

Online laboratory "Physics of a nucleus and ionizing radiation"

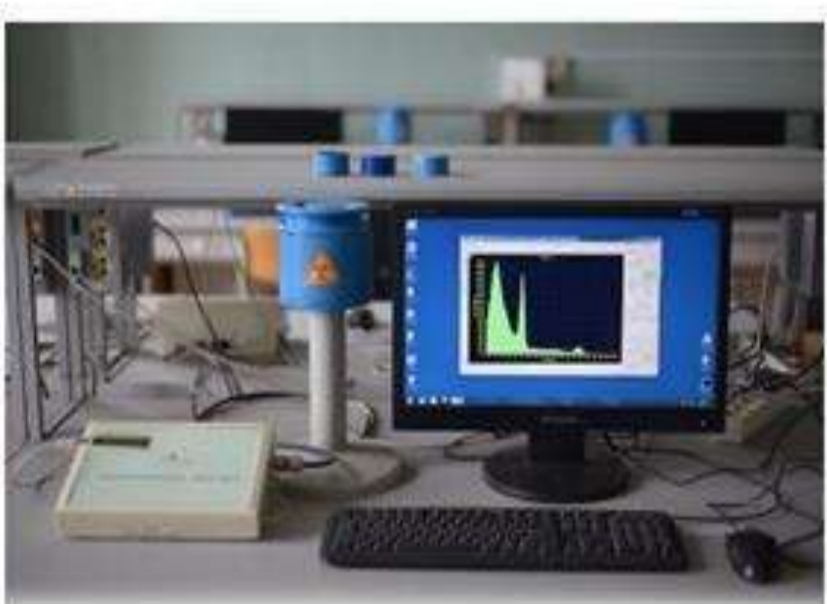
Introduction

The training module contains full description of the set-up, software for the experimental data primary processing, software MathCad

Перечень лабораторных работ

- Универсальный лабораторный комплекс по ядерной физике
- Статистика ядерных измерений
- Изучение принципа действия сцинтилляционного детектора
- Взаимодействие γ -излучения с веществом
- Изучение проникающей способности γ -квантов разных энергий

- Измерение удельной активности
- Сцинтилляционный спектрометр с неорганическим сцинтиллятором
- Сцинтилляционный спектрометр с органическим сцинтиллятором
- Взаимодействие β -электронов с веществом
- Изучение формы β -спектра
- Взаимодействие α -частиц с веществом



Universal laboratory set-up. It consists of detector, electronic module, personal computer and is designed to carry out laboratory works at one experimental unit

Detector

Contains replaceable blocks for detection and measurement of α -, β -, γ - radiation, and basic unit for transformation of light signal to an electric one with consequent formation and amplification of it. Each replaceable block has accessories providing space configuration of an experiment and shielding against radiation



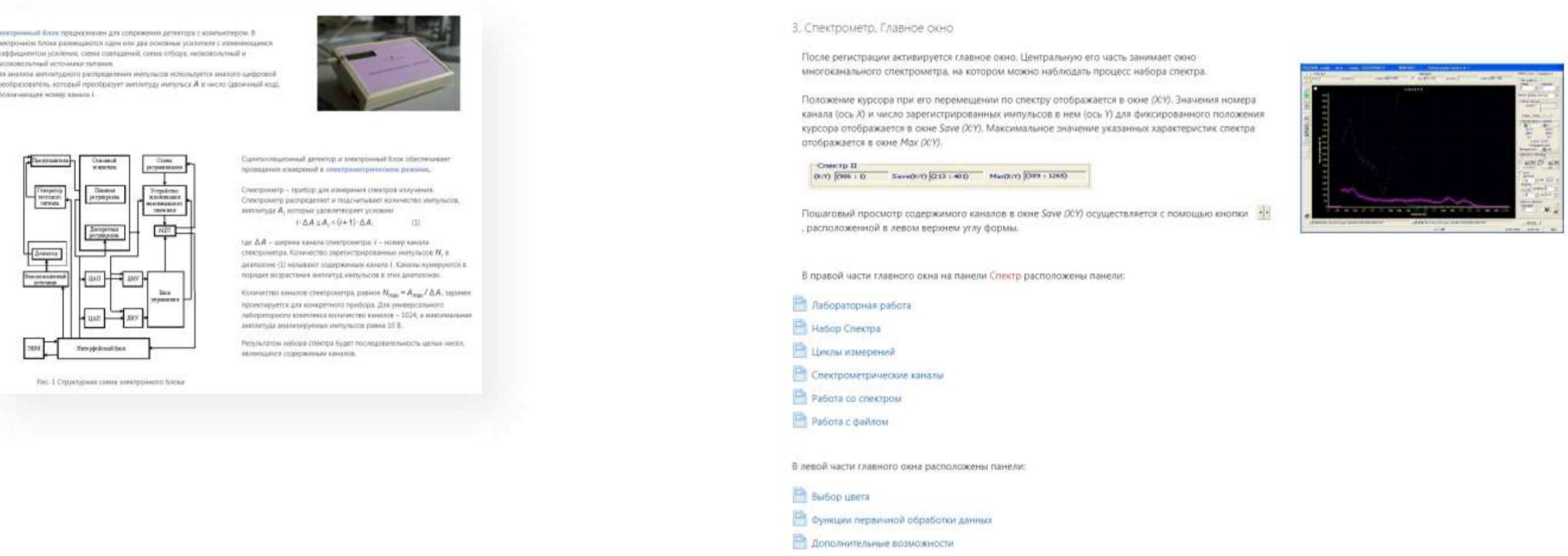
Основными элементами сцинтилляционного детектора являются сцинтиллятор, фотоэлектронный умножитель (ФЭУ), оптическая система для сочленения сцинтиллятора и ФЭУ.

Electronic module

It is used to transform the detector signal to a digital form recognizable by a computer

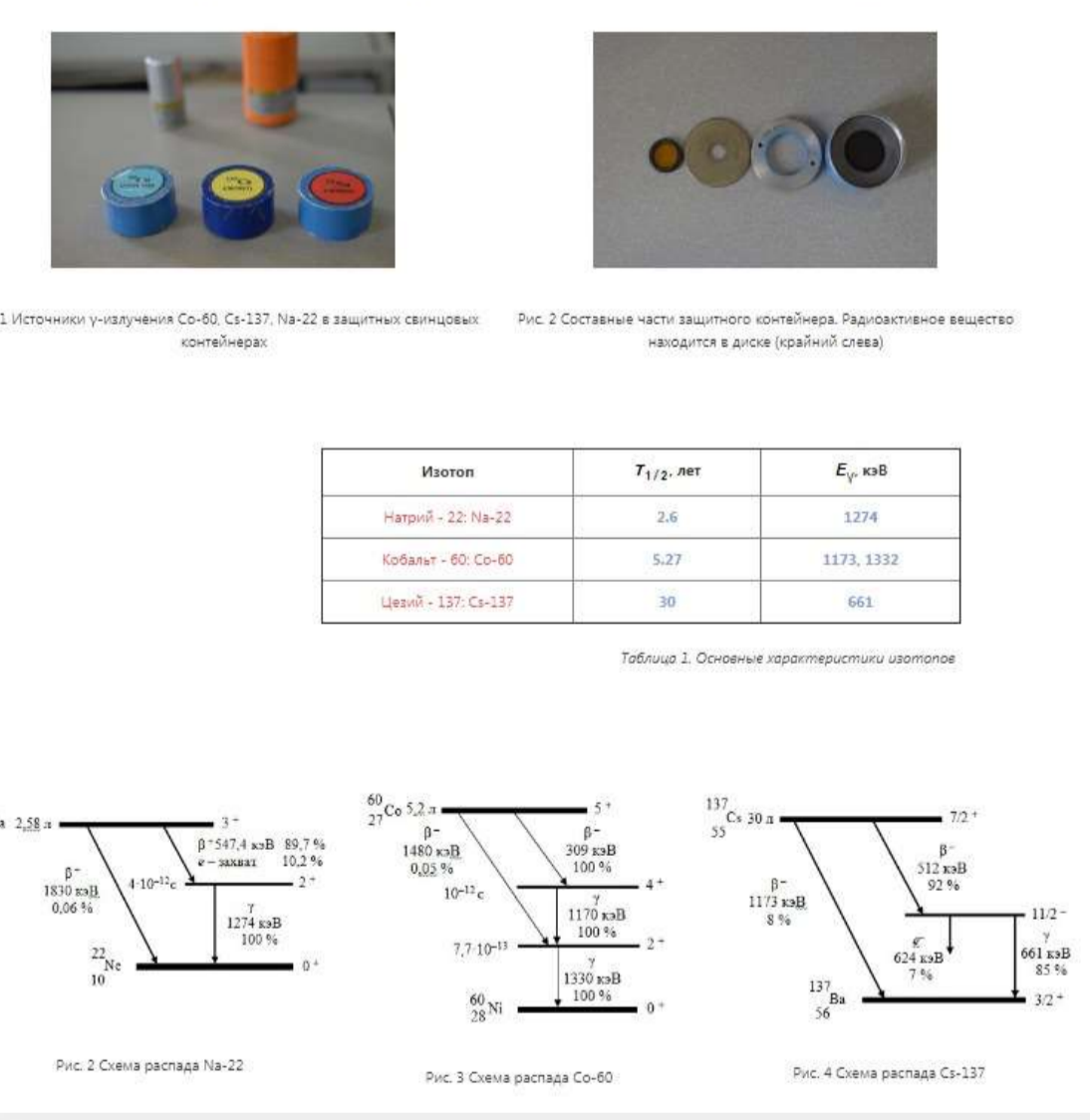
Software "Spectrum" (Atomtex production)

It is used to set up and control the spectrometer parameters, parameters of an experiment and primary data processing



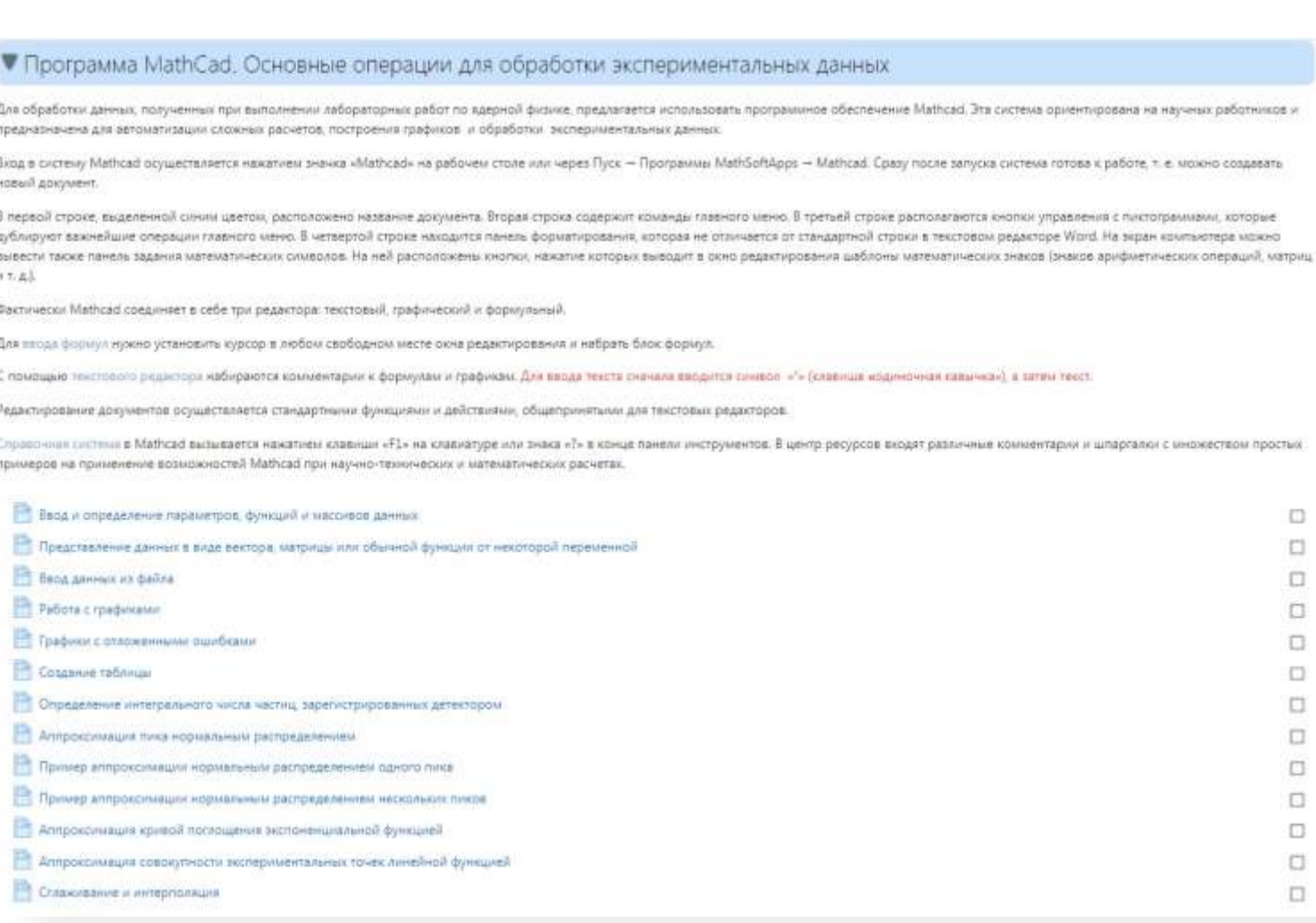
Ionizing radiation sources

Закрывать источники фотонного излучения. Эталонные. Набор ОСГМ

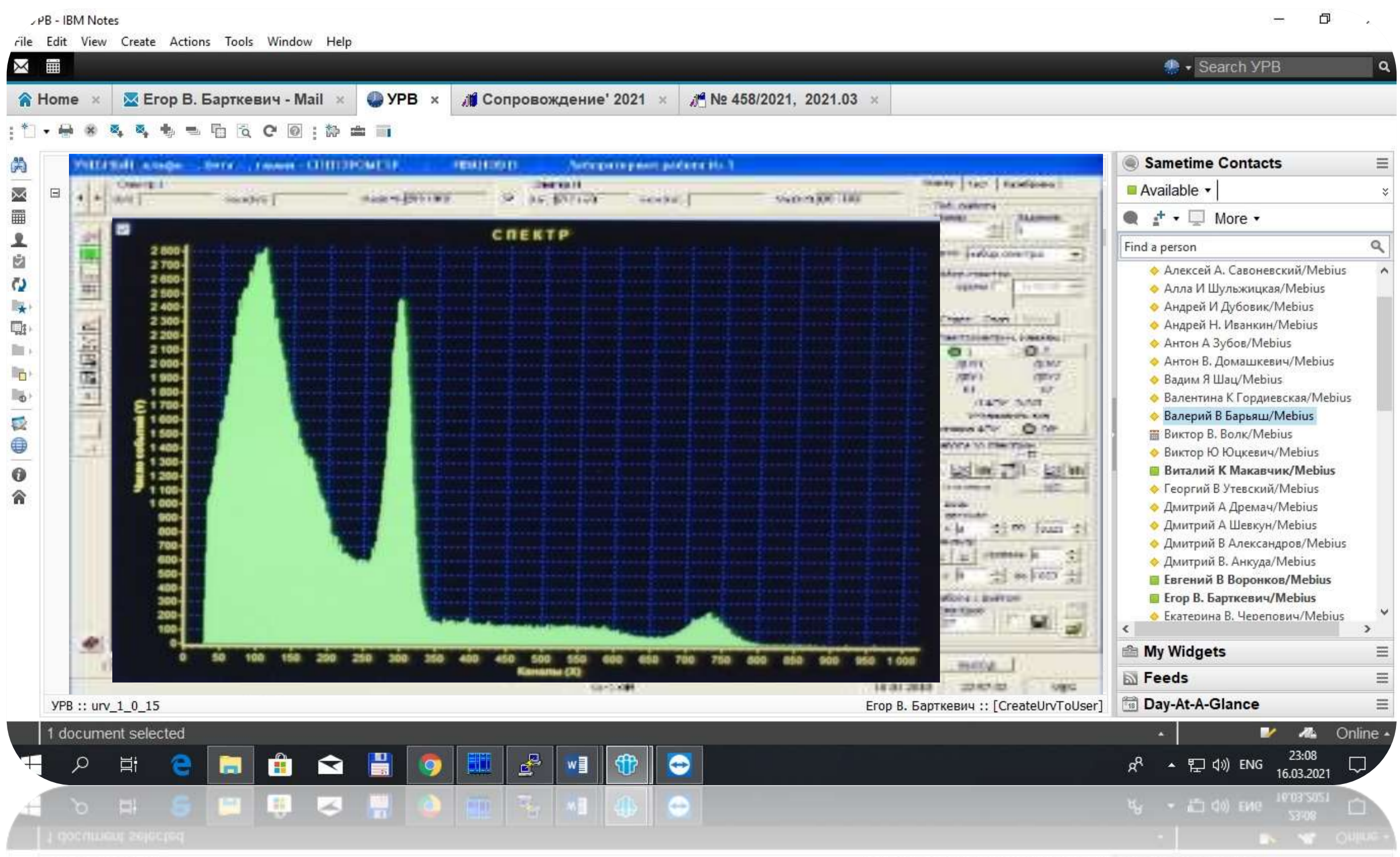


Software "MathCad"

The spectra obtained are saved in a file of the type "DAT" that allows to process the received experimental data with the help of any data processing software



Remote set-up control "Remote desktop"



Laboratory works

The training module consists of manuals for 10 laboratory works to the Part I "Review of Fundamentals" and Part II "Quantities and measurements" of the PGEC Syllabus. The manuals are formed along the equal principles anticipating the formulation of the work purpose, briefing in objects and phenomena to be studied, experimental part with the description of a set-up and methodology of measurements to be used, and also list of assignments on performing an experiment and data processing.

The laboratory work topics comprise the following: radioactivity, interaction of ionizing radiation with matter, detection and measurement of nuclear radiation, dosimetry, etc. The main concept definitions are provided in the Glossary attached.

After learning theoretical material a student/participant is proposed to implement a number of assignments. There are more than 300 questions for a quiz. Their role is to facilitate a student/participant self-study: to assume a theory, to make self-control of the main concepts and physical laws acquiring. There are also control questions to check the compliance of a student/participant with appropriate learning objectives that he/she has an opportunity to demonstrate in personal communication with an instructor while defending a laboratory work report.

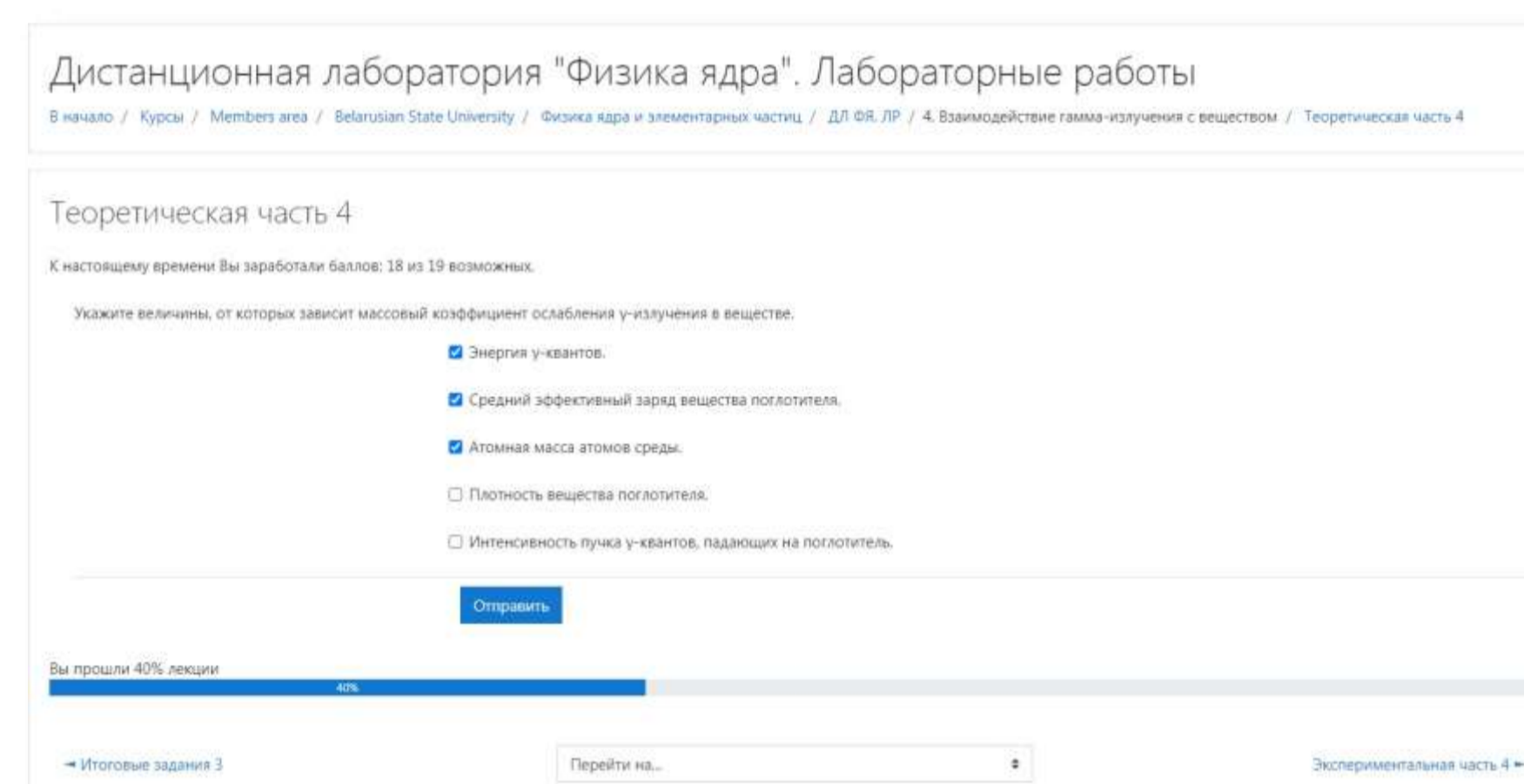
An example of a topic description outlook at the web

4. Взаимодействие гамма-излучения с веществом

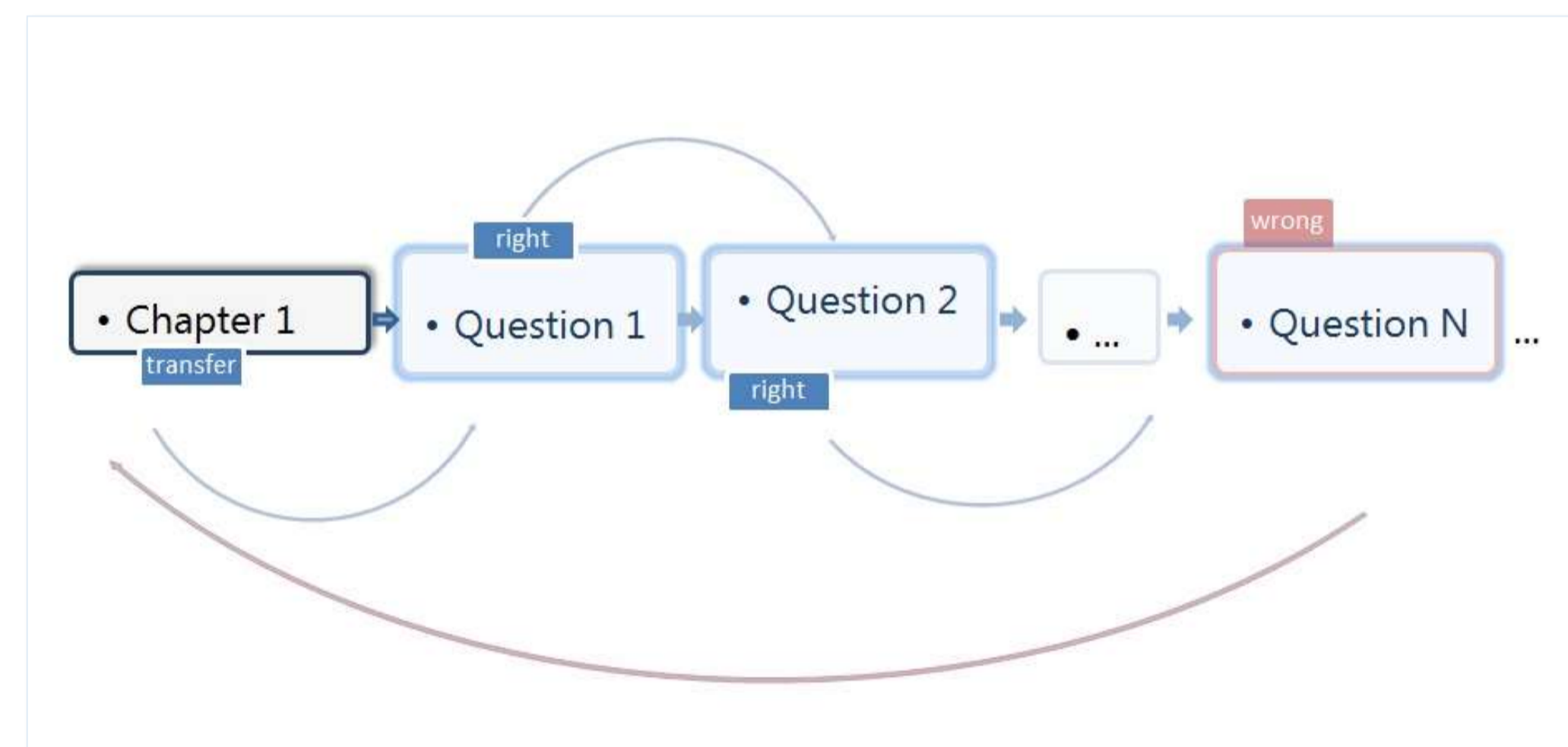
Цель работы: изучить механизмы взаимодействия γ -излучения с веществом; измерить функцию пропускания и рассчитать коэффициент поглощения γ -излучения Cs-137 в свинцовом и медном полостителях; определить энергию γ -излучения

- Теоретическая часть 4
- Экспериментальная часть 4
- Итоговые задания 4

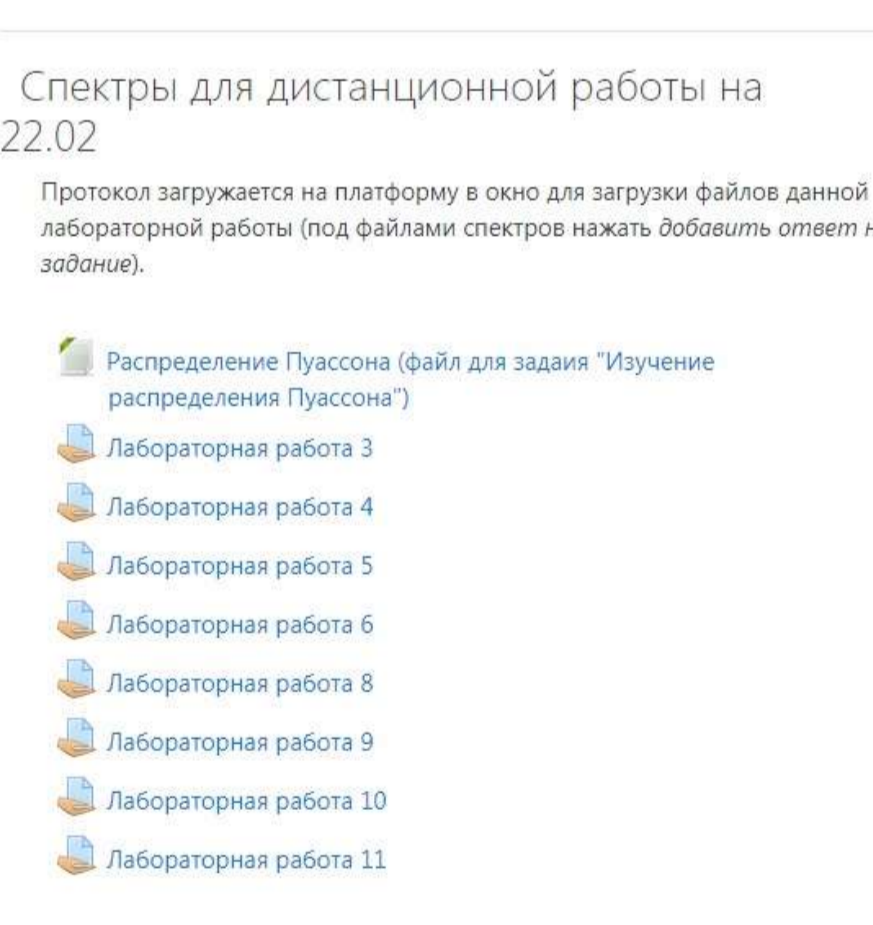
Implementation performance indicator of a Theoretical part "Lecture"



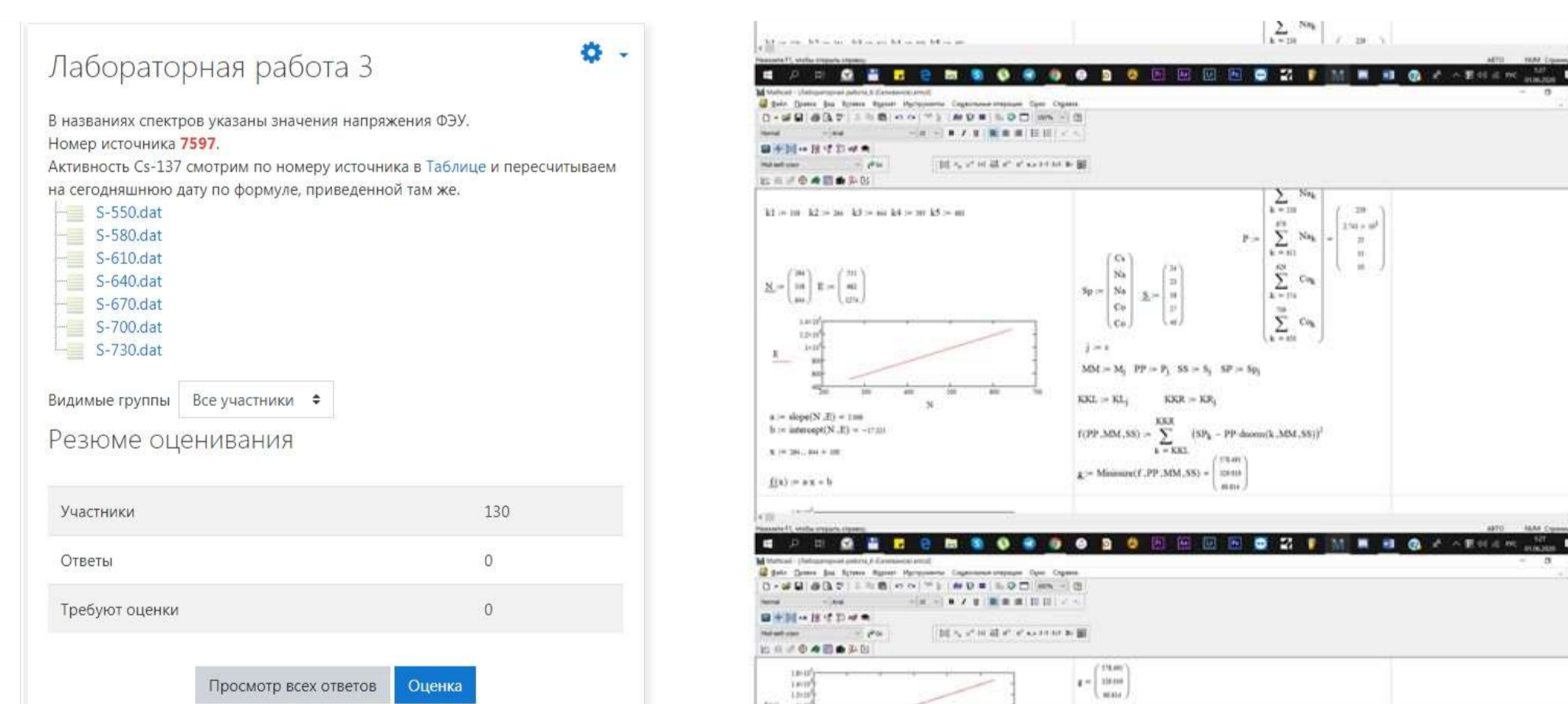
The chart of a student/participant progress flow for self-control



Spectra for the e-learning



The excerpt from file with the data processing



One of the questions from the final quiz

Как можно рассчитать или оценить число импульсов в некотором канале, зная функцию распределения импульсов по амплитуде $U(t)$?

Выберите один или несколько ответов:

- a. $U = \langle UV \rangle / \Delta t$ - номер канала.
- b. $U = \langle UV \rangle / \Delta t - U(V)$, Δt - ширина канала, V - номер канала.
- c. $U = \langle UV \rangle / \Delta t$, Δt - ширина канала, V - номер канала.
- d. $U = \int_0^{\infty} U(V) V dV$, Δt - номер канала, Δt - ширина канала.

Control of a student/participant performance

