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USING FREE SOFTWARE TO TEACH MEDICAL PHYSICS STUDENTS

LEBED Viktoriia

Bachelor of the 4th year to study

Motivation

Problem: Many educational institutions in Ukraine have problems with funding and obtaining license for programs which can be used to teach medical physics students

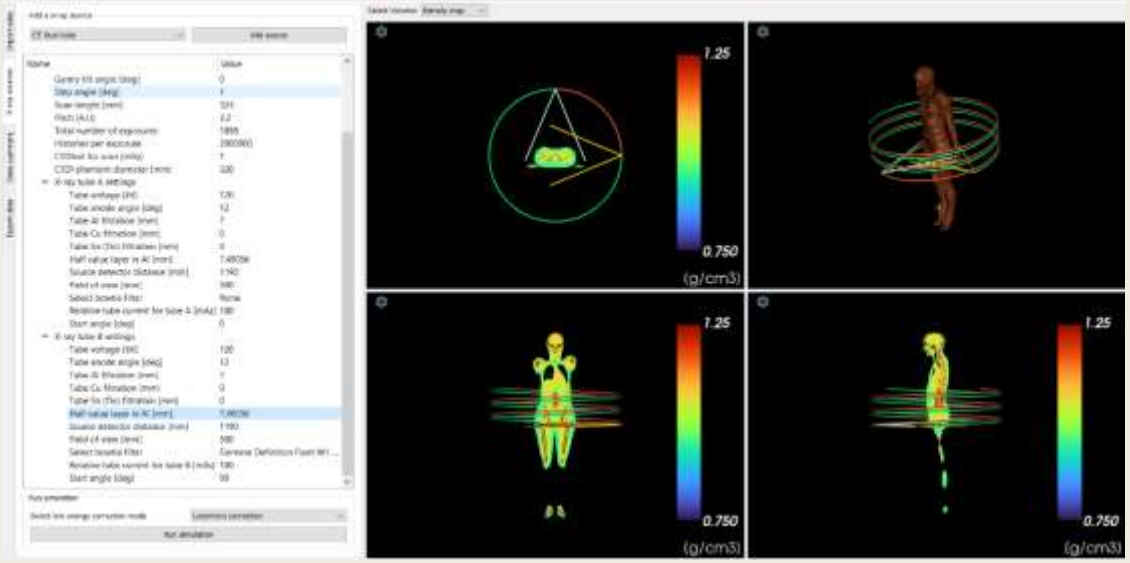
Required software for educational purposes:

- free/open source
- allows to work with real data
- can perform complex calculation for different types of doses

Software review

- OpenDXMC (visualizing and calculation)
- ADRC(calculation)
- DC_PAK3(calculation)
- DCAL(calculation)
- AcuteDose (calculation)
- PRIMO

OpenDXMC



- calculation and visualizing dose distribution in diagnostic X-ray examination
- just an alpha version

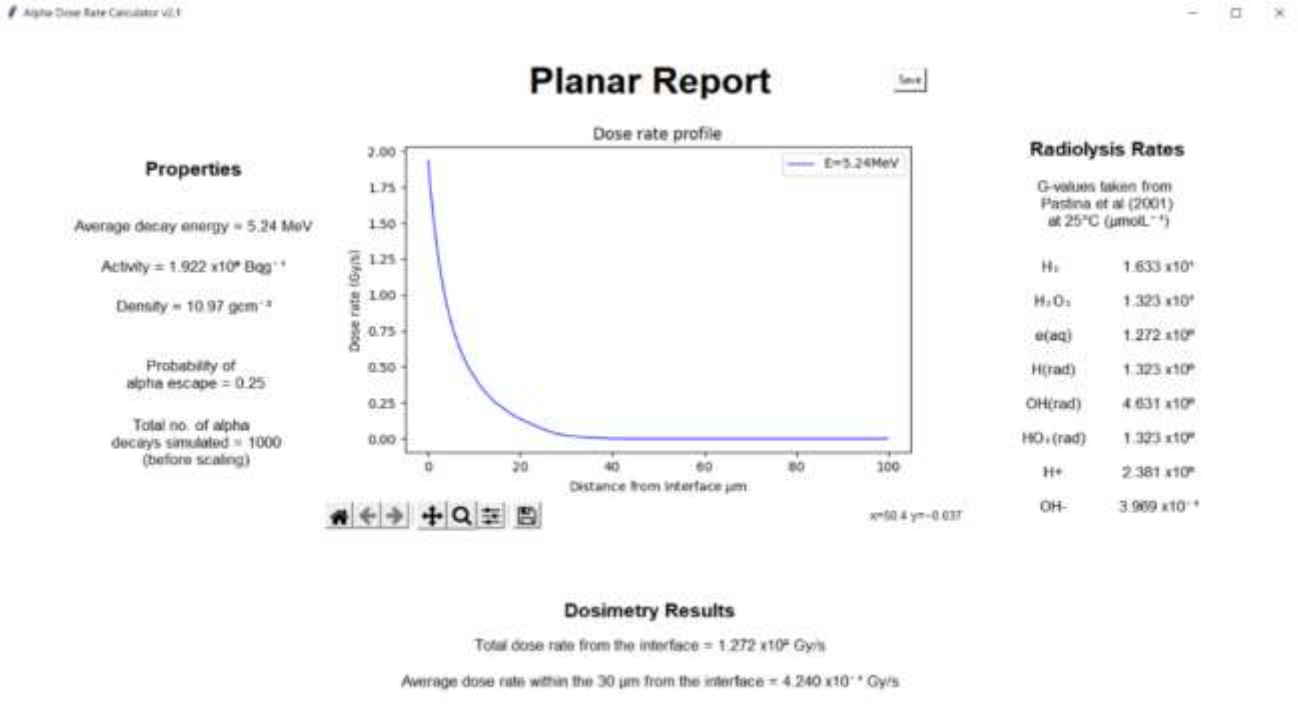
Result:

- dose values for each organs and materials

Color	Material name	Mass (kg)	Volume (cm3)	Dose (mGy)	Dose stddev (mGy)	Dose max value (mGy)	Number of voxels (N)	Number of events (N)	Dose variance (mG
	Air, Dry (near sea level)	0,166866	158119	0	0	0	10369104	11067941	0
	Teeth	0,0400062	14,5476	0,00309509	1,56174e-06	0,00830013	954	12281	1,2633e-09
	Mineral bone	3,20327	1666,67	1,01754	1,72774e-05	10,5444	109297	391708228	4,57267e-09
	Humeri, upper half, spongiosa	0,111903	94,4372	0,00385845	3,77801e-07	0,0145303	6193	78213	4,47325e-10
	Humeri, lower half, spongiosa	0,0527678	47,2415	1,1361	0,000278133	3,02403	3098	12782469	2,46631e-07
	Lower arm bones, spongiosa	0,0912091	81,8583	1,74073	0,000731759	5,4843	5355	40402448	1,99918e-07
	Hand bones, spongiosa	0,0728145	65,1896	1,49972	0,000190819	3,0673	4275	26817435	2,24066e-07
	Clavicles, spongiosa	0,0404448	33,9596	0,00587176	1,87372e-06	0,0230027	2227	40898	1,93713e-09
	Cranium, spongiosa	0,416869	334,93	0,000314671	2,58628e-08	0,00552263	21964	21660	1,04922e-11
	Femora, upper half, spongiosa	0,224949	215,087	0,676008	1,80657e-05	1,46238	14105	39798912	5,29163e-08
	Femora, lower half, spongiosa	0,174615	156,333	0,00160587	1,23272e-07	0,00954071	10252	56606	1,16009e-10

Color	Organ name	Mass (kg)	Volume (cm3)	Dose (mGy)	Dose stddev (mGy)	Dose max value (mGy)	Number of voxels (N)	Number of events (N)	Dose variance (mGy^2)
	Air, Dry (near sea level)	0,166866	158119	0	0	0	10369104	11067941	0
	Adrenal, left	0,00571285	5,56589	0,29558	9,6405e-05	0,574447	565	466902	5,61034e-07
	Adrenal, right	0,00727207	7,0603	0,719571	0,000290513	1,00531	463	1447628	1,05831e-06
	Anterior nasal passage (ET1)	0,00431929	4,19348	0,00116628	4,19851e-06	0,00565107	275	1420	2,90507e-09
	Posterior nasal passage down to larynx (ET2)	0,014283	13,8786	0,000601936	7,77059e-07	0,00442547	910	2887	4,26033e-10
	Oral mucosa, tongue	0,0384451	37,3669	0,000882751	7,27419e-07	0,00684059	1152	4539	5,26794e-10
	Oral mucosa, lips and cheeks	0,00400268	3,81226	0,00102038	3,51989e-06	0,00480946	250	1147	2,86407e-09
	Trachea	0,00799456	7,76175	0,00496159	6,23714e-06	0,0150588	509	11773	6,45893e-09
	Bronchi	0,00868586	8,43271	0,0190827	1,48019e-05	0,0517792	553	48017	2,33058e-08
	Blood vessels, head	0,0060615	5,71838	0,000651924	1,87953e-06	0,00486268	375	1048	1,20044e-09
	Blood vessels, trunk	0,242392	228,659	0,484966	3,6803e-05	3,01938	14995	29461563	2,29573e-08

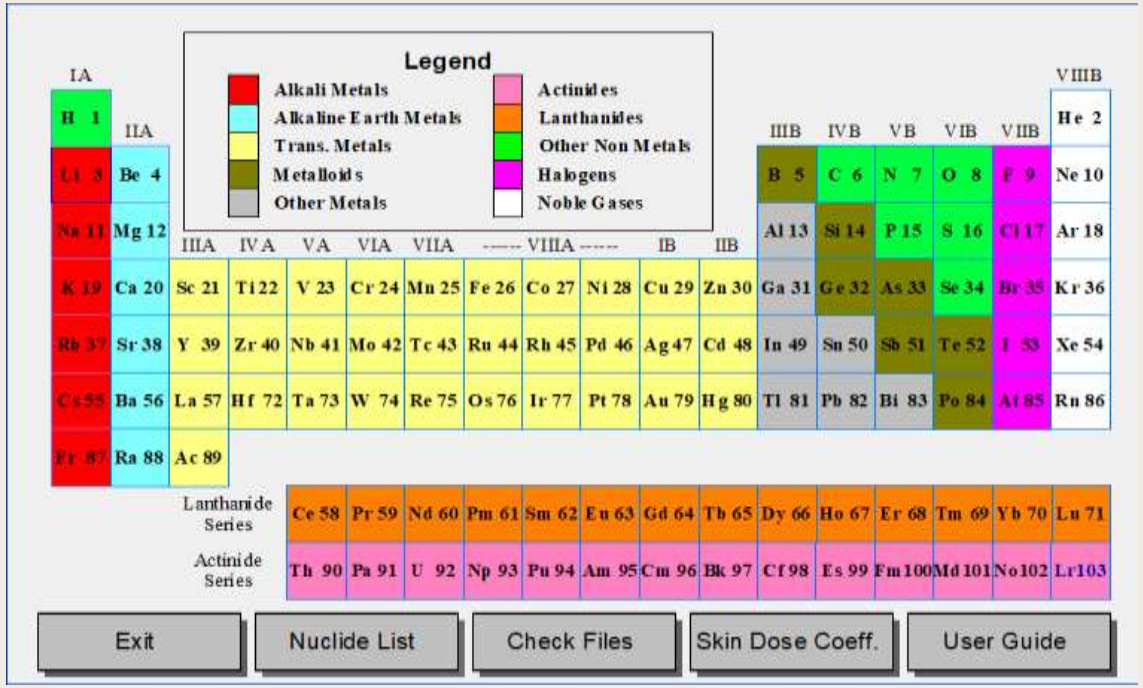
ADRC



Need to know:
- distance to the source
- activity of isotope
- alpha particle energy

- can calculating alpha radiation dose
- can handle up to 100 isotopes or custom energy inputs per calculation
- only applicable to UO2 in water

DC_PAK3



Need to know:
- particle characteristics
- respiratory parameters
- time of exposure to the contaminated area

- calculates the inhalation dose

Summary

I have reviewed several open sources programs that can help in teaching medical physics students. The introduction of free software into medical physics teaching programs will provide students with access to modern tools, facilitate their practical learning, and improve the quality of education. This will be a great opportunity for many students, regardless of the financial capabilities of the educational institution. The use of open source programs will allow the integration of the latest technologies into the educational process, making it more relevant and practically oriented.

Thank you for attention!