

Hands-on Practice for MMCLAB

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Finish the following tasks step by step:

1. Load the given brain mesh “3-0Months”, plot the cross-section plane where $x+y=150$ mm.
2. Set the optical properties to different media types of the mesh according to <http://mex.space/wiki/index.cgi?MMC/Colin27AtlasMesh>
3. Add a uniform disk source with $r = 10$ mm at $[70, 75, 160]$ mm. The illumination source points towards $-z$ direction, but is divergent with a focus distance of 20 mm.
4. Add a planar detection plane of size 20×20 mm². The plane is parallel to x - z plane and the center of the detection plane is $[140, 75, 80]$ mm.
5. Merge the illumination plane and detection plane with the skull model, and have the modified mesh ready for simulation.
6. The total simulation time should be 5 ns and each time gate width is 0.1 ns.
7. Choose photon counts based on your computer (suggested: $3e6-1e7$). Use a random seed, consider reflection index mismatch. Save detected photons with exit information as well as their seeds.
8. Run MMCLAB with your defined parameters, record the time of your simulation
9. Plot the photon fluence distribution (Continuous Wave) on ‘ $y = 75$ ’ mm plane (in \log_{10} scale). Remember to use the mesh before re-tessellation. Can you also plot contours?
10. In a different figure, plot the Temporal Spread Function (TPSF) of the detected photons.
11. Is the number of detected photons large enough? If not, try using more photons or increasing the size of the detection plane. Reducing the scattering values might also help.
12. Let’s try building the absorption Jacobian (Continuous Wave) when you are satisfied with the detected photon counts. Again, plot the Jacobian on ‘ $y = 75$ ’ mm plane.