better, when more understandable global description is more preferable compared with more precise, but also more complex for understanding physical models. We describe a few simple models that can be applied in the practical engineering to understand the basic behavior of modern semiconductor devices.

Various types of detectors with internal amplification of weak signals produced by ionizing radiation are used in modern physical experiments. There is a large class of gaseous detectors and presently widely used semiconductor avalanche photo detectors (APDs) [1]. Avalanche physical processes in semiconductors are more complex to describe and understand compared with simple Tungsten model for avalanche in gaseous detectors. However, it is not necessary to solve the fundamental system of partial differential equations to understand the processes in this type of detectors. Well known by radio engineers common conception of feedback can be applied for simple description of such a complex system [2]. Simple feedback model can be used for the classification of different types of modern APDs and for description of its internal processes. Simple “Logistic” model is applied to explain how the rising time of avalanche depends on the probability of avalanche occurrence in the APD. To understand how carriers generation-recombination processes are affected by traps created during irradiation and self annealing in semiconductors, one can apply a simple model based on assumption of a single traps level and a single lifetime of carriers on this level [3]. Interpretation of results obtained for a few types of commercial APDs is presented. Example of method of the detector noise introduction applied to the detector SPICE model is discussed. In addition, simple SPICE model describing gain coefficient and applicable for transient analysis of APD is proposed.

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FINANCIAL INSTRUMENTS PORTFOLIO OPTIMIZATION

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Nowadays investment of money is one of the most popular ways of income acquisition. One of the most urgent tasks of financial investment is analysis and prediction of expected profit and risks. Due to this, analysis and prediction of expected profit and risks suffered by an investor in the course of portfolio management is becoming topical as well.

The foundation of portfolio investment is allocation of investment money between various groups of assets, since it is impossible to predict fulfillment of two conditions at the same time: high reliability and maximum yield. Depending on the tasks and objectives, investors analyze the stock market situation and reasons that influence the stock price. The process of portfolio construction implies indicating the most appropriate portfolio structure for a certain type of securities; the percentage ratio of financial instruments is defined as well. Therefore, a portfolio represents a set of financial instruments integrated for implementation of investor’s purposes, profit growth and mitigation of damages.

In order to avoid excess risk, investors will struggle to minimize the yield standard deviation by diversifying the capital between different objects of investment. In this case, the risk is reduced since the portfolio yield standard deviation is less than average weighted standard deviations of the securities that make up this portfolio.

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ОДНОМЕРНАЯ МОДЕЛЬ МИКРОВОЛНОВОЙ ИМПУЛЬСНОЙ РЕФЛЕКТОМЕТРИИ ПЛАЗМЫ ТОКАМАКА КТМ

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Метод микроволновой импульсной рефлектометрии плазмы используется на установках управляемого термоядерного синтеза типа токамак для нахождения распределения плотности электронов [1]. При практической реализации метода требуется решить некорректую обратную задачу нахождения профиля плотности электронов по результатам прямых измерений времени пролета. Для разработки и проверки алгоритмов решения некорректной обратной задачи необходимо использовать математическую модель, описывающую решение прямой задачи импульсной рефлектометрии плазмы (ИРП) и адекватную экспериментальным данным. Проверка адекватности с использованием данных натурного эксперимента ИРП в настоящее время не осуществима, потому что на токамаке КТМ еще не получена плотная плазма.

Возникает проблема априорного выбора требований к модели по соотношению признаков «полнота описания» и «сложность реализации». В настоящей работе сделан выбор в пользу минимизации требований к сложности реализации, предусматривающий развитие уже апробированных на токамаках одномерных моделей ИРП, основанных на использовании приближения геометрической оптики и описания плазмы как плоскослоистой среды [2].

Полученные в рамках указанного подхода решения развиты и адаптированы для КТМ. Уточнены требования к минимально приемлемой полноте и точности описания моделируемой системы. Синтезирована и верифицирована одномерная модель импульсной рефлектометрии плазмы. Поставлена и предварительно исследована задача и принципы использования модели при синтезе алгоритмов обработки данных ИРП токамака КТМ. Показаны преимущества и ограничения представленной модели.

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