INTRODUCTION TO VARSKIN+

RAMP 2020 FALL USERS VIRTUAL MEETING

OCTOBER 26-30, 2020

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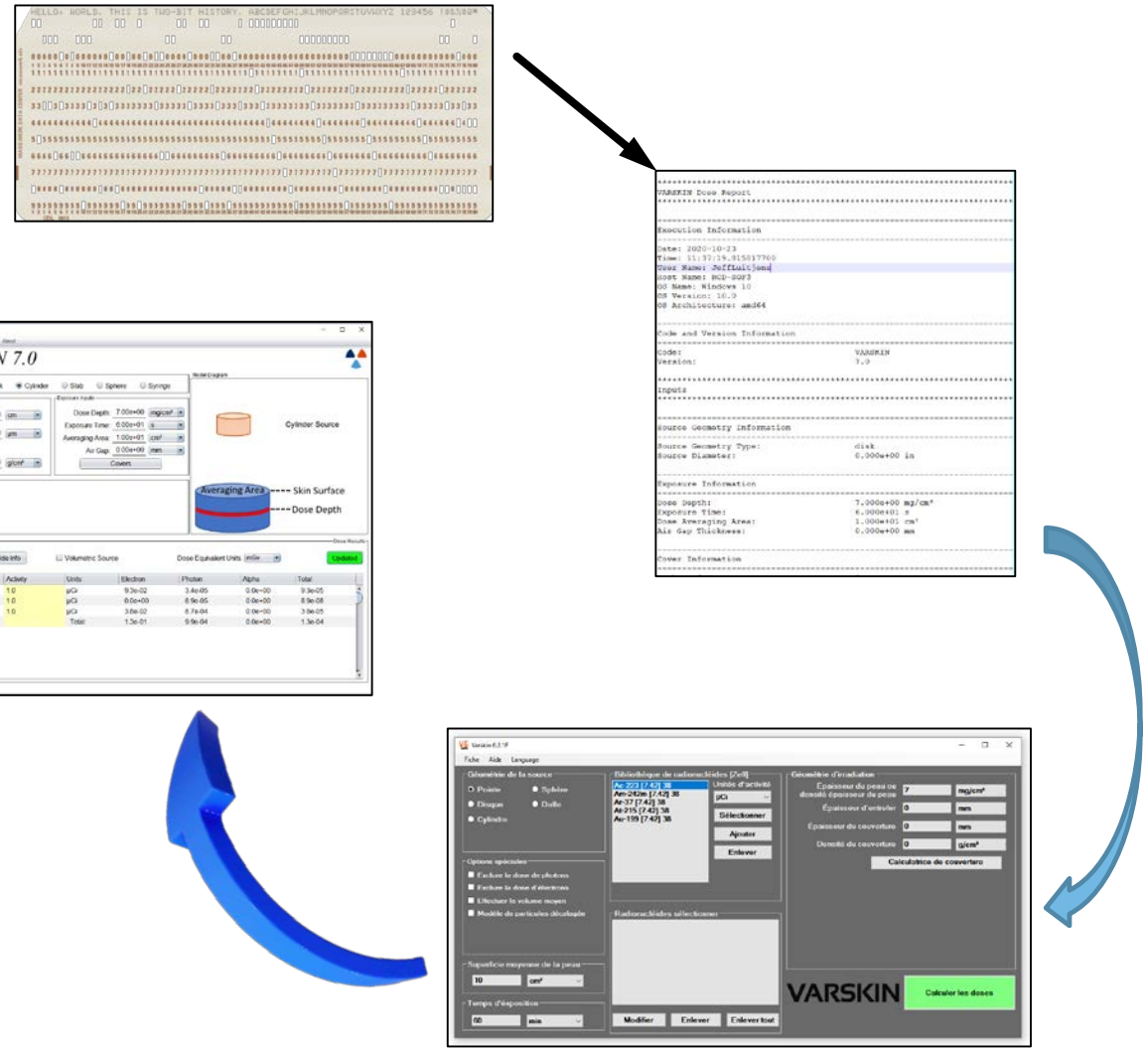
RENAISSANCE CODE DEVELOPMENT

OUTLINE

- Upgrade Philosophy
- Description of Varskin+
- VARSKIN v7.0
  - Modernization
  - New Functionality and Models
- Wound Dose Introduction (New Model)
- Neutron Dose Introduction (New Model)
- Eye Dose Introduction (New Model)

UPGRADE PHILOSOPHY

- Technology and standards change
  - Operating systems change and software must adapt to continue to be useable
  - Hardware gets better and software should take an advantage of that
  - Machines change in the way the user interacts with them and the software should reflect that
- User experiences and expectations change with time
  - Ensure a level of comfort for current and potentially new user base
    - Punch cards -> Text inputs -> Graphical User Interfaces (GUIs)
- Increase Usability and Functionality
  - JAVA as the user interface with Fortran as the physics calculator

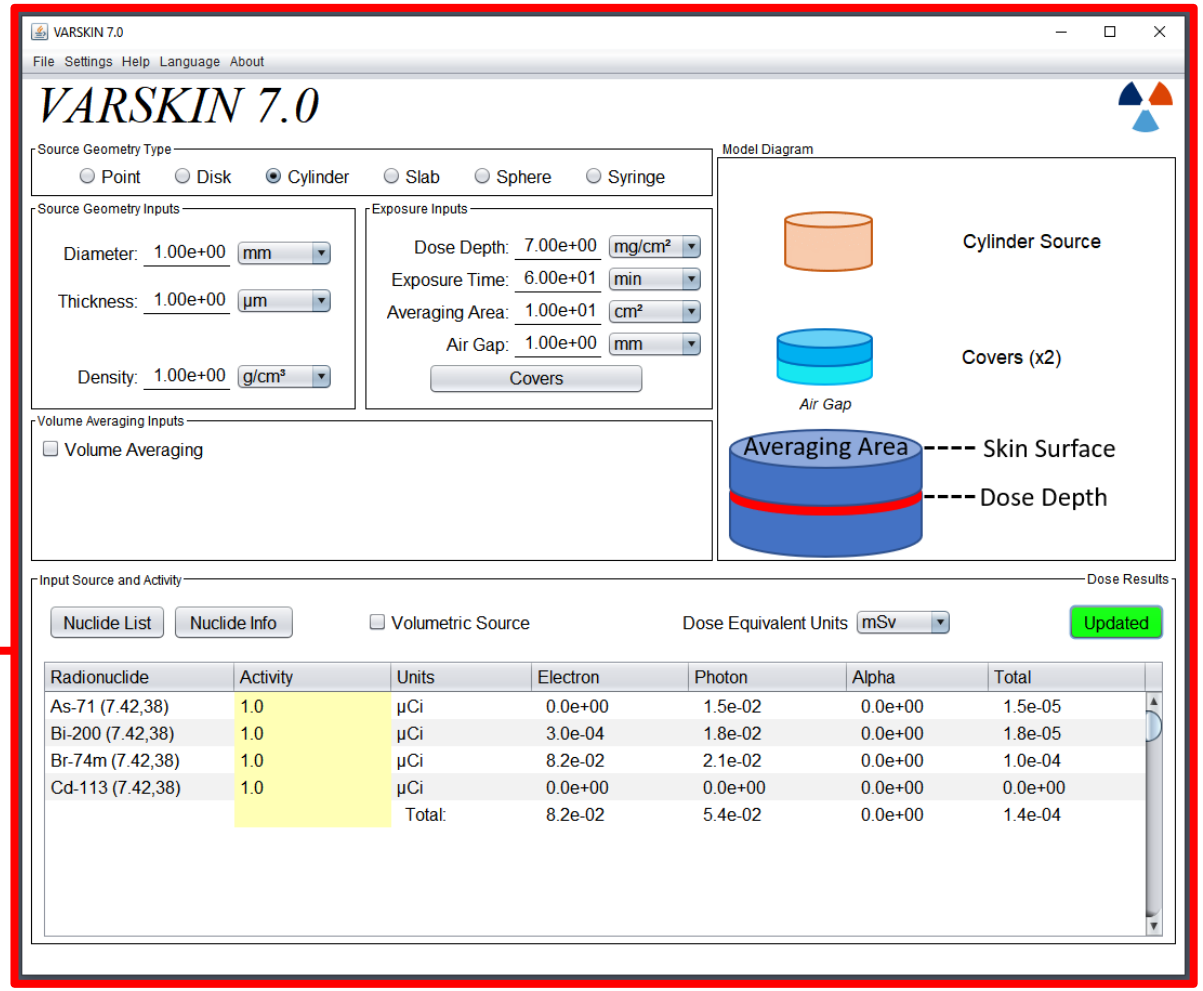


DESCRIPTION OF VARSKIN+

- Varskin+ is a collection of different physics modules/packages
  - VARSKIN v7.0 for shallow dose calculations
  - Wound model for internal shallow, local, and systemic dose calculations
  - Eye dose model for total dose to the eye
  - Neutron model for shallow dose
- The goal is to collect related functions into a single package for ease of access

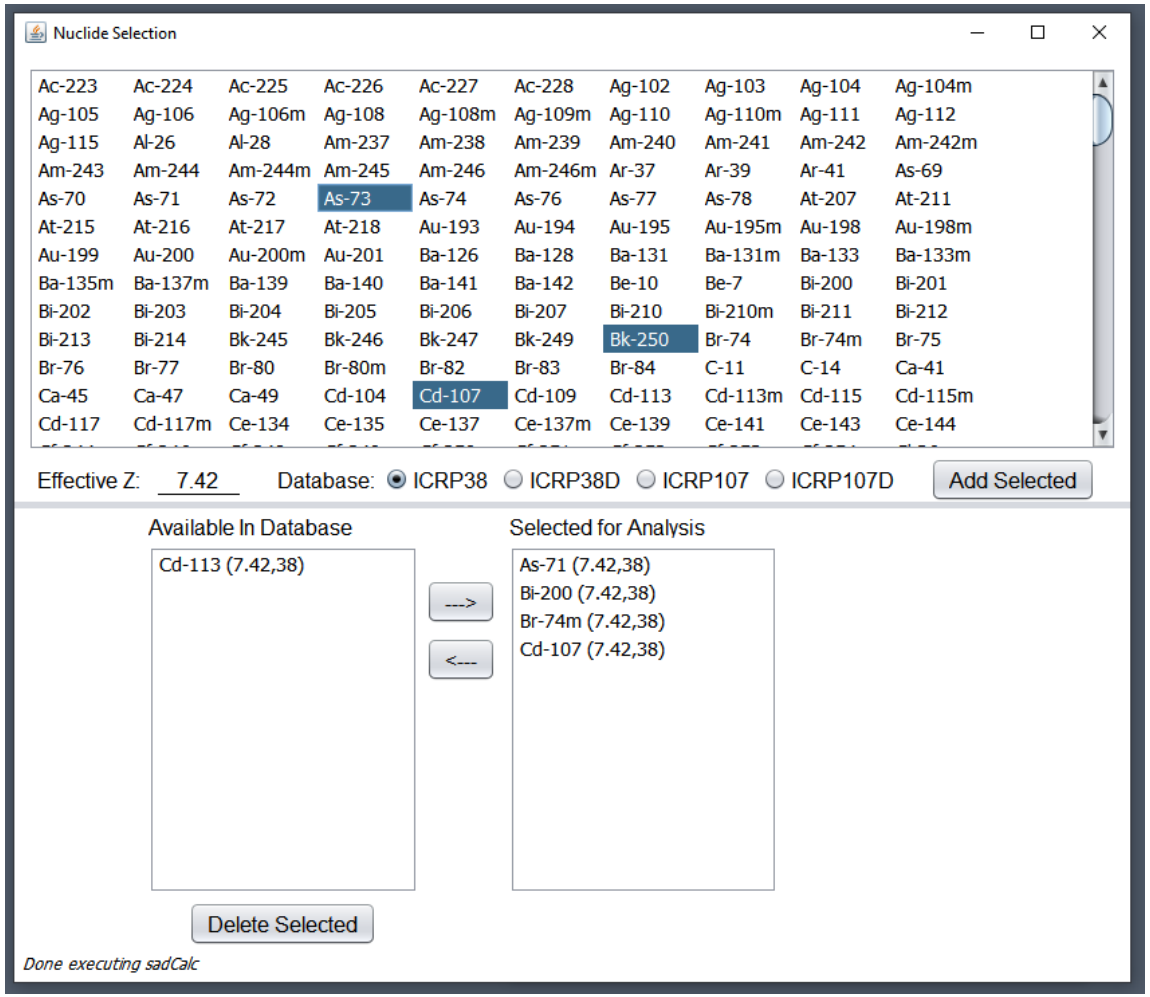
MODERNIZATION OF VARSKIN V7.0

- Brand new user interface
  - Maintained similar input structure as previous versions for ease of transition
  - Added a diagram to provide a visual display of what the user is modeling
  - Reduced inputs and results to a single screen to provide a clean one-look overview



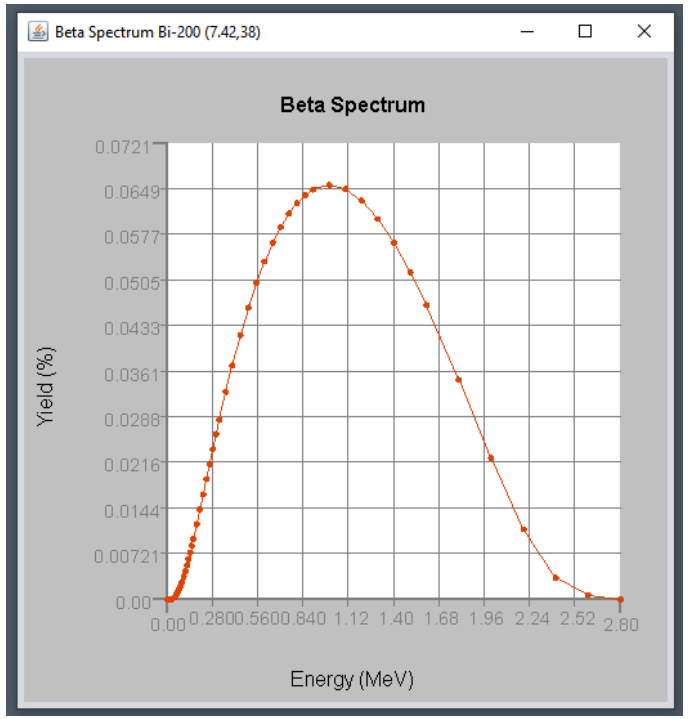
MODERNIZATION OF VARSKIN V7.0

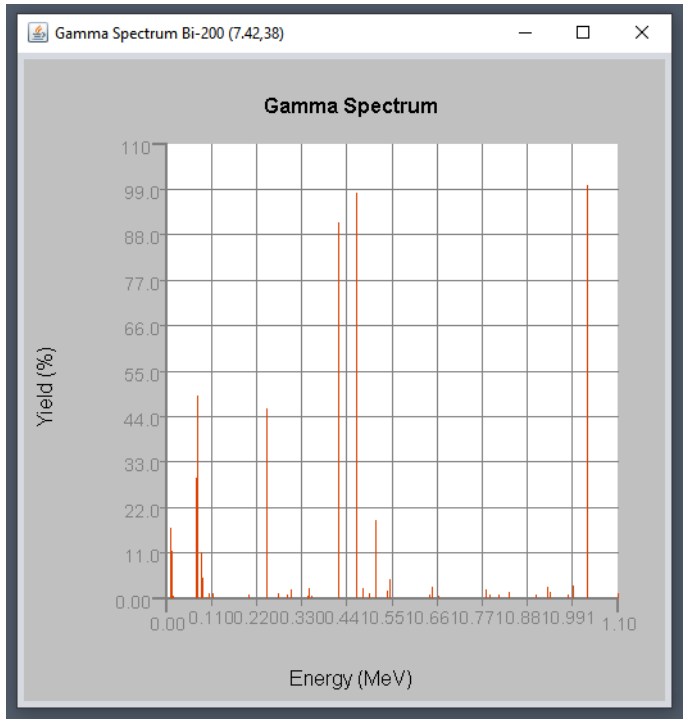
- Calculation Speed Improvements
  - Adding a nuclide only takes about 5 seconds compared to 20 seconds in the prevision version
  - Multiple nuclides can now be added once
  - Calculation speed improvement for general dose calculations

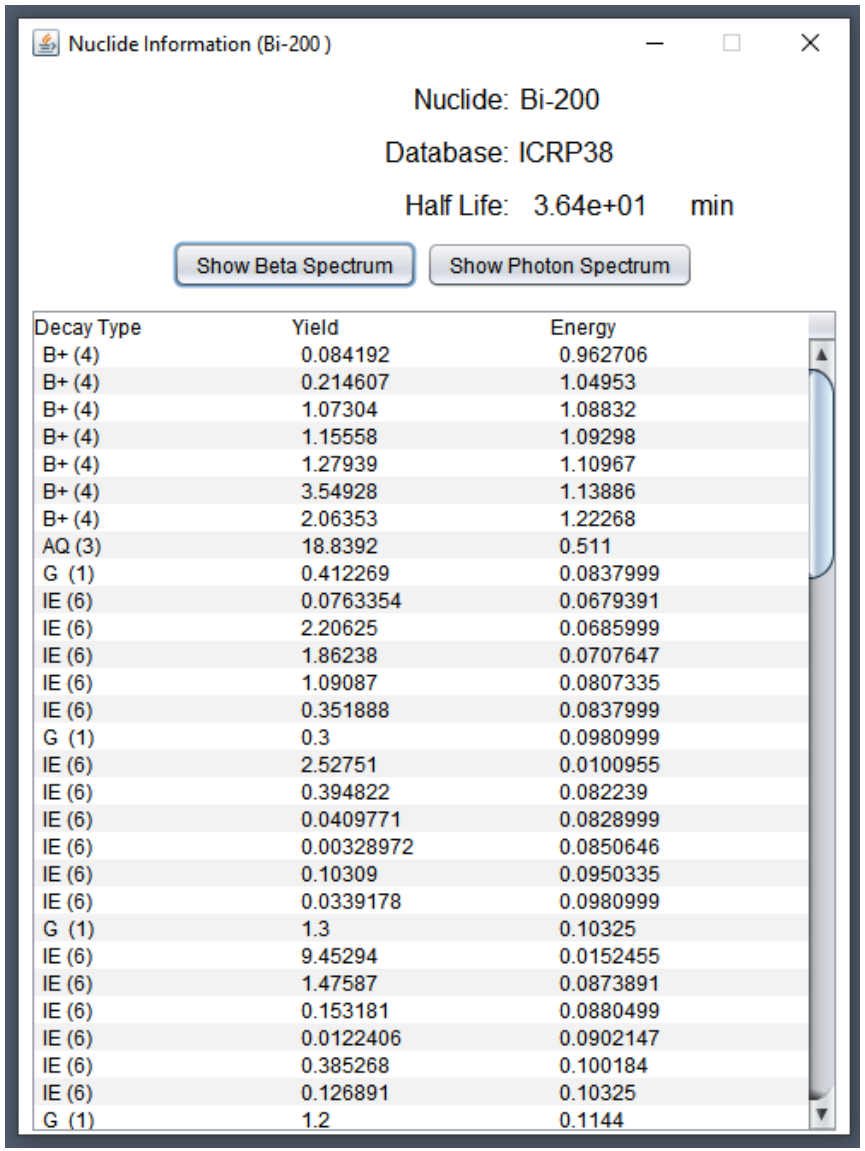


NEW FUNCTIONALITY OF VARSKIN V7.0

- Access to spectrum information for each nuclide







Decay Type	Yield	Energy
B+ (4)	0.084192	0.962706
B+ (4)	0.214607	1.04953
B+ (4)	1.07304	1.08832
B+ (4)	1.15558	1.09298
B+ (4)	1.27939	1.10967
B+ (4)	3.54928	1.13886
B+ (4)	2.06353	1.22268
AQ (3)	18.8392	0.511
G (1)	0.412269	0.0837999
IE (6)	0.0763354	0.0679391
IE (6)	2.20625	0.0685999
IE (6)	1.86238	0.0707647
IE (6)	1.09087	0.0807335
IE (6)	0.351888	0.0837999
G (1)	0.3	0.0980999
IE (6)	2.52751	0.0100955
IE (6)	0.394822	0.082239
IE (6)	0.0409771	0.0828999
IE (6)	0.00328972	0.0850646
IE (6)	0.10309	0.0950335
IE (6)	0.0339178	0.0980999
G (1)	1.3	0.10325
IE (6)	9.45294	0.0152455
IE (6)	1.47587	0.0873891
IE (6)	0.153181	0.0880499
IE (6)	0.0122406	0.0902147
IE (6)	0.385268	0.100184
IE (6)	0.126891	0.10325
G (1)	1.2	0.1144

NEW FUNCTIONALITY OF VARSKIN V7.0

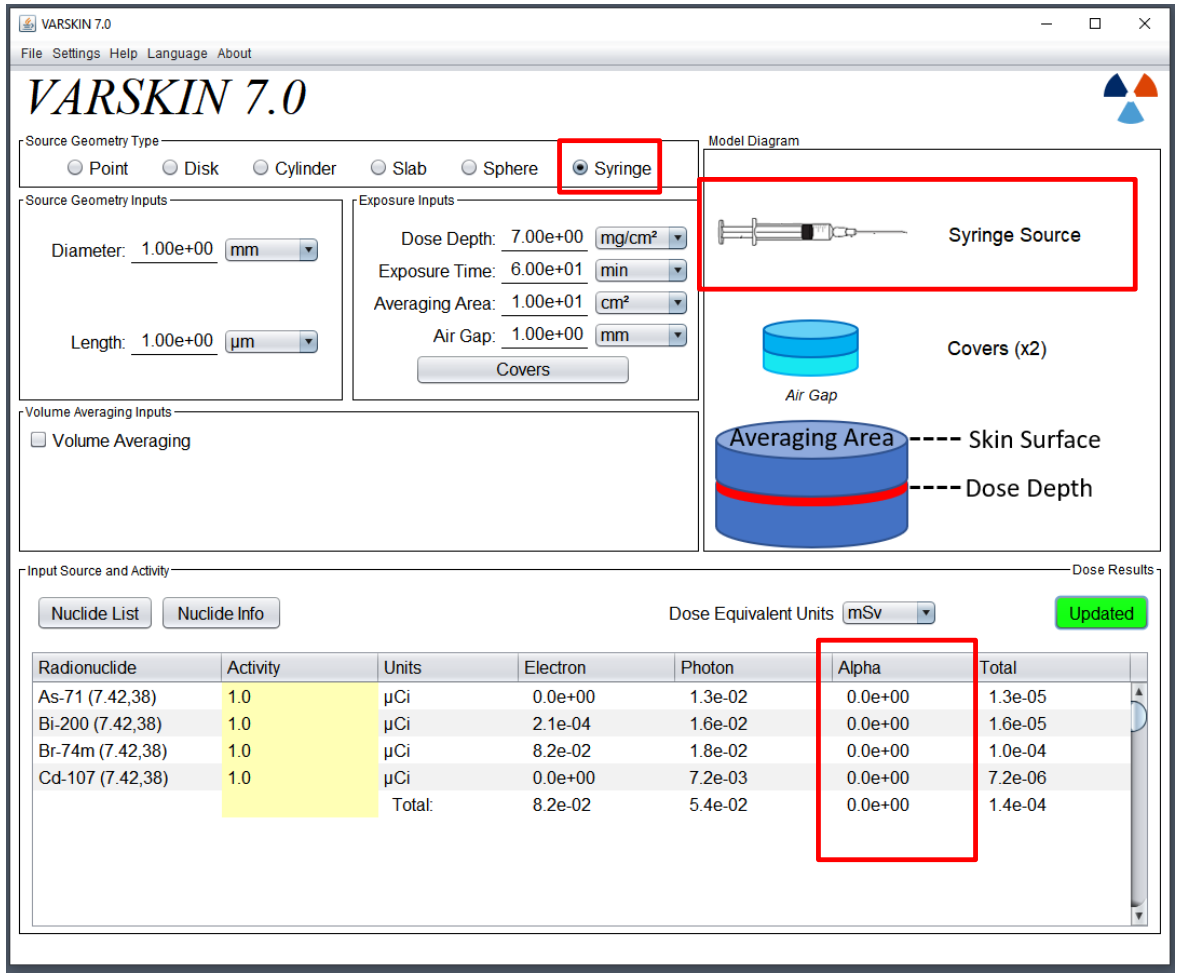
- Generation of Reports that can be used as a formal record

```
********************************************************************************
VARSKIN Dose Report
********************************************************************************

--------------------------------------------------------------------------------
Execution Information
--------------------------------------------------------------------------------
Date: 2020-10-23
Time: 12:36:01.248642600
User Name: [redacted]
Host Name: [redacted]
OS Name: Windows 10
OS Version: 10.0
OS Architecture: amd64

--------------------------------------------------------------------------------
Code and Version Information
--------------------------------------------------------------------------------
Code:                                   VARSKIN
Version:                                7.0
```

```
********************************************************************************
Inputs
********************************************************************************

--------------------------------------------------------------------------------
Source Geometry Information
--------------------------------------------------------------------------------
Source Geometry Type:                   cylinder
Source Diameter:                        1.000e+00 mm
Source Thickness:                       1.000e+00 µm
Source Volume:                          7.854e-07 cm³
Source Density:                         1.000e+00 g/cm³

--------------------------------------------------------------------------------
Exposure Information
--------------------------------------------------------------------------------
Dose Depth:                             7.000e+00 mg/cm²
Exposure Time:                          6.000e+01 min
Dose Averaging Area:                    1.000e+01 cm²
Air Gap Thickness:                      1.000e+00 mm

   Nuclide  Database  Source Z   Actvity     Units
     As-71    ICRP38       7.42 1.000e+00       µCi
    Bi-200    ICRP38       7.42 1.000e+00       µCi
    Br-74m    ICRP38       7.42 1.000e+00       µCi
    Cd-113    ICRP38       7.42 1.000e+00       µCi
    Cd-107    ICRP38       7.42 1.000e+00       µCi

********************************************************************************
Results
********************************************************************************

--------------------------------------------------------------------------------
Shallow Dose Equivelent(mSv)
--------------------------------------------------------------------------------
   Nuclide  Database      Electrons     Photons      Alphas      Total
     As-71    ICRP38      0.000e+00  1.528e-02  0.000e+00  1.528e-05
    Bi-200    ICRP38      2.962e-04  1.801e-02  0.000e+00  1.831e-05
    Br-74m    ICRP38      8.164e-02  2.111e-02  0.000e+00  1.027e-04
    Cd-113    ICRP38      0.000e+00  0.000e+00  0.000e+00  0.000e+00
    Cd-107    ICRP38      0.000e+00  8.253e-03  0.000e+00  8.253e-06

              Total:      8.193e-02  6.265e-02  0.000e+00  1.446e-04

********************************************************************************
End of Report
********************************************************************************
```

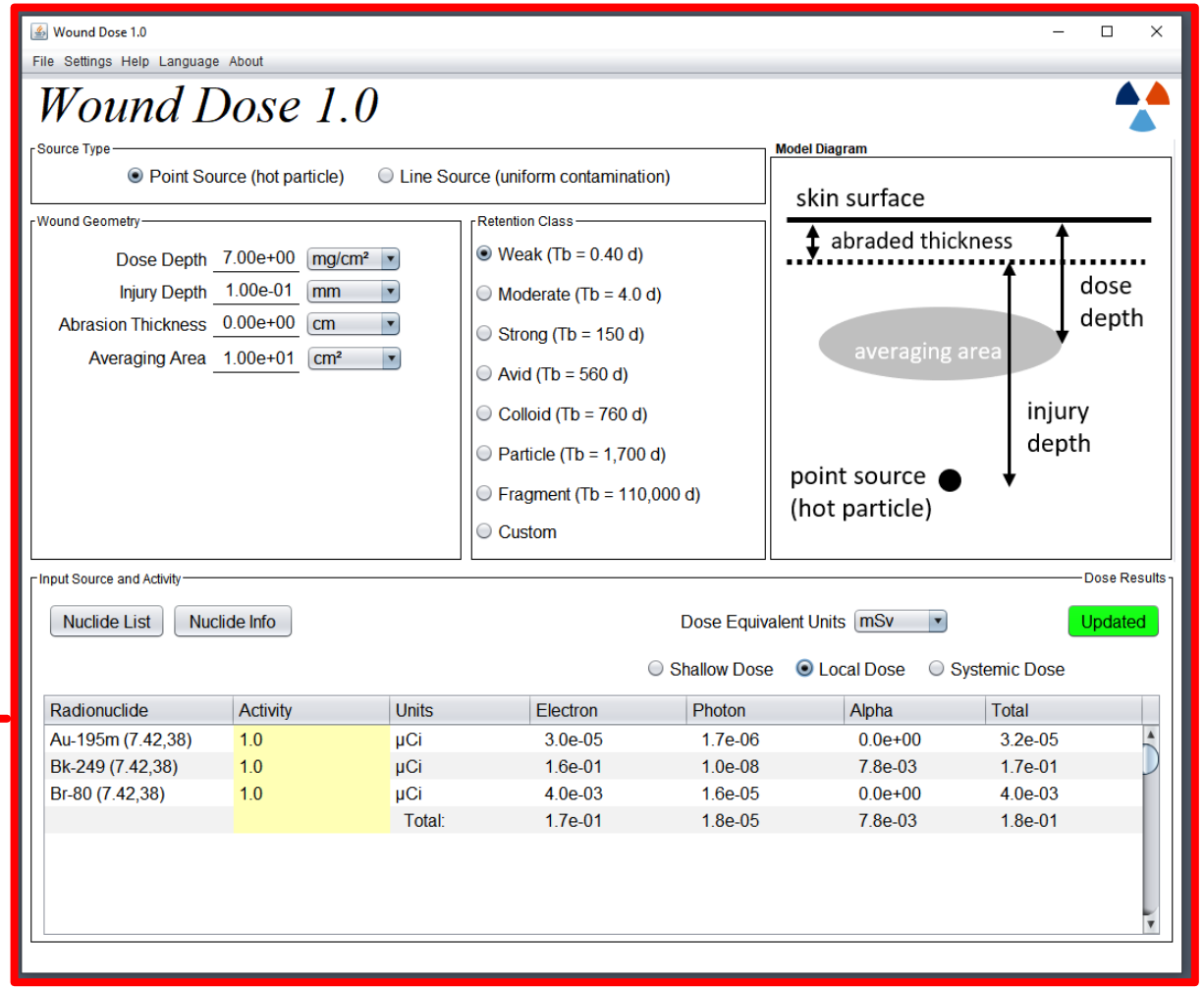
NEW MODELS OF VARSKIN V7.0

- Addition of Alpha Dose
- Addition of a Syringe Model



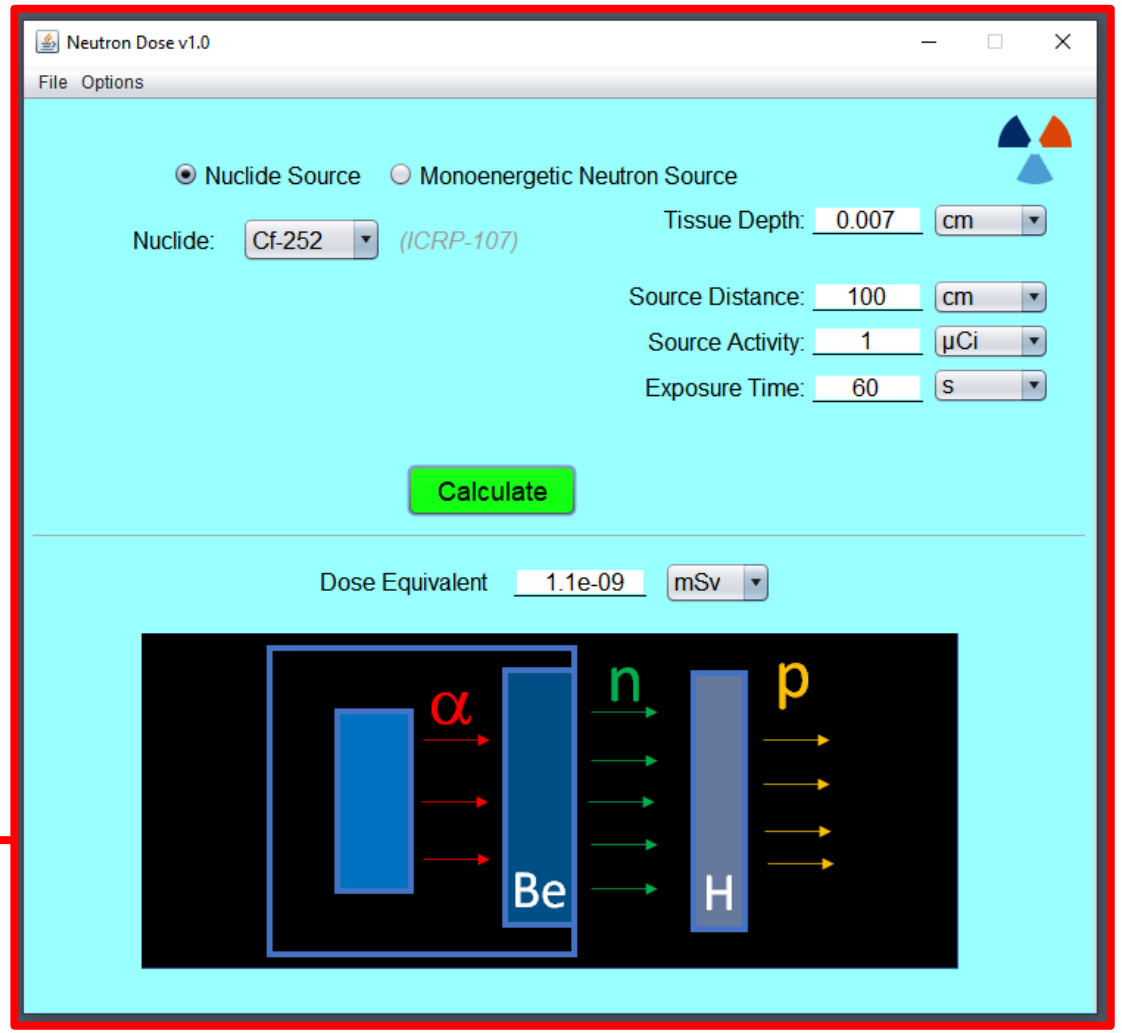
WOUND DOSE (NEW)

- Brand new model for internal dose calculations
  - Shallow dose
  - Local dose
  - Systemic dose
- Dose can be calculated from an *embedded particle* or *uniform line source*



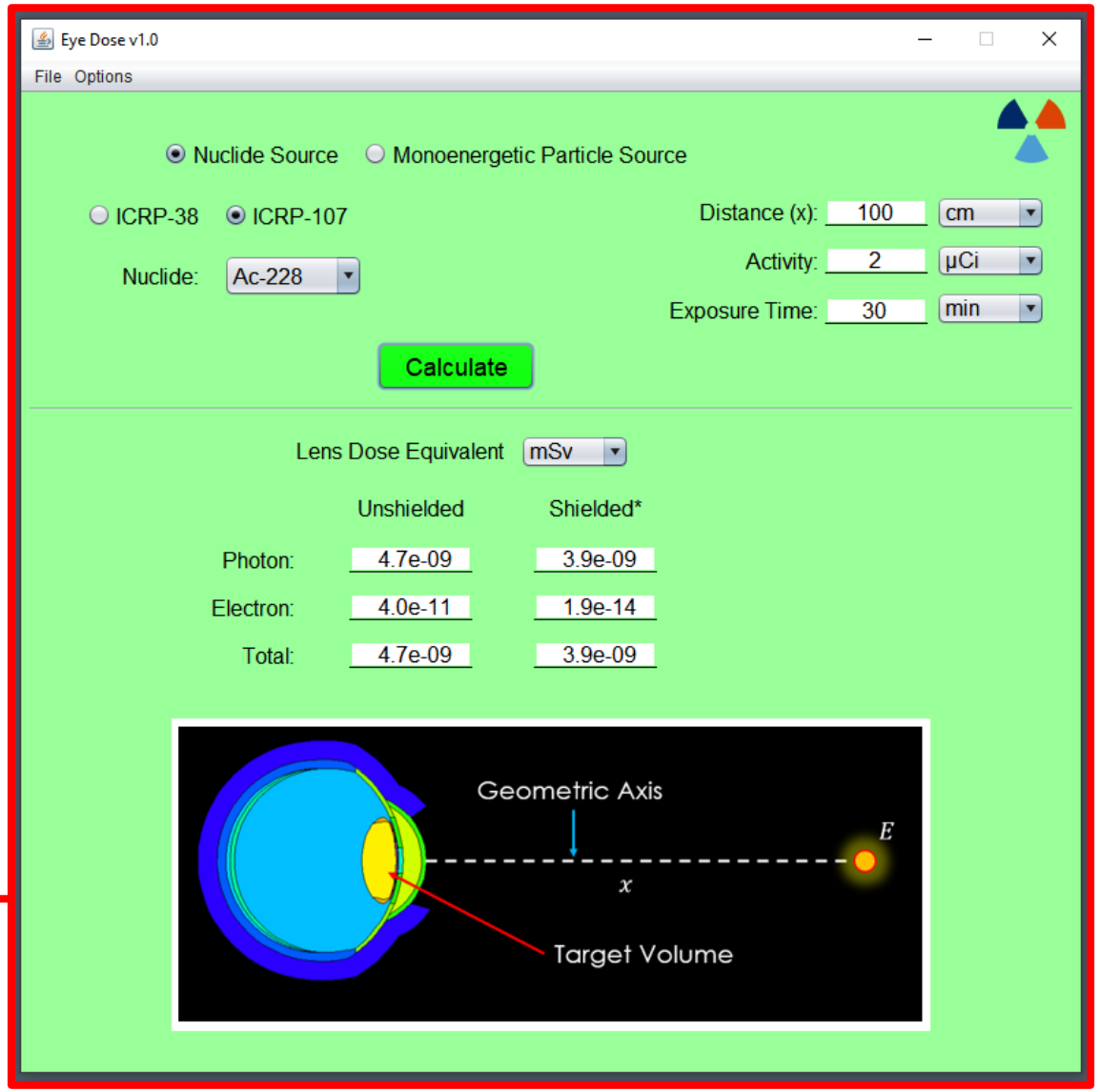
NEUTRON DOSE (NEW)

- Brand new model for neutron shallow dose calculations
- Dose can be calculated from a *mono-energetic* source a *nuclide* source



NEUTRON DOSE (NEW)

- Brand new model for total eye dose
- Dose can be calculated from a *mono-energetic* source a *nuclide* source



QUESTIONS


RADIATION PROTECTION COMPUTER CODE
RAMP
ANALYSIS AND MAINTENANCE PROGRAM