



FMBA of Russia



State Research Center  
Burnasyan Federal  
Medical Biophysical  
Center of Federal Medical  
Biological Agency

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# **Federal guidelines for estimating external exposure of radiation workers**



## Application area

- Methodical guidelines are intended for the procedure of optimization of radiation protection in normal use of ionizing radiation sources on facilities of the State Corporation "Rosatom".
- General provisions, procedure and methods of applying the principles of optimization on facilities of the State Corporation "Rosatom" are presented in methodical guidelines. It is showed in accordance with the requirements of the Radiation Safety Standards NRB-99/2009 and Basic sanitary rules of radiation safety OSPORB-99/2010.
- Guidelines are intended for use by radiation safety services, by persons those responsible for ensuring radiation safety of the personnel at the facilities of the State Corporation "Rosatom" and by services of the Federal Medical and Biological Agency, that perform regulatory oversight of radiation safety of staff.



## The optimization procedure

- Planning of the work
- Preparation for the work
- Performance of the work
- Analysis and assessment of results

Modeling and optimization of external exposure of personnel can be carried out by specialized software.

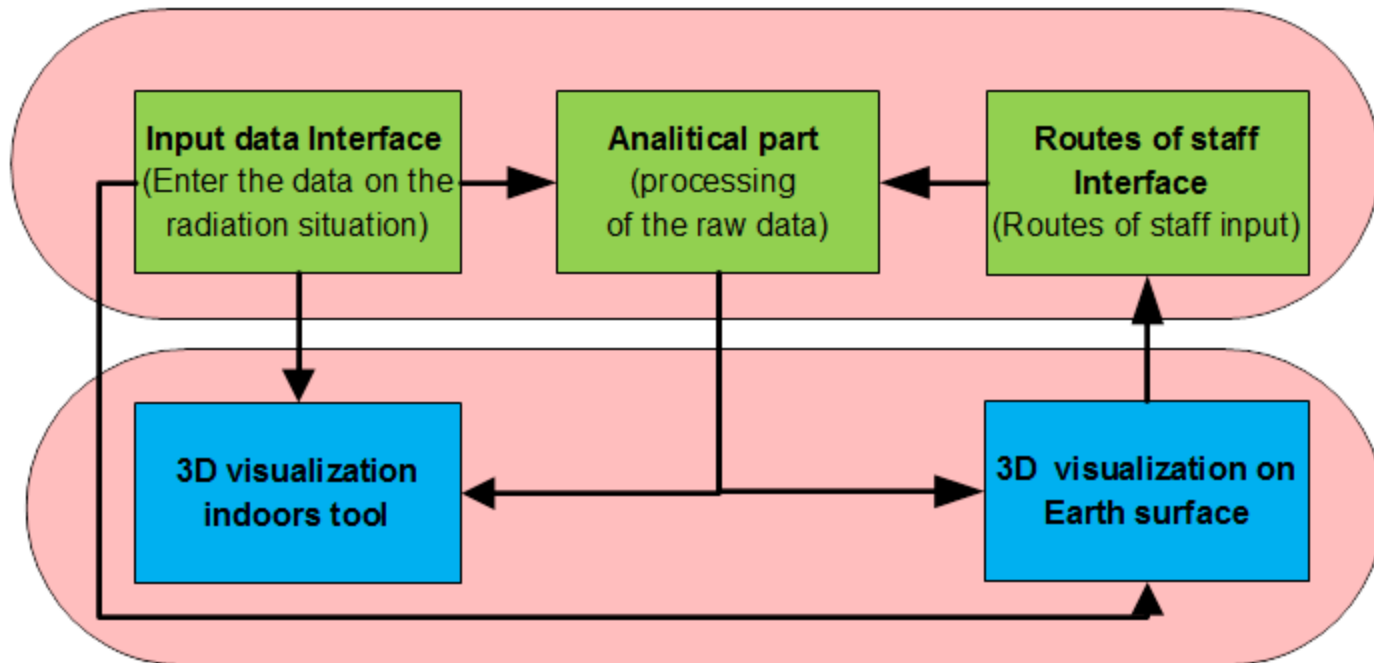


## Software requirements

- Software should include a database on the relevant radiation environment data on the industrial site and in premises
- Software should include the dynamic visualization of radiation environment
- Software should be able to solve basic analytical tasks of radiation safety.
- Interface of the software should be user-friendly



## Software scheme





# Input data interface

Интерфейс Мазура 0.13.05.16 Оператор: Администратор

Здания:  
Промплощадка  
Промплощадка\_1  
Схема РМО ПВХ 2008  
Схема РМО ПВХ 2011

Измерения Координаты  Плановое

	Ру 0,1м, мкЗв/час	Ру 1м, мкЗв/час	Ру 2м, мкЗв/час	Нβ, част/мин см2	Нр, част/мин
1	0,00	0	0	0	0
2	0,00	0	0	0	0
3	0,00	0	0	0	0
4	0,00	0	0	0	0
5	0,00	0	0	0	0
6	0,00	0	0	0	0
7	0,00	0	0	0	0
8	0,00	0	0	0	0
9	0,00	0	0	0	0
10	0,00	0	0	0	0
11	0,00	0	0	0	0
12	0,00	0	0	0	0
13	1,20	0	0	0	0
14	0,00	0	0	0	0
15	0,00	0	0	0	0
16	0,00	0	0	0	0
17	0,00	0	0	0	0
18	0,00	0	0	0	0
19	0,00	0	0	0	0
20	0,00	0	0	0	0
21	1,00	0	0	0	0
22	0,00	0	0	0	0
23	0,00	0	0	0	0

Дата:  
05.01.2013  
09.01.2013  
10.01.2013  
11.01.2013  
12.01.2013  
13.01.2013  
19.01.2013  
26.01.2013  
02.02.2013  
05.02.2013  
09.02.2013  
16.02.2013  
23.02.2013  
24.02.2013  
28.02.2013  
02.03.2013  
09.03.2013  
16.03.2013  
16.03.2013  
23.03.2013  
30.03.2013  
06.04.2013  
13.04.2013  
27.04.2013

Удалить  
Добавить новую  
21.06.2013 15  
 Плановое  
Отобразить схему обследования  
Экспорт

Сохранить все изменения

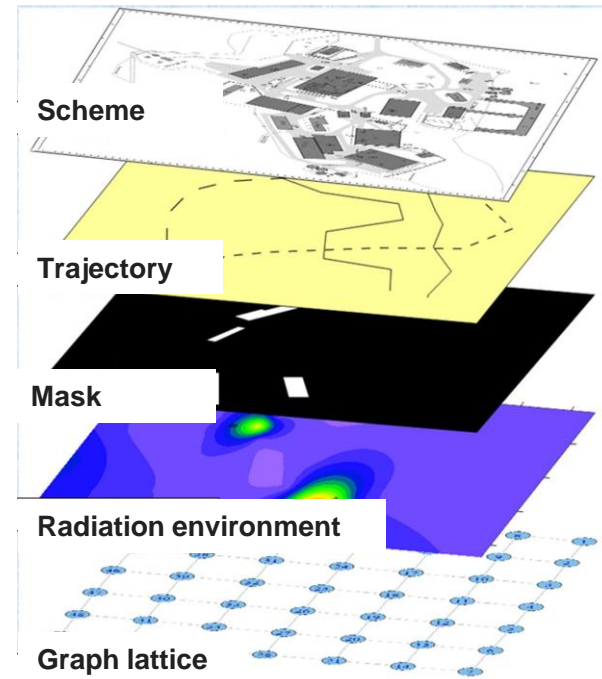
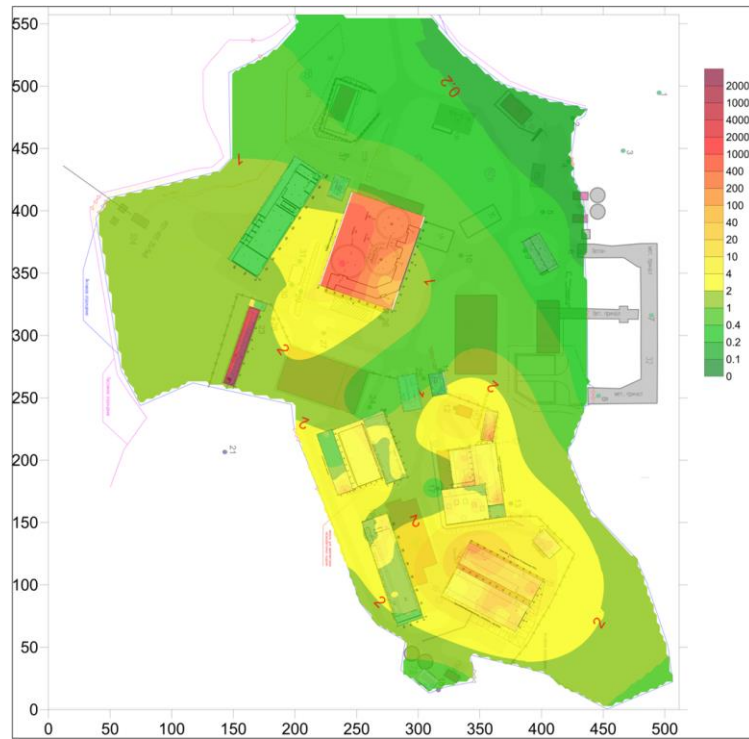
Схема обследования: Промплощадка

Прозрачность точек: \_\_\_\_\_

Координаты (действительные): \_\_\_\_\_  
Координаты (изображения): 97,2051282051282; 41,6593406593407

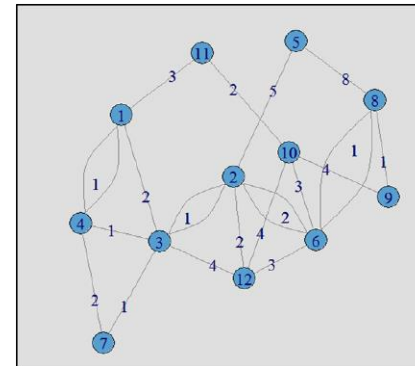
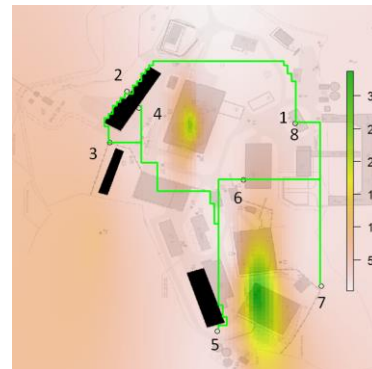
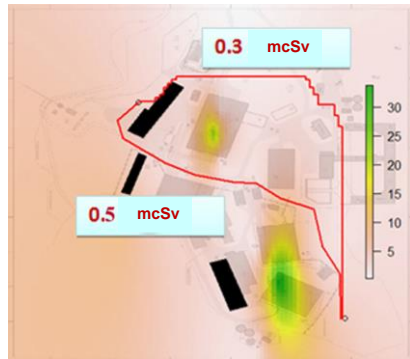
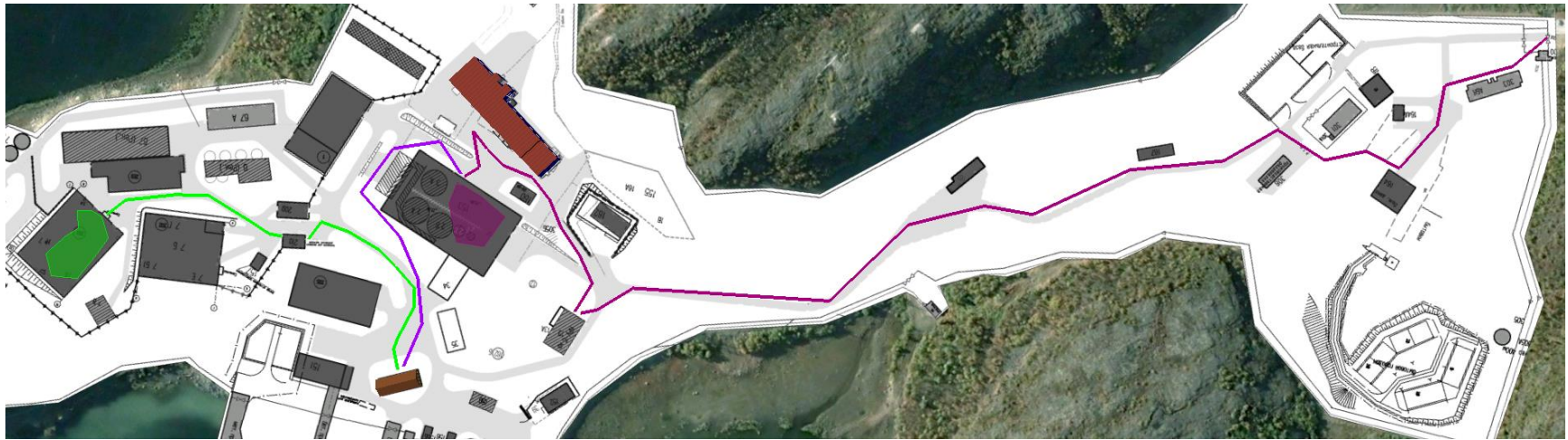


# Analytical tasks





# Calculation of doses on the routes and finding the optimal routes





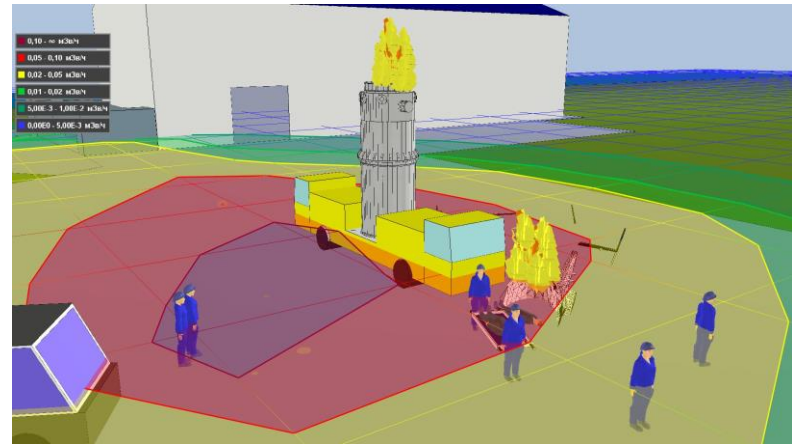


# Visualization of radiation environment

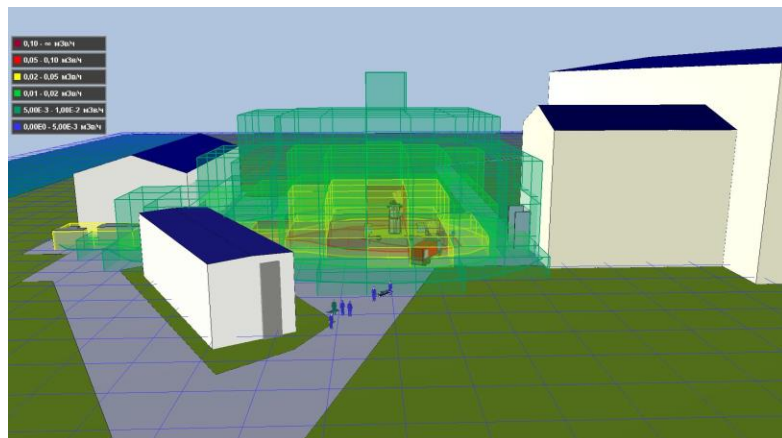
3D



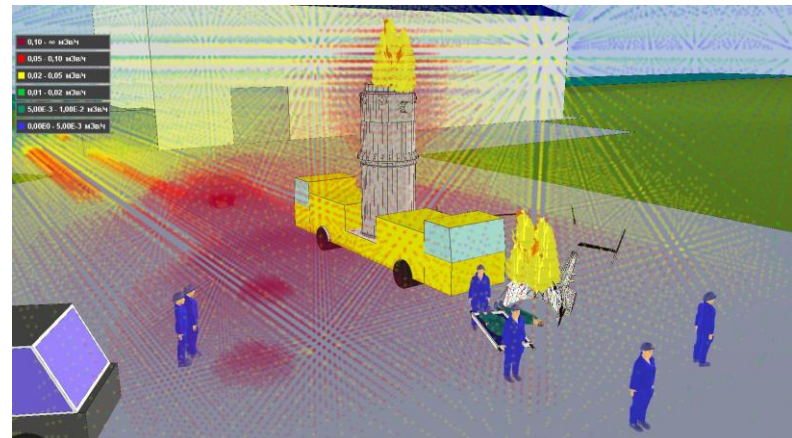
2D



3D boxes

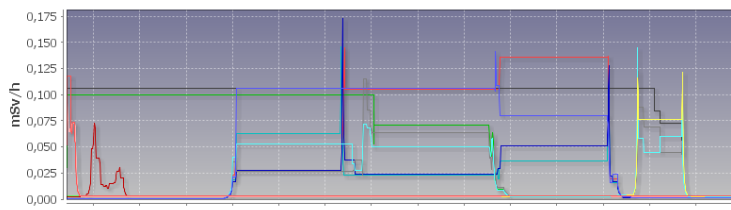
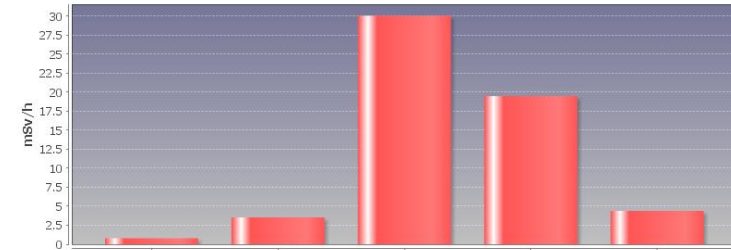
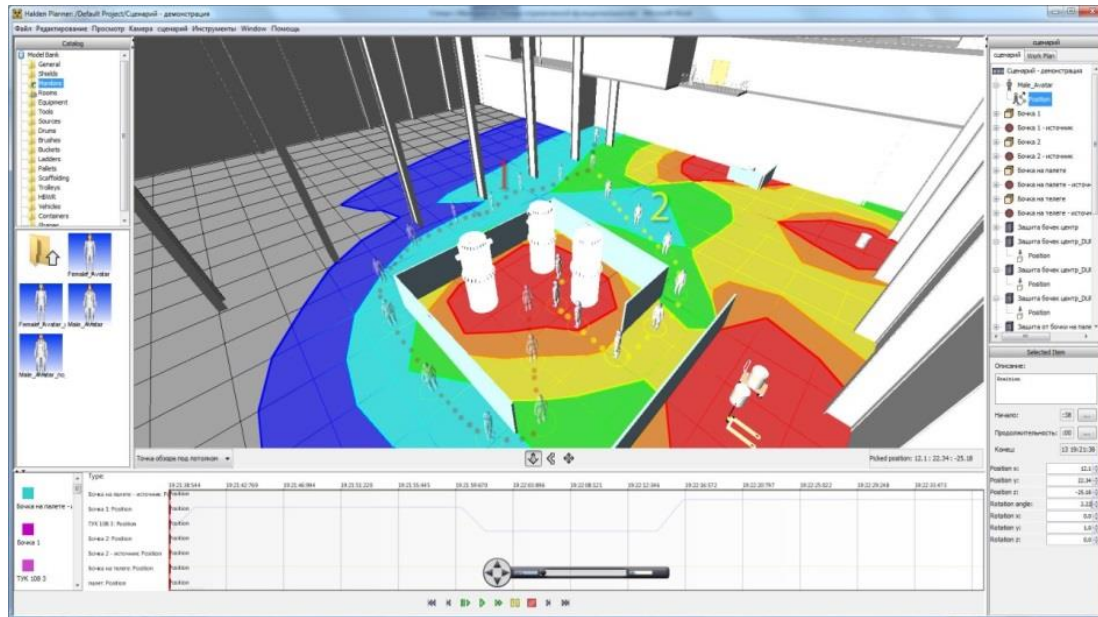


3D cloud of particles





# Scenario optimization and training of staff





## Scenario optimization and training of staff

Staff should apply methods of protection against ionizing radiation, such as:

- distance protection;
- temporary protection;
- use of automation, appliances and equipment;
- use of shields (natural and portable).



## Conclusions (1)

- Radiation environment is transferred from the category of invisible psychological stressors to directly perceived stressor by virtual reality technology. This feature reduces the uncertainty in the assessment of the radiation doses in works.
- Virtual reality technology allows to create different scenarios of work and simulate them on a computer with a numerical assessment of the radiological consequences for staff in each scenario.



## Conclusions (2)

- Specialized software should use in calculations measured data of the radiation situation made by staff of radiation services and simulate the radiation situation based on the information about the activity, radionuclide composition and geometry of the radiation sources.
- Specialized software should contain a powerful analytical tasks unit designed to support the decision-making process.



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**Thank you!**