

# Test-control of knowledge of participants of regional PGEC course on radiation protection and safety of radiation sources in ISEU, Minsk, Belarus

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## **Abstract**

Special computerized test-control of knowledge passed by participants during the post-graduate educational and training course on radiation protection and safety of radiation sources was processed for several years (since 2001). The destination of the test-control comprise two parts: 1) testing the state of core knowledge in each part of training programme (10 modules of IAEA Standard Syllabus) and 2) stimulation of education process. The pool of questions and short problems is accumulated. To distribute questions randomly between participants from the pool and to process their answers automatically the special computer Web-friendly programme named 'Environmental UniversTest' was processed. Testing participants at the beginning of the course usually shows considerably low basic level of their knowledge in key fields. It gives an opportunity to focus efforts of trainers on the specific questions and to introduce corrections into academic process. Testing also establish the atmosphere of competition between participants. Methodological peculiarities of question pools on some topics are discussed in the report. The 'Environmental UniversTest' will be available from the site <http://www.iseu.by> for future participants with special pool of questions for pre-training testing.

## **1. Introduction**

Test-control of knowledge being adequately organized is one of the effective tools for verifying and maintaining knowledge. Testing approach can be used not only in training specialists but for self education. World wide web provides new facilities to reach everybody who wants to be trained and to test him/herself. That is why radiation protection knowledge test control should be built in within appropriate software. Test control is one of major evaluation tools using during IAEA PGEC in Minsk. For this purpose the special software was created some details of which and experience of it use will be given below. Being appropriately developed and standardized it can be a tool for qualifying specialists nominated for some capacity in radiation protection.

Specific situation in Belarus after Chernobyl disaster, long-term problems of overcoming its consequences ought to pay increasing attention to the knowledge of population in ionizing radiation matters. There is the hypothesis that the level of internal dose got by people depends on the knowledge and practical application of radiation protection techniques and methodologies, i.e. depends on the culture level in radiation safety. It is impossible to prohibit only to do something, people should knowingly behave in radioactively contaminated environment. In this case unified test-control provides an opportunity to estimate quantitatively dependence of internal dose and level of knowledge in radiation protection (if its regulations are applicable).

In every case creation of special computerized test control system (TCS) for the purposes of knowledge management in radiation protection is desirable.

The following problems should be solved to create TCS:

1. to provide common access to the centralized database of knowledge with possibility of self training (IAEA apply many efforts now to do that);
2. to establish different levels of access and procedures to get the access step by step depending on growing knowledge and more materials being available;
3. to give tools for self-training;
4. to issue a pool of centralized control tests;
5. to create automatic processing of group tests.

The pilot version of programming complex "Environmental UniversTest" was created in International Sakharov Environmental University (ISEU) in 2000 according to the order of Belarus Chernobyl Committee. Programme tools processed provide implementation of the following functions:

- producing tests
- testing within local network

- access to the testing procedures via Internet
- group processing of results
- accumulation of results in one database

This version was applied on IAEA PGECs in Minsk since 2001 and during routine academic process in ISEU.

## 2. The structure of programme complex

The system of complex radiation safety testing is realized on the base of Internet Information Server and may be used within *Windows* starting from *Windows 95* or *NT4*.

The system architecture implies to have a separate internet-server. It is needed to centralize pools of questions and results of testing. To switch on a User should have an access from his/her local computer to the server due to local network or via Internet. It requires to install *Internet Explorer* not less than *Version 4* that is easily implemented in all up-to-date computers.

## 3. Generation of tests

The database is a list of questions. Each question can be referred to several problem fields. It has different weight coefficient in each field.

There is a list of User categories related to some of problem fields. Each User is registered by unique identification number. It is written in the system as a record contained both individual parameters of a User and settings of the system at the moment of registration. Due to that results of testing are protected against next database modifications.

A User should choose the category of the test he/she would like to pass. It influence on questionnaire defined by the System Administrator. The System Administrator may provide the User by a list of answers and indicate the character of questioning (questions with one correct answer, matched questions, etc.).

A pool of questions within the problem field is formed randomly. But each question is provided by its own probability to be randomly chosen. The sequence of possible answers is not also fixed and is varied from case to case.

At the end the user is provided by information about amount of correct answers and score accumulated both for the test totally and for each problem field.

## 4. Processing results

All testing results are accumulated for each user. It gives an opportunity to process different data about each user or groups of users (e.g. physicists or non-physicists).

All data are stored in *Microsoft Access* providing the opportunity to get queries. Results of testing are available via *Jet Engine* from any programme launched on Server and also from any computer in the local network. Results are delivered by software *Automator Suite* produced by the firm "Applied systems". The result is produced as xls-file with table of the results of users. It gives an opportunity to build diagrams for groups of users and for a user personally, to study frequency of correct answers on separate questions, etc.

## 5. Application to participants of IAEA PGEC

Evaluation of knowledge on IAEA PGEC in Minsk is carrying out within 11 modules of Standard Syllabus [1], preliminary test (before the course) and final test at the end of the course for comparison and partially final evaluation. The questions database is completed by lecturers engaged for the course. Key problem questions are includes in several pools generated for evaluation on different parts of the course.

Each time preliminary testing shows rather low initial level of participants and 'open eyes' of trainers giving information to them for correction of training approach. Announcing the results of testing leads to competition between participants and helps organizers to interest participants in studying.

Results of testing of participants in 2004-2005 in different problem fields are given below onto 2 diagrams, the 1<sup>st</sup> is for those who have background education in physics, the 2<sup>nd</sup> one is for non-physicists. The 3<sup>rd</sup> diagram shows the progress of participant's knowledge on such important issue as definitions and use of units for measuring radiation. There is also the legend describing the sence of parts of the diagrams.

## 6. Conclusions

Results obtained allow to recommend the “Environmental UniversTest” system for use within the international educational and training network in radiation protection. But a number of serious technical restrictions prevents now easy dissemination of this technology. Now we are working to overcome it by building more comprehensive and flexible database.

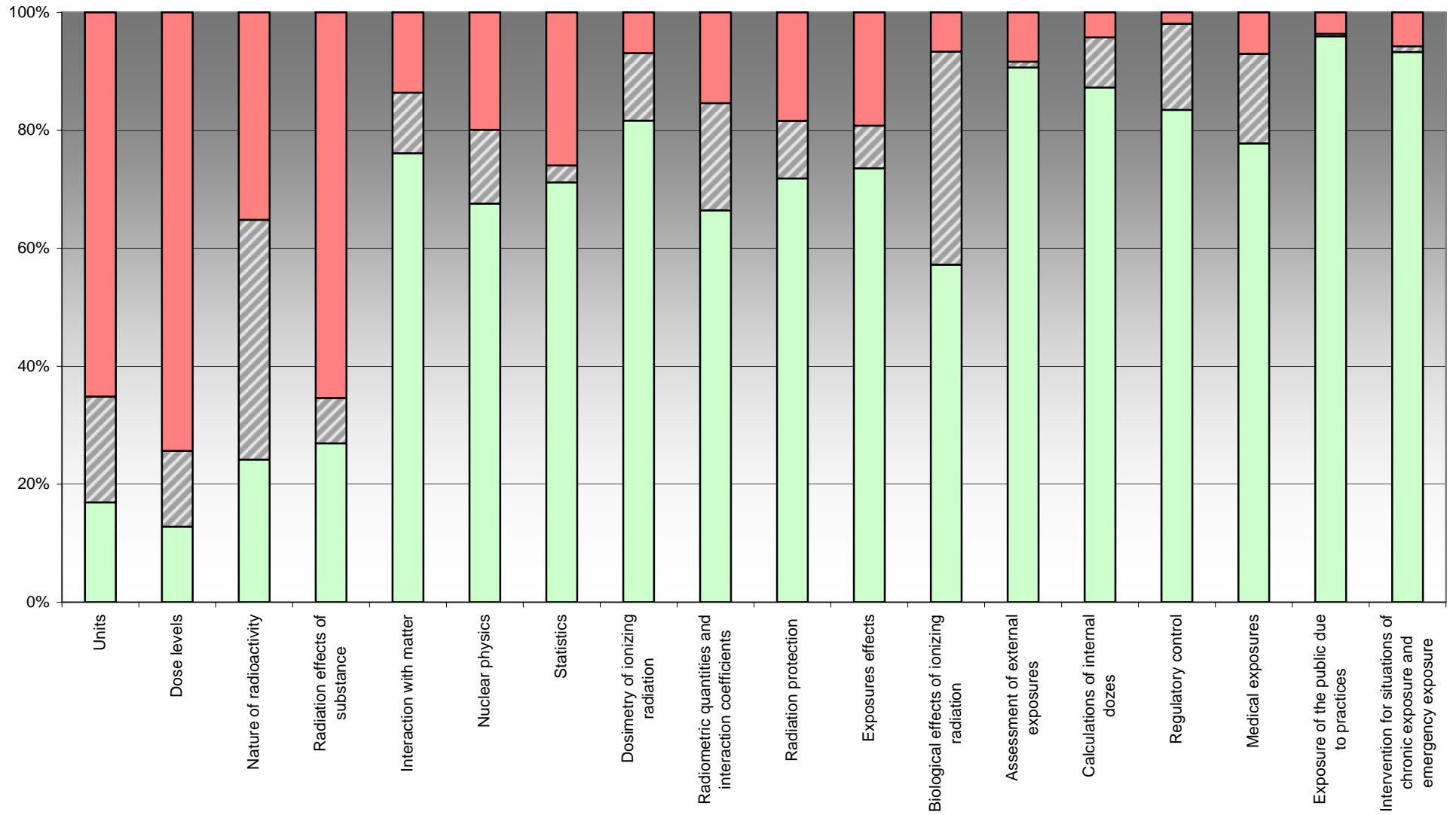
## References

- [1] Post-Graduate Educational Course n Radiation Protection and Safety of Radiation Sources. Training Course Series, 18. Vienna, IAEA, 2002.

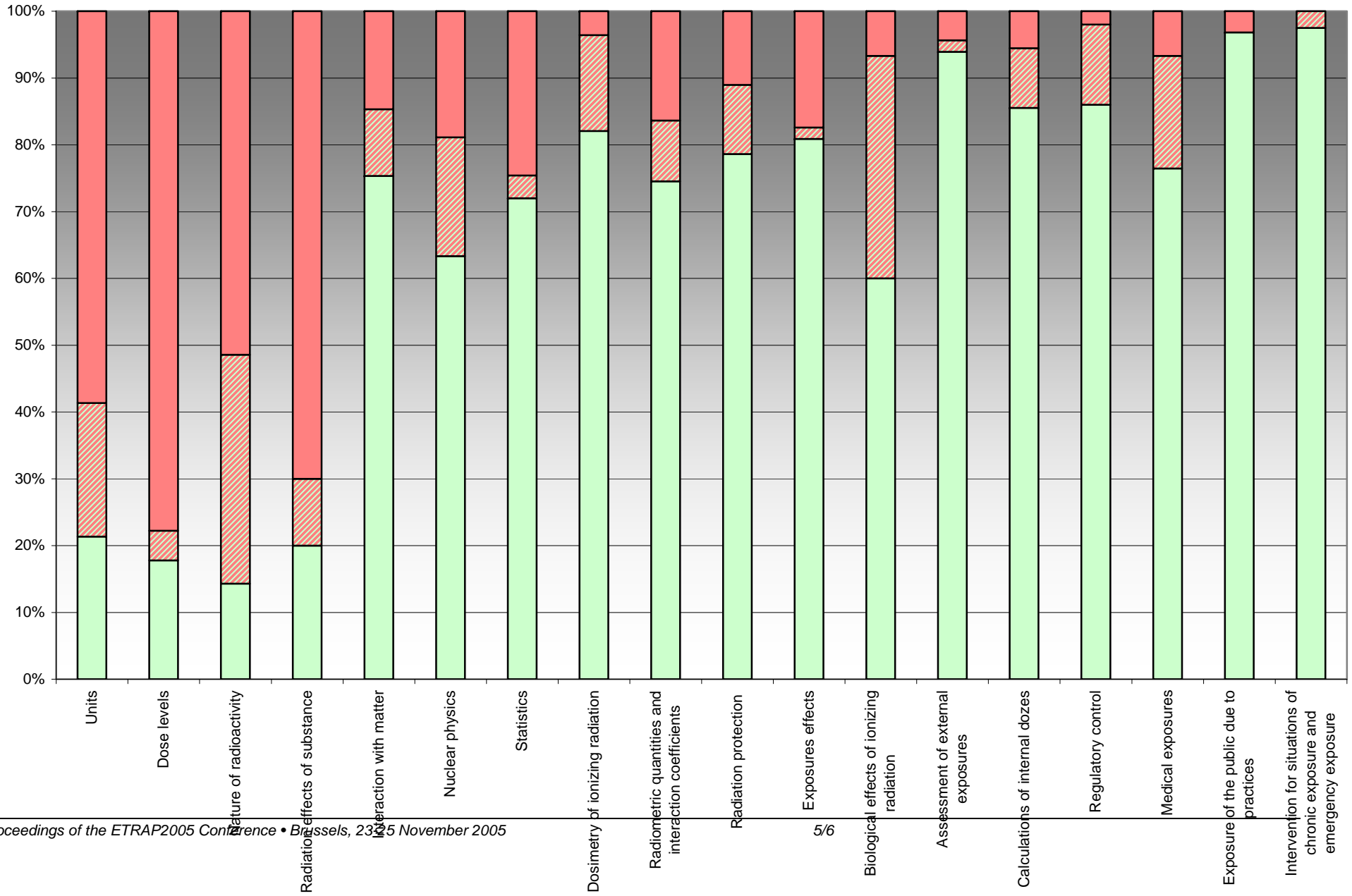
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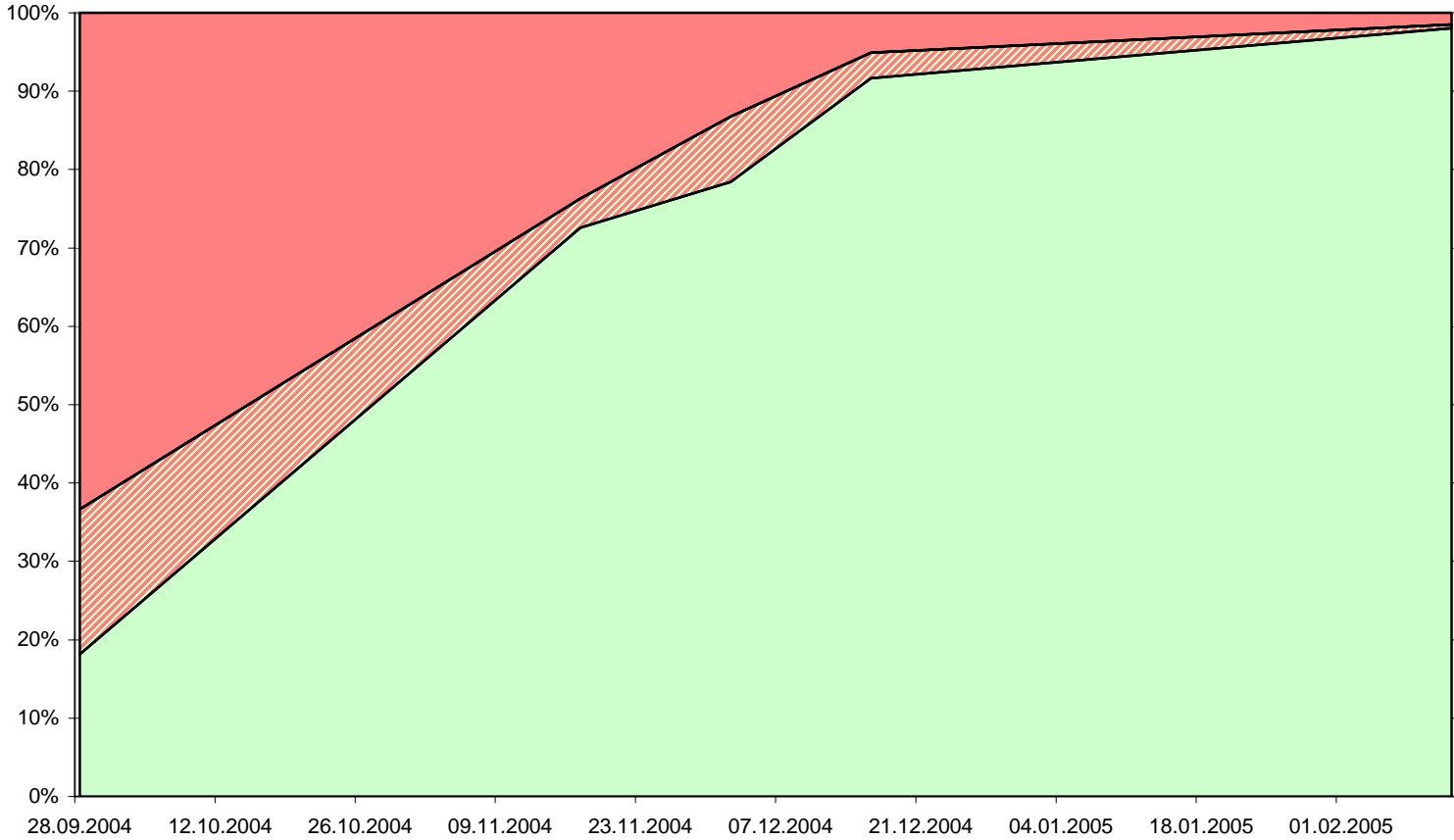
## Physicists



## Non-physicists



### Units



	28.09.2004	17.11.2004	02.12.2004	16.12.2004	12.02.2005
Wrong answer	171	64	27	11	3
Semi-right answer	50	10	17	7	1
Right answer	49	196	160	198	200