MNPBEM SOP 1.0 (10/29/2024)

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# **Introduction**

U. Hohenester and A. Trügler, Comp. Phys. Commun. 183, 370 (2012).

U. Hohenester, Comp. Phys. Commun. 185, 1177 (2014).

J. Waxenegger, A. Trügler, and U. Hohenester, Comp. Phys. Commun. 193, 138 (2015).

# **MNPBEM Installation**

1. Go to the GitHub repository “MNPBEM\_GUI” (<https://github.com/Nikolaos-Matthaiakakis/MNPBEM_GUI/tree/master>).
2. Press the green button saying “<> Code” and “Download ZIP”.
3. Extract all from “MNPBEM\_GUI-master.zip” in your folder.
4. Rename “MNPBEM\_GUI\_master” to “MNPBEM\_GUI” to avoid pathing errors.
5. You completed installing MNPBEM17 and MNPBEM-GUI (Graphical User Interface), the latest version of MNPBEM as of 10/29/2024.

\*If you want to use MNPBEM-GUI, the user manual is available under the “help” folder.

\*In this SOP, BEM simulations are performed with matlab code under MNPBEM17

You can just copy and paste the following folder to your path.

\\samba.campuscluster.illinois.edu\illinois-flandes\Katsuya Shiratori\04\_codes\MNPBEM\_GUI

# **Simulation Workflow**

## **Nanoparticle Geometry**

## **Material Properties**

## **Simulation Parameters**

## **Running Simulation**

# **Example 1: Scattering/Absorption Spectra of AuNS and AuNR**

# **Example 2: Electric Fields of AuNS and AuNR**

# **Example 3: Charge Density Distributions of AuNS and AuNR**

# **FDTD Benchmarking**

# **Post-Processing**

## **Result Visualization**

## **Data Interpretation**

# **Common Troubleshooting**

Problem 1: The file doesn’t run.

Answer 1: Check the path

# **References and Resources**

Mie scattering FDTD:

<https://optics.ansys.com/hc/en-us/articles/360042703433-Mie-scattering-FDTD->

Tips and best practices when using the FDTD TFSF source:

<https://optics.ansys.com/hc/en-us/articles/360034382934-TFSF-source-Correct-usage>

Understanding Mesh Refinement and Conformal Mesh in FDTD:

<https://optics.ansys.com/hc/en-us/articles/360034382594>

Selecting the best mesh refinement option in FDTD simulation object:

<https://optics.ansys.com/hc/en-us/articles/360034382614>

Tips for improving the quality of optical material fits:

<https://optics.ansys.com/hc/en-us/articles/360034915053-Tips-for-improving-the-quality-of-optical-material-fits>

Calculating charge distributions and currents in metals induced by an optical field:

<https://optics.ansys.com/hc/en-us/articles/360034395074-Calculating-charge-distributions-and-currents-in-metals-induced-by-an-optical-field>

Convergence testing process for FDTD simulations:

<https://optics.ansys.com/hc/en-us/articles/360034915833>

Argonne National Lab HPC/Applications/Lumerical:

<https://wiki.anl.gov/cnm/HPC/Applications/lumerical>

# **Updates**

Version 1.0 Notes: First iteration of SOP by Katsuya Shiratori ([katsuya2@illinois.edu](mailto:katsuya2@illinois.edu))