

CODECHECK Certificate 2025-004

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Item	Value
Title	Computationally Efficient Conical Horn Antenna Design. A theoretical design approach
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Publication	https://resolver.tudelft.nl/uuid:190e87c7-9309-470f-a821-43b7c3b8867b
Publication Repository	https://doi.org/10.4121/e06f14b2-d884-4d1a-88fd-4ee8ebc3a98e
Codechecker	João Guimarães (0000-0002-6545-3102)
Date of Check	2025-04-22
Summary	The first figure shown in the publication repository's README, so as the figures generated by the example instructions on how to execute the code shared in the same README. These figures are not found in the main publication.
Codecheck's Repository	https://github.com/codecheckers/certificate-2025-004

Table 1: CODECHECK summary

Summary

The author provided the code repository associated with the Master's thesis publication, which contained in the README (i) an example on how to execute the code to generate geometry data that can be plotted and (ii) an example figure of a given geometrical structure. These resources can be accessed in the 4TU.ResearchData repository:

<https://data.4tu.nl/datasets/e06f14b2-d884-4d1a-88fd-4ee8ebc3a98e/1>.

As part of this CODECHECK, we used the scripts to (i) reproduce the code execution following the instructions shared in the README and (ii) reproduce the example figure based on data that was previously generated by the author and made available via the code repository.

Output	Comment
TWORIT_Results/ Antenna_Geometry_Generation_REF/ Attempt1/3DPlot_Antenna_Geometry_a1.jpg	Figure showing geometric structure retrieved by executing REF.m as instructed in the README.
TWORIT_Results/ Antenna_Geometry_Generation_REF/ Attempt2/3DPlot_Antenna_Geometry_a2.jpg	Figure showing geometric structure retrieved by executing REF.m following the same instructions in the README, except 200 frequency points were requested instead of the suggested 100.
TWORIT_Results/ Antenna_Geometry_Generation_REF/ Attempt3/3DPlot_Antenna_Geometry_a3.jpg	Figure showing geometric structure retrieved by executing REF.m following the same instructions in the README, except the instructions to define the radius and length of Elements 1 and 3 are switched between the two elements.
TWORIT_Results/ Geometry_Figure_in_README/ readme_1stGeomFigure.jpg	Figure showing geometric structure represented in the README's first figure

Table 2: Summary of output files generated

CODECHECKER notes

Installation prerequisites and computational environment

- Matlab 2023b

Data preparation

- Data needed to reproduce README's figure:
.\TWORIT\S_param\Cone_minxp\Minxp_GEO.mat

Running the code

Code Execution

1. In Matlab, navigate to the main folder of code repository
2. In the Command Window, run the command `REF` and follow instructions. Bellow you can find the instructions the codechecker followed in 3 different attempts:
 - a. in Attempt 1, the codechecker followed the same exact instructions as shared at the end of the code repository's README

```
>> REF

Select, 1: Cascaded cylinders, Select, 2: Cylinder base with Cascaded Cone structure: 1
Number of cylinders you want: 3
Radius of Element 1 in [m]: 2e-2
Length of Element 1 in [m]: 2e-2
Relative permittivity of Element 1 [1]: 1
Relative permeability of Element 1 [1]: 1
Radius of Element 2 in [m]: 3e-2
Length of Element 2 in [m]: 3e-2
Relative permittivity of Element 2 [1]: 1
Relative permeability of Element 2 [1]: 1
Radius of Element 3 in [m]: 4e-2
Length of Element 3 in [m]: 2e-2
Relative permittivity of Element 3 [1]: 1
Relative permeability of Element 3 [1]: 1
Do you want to plot the Geometry?: Select 1 for YES, Select 2 for NO, Default is NO: 1
=====

Plotting the Antenna Geometry
Input the start frequency of the operation in [GHz]: 5
Input the end frequency of the operation in [GHz]: 10
Input the number of frequency points you need: 100
```

Smart mode selection strategy starts:

Smart mode selection strategy ends:

Want to print the modes? 1 for YES, 0 for NO [0]: 0

Give 0 is you agree with this options, 1 if you want to reintroduce them [0]:0

Calling the S parameter function:

=====

The number of cylindrical elements to solve for General Scattering Matrix:

3

Number of waveguide Junction problems to be solved:

2

Number of modes for all waveguides in succession:

8 20 32

Junction

Junction

1

of

2

2

of

2

Frequency Iteration: 1 ... 100

S Parameters Computed:

Save Data Section:

Do you want to save the Geometry in a file? 1 for Yes, 0 for No: [1]: 1

Select the folder in the UI:

Input the file name you want: Use single quotes when writing file name such as: 'Test':
'3DPlot_Antenna_Geometry_a1'

Data saved in/path/3DPlot_Antenna_Geometry_a1.mat

For plotting the Geometry from a mat file, please use Plot_Geomat.m File

Save Data Section:

Do you want to save the results in a file? 1 for Yes, 0 for No: [1]: 1

Select the folder in the UI:

Input the file name you want: Use single quotes when writing file name such as: 'Test':
'Antenna_Geometry_Results_a1'

Data saved in/path/ Antenna_Geometry_Results_a1.mat

>> Plot_Geomat

Do you want to plot the Geometry from a mat file? : 1 for Yes, 0 for No: [0]: 1

=====

Plot section:

=====File Selection=====

User selected in/path/3DPlot_Antenna_Geometry_a1.mat

- b. in Attempt 2, the codechecker followed the same instructions but requested 200 frequency points instead of 100, resulting in a figure with higher resolution

>> REF

Select, 1: Cascaded cylinders, Select, 2: Cylinder base with Cascaded Cone structure: 1

Number of cylinders you want: 3

Radius of Element 1 in [m]: 2e-2

Length of Element 1 in [m]: 2e-2

Relative permittivity of Element 1 [1]: 1

Relative permeability of Element 1 [1]: 1

Radius of Element 2 in [m]: 3e-2

Length of Element 2 in [m]: 3e-2

Relative permittivity of Element 2 [1]: 1

Relative permeability of Element 2 [1]: 1

Radius of Element 3 in [m]: 4e-2

Length of Element 3 in [m]: 2e-2

Relative permittivity of Element 3 [1]: 1

Relative permeability of Element 3 [1]: 1

Do you want to plot the Geometry?: Select 1 for YES, Select 2 for NO, Default is NO: 1

=====

Plotting the Antenna Geometry

Input the start frequency of the operation in [GHz]: 5

Input the end frequency of the operation in [GHz]: 10

Input the number of frequency points you need: 200

Smart mode selection strategy starts:

Smart mode selection strategy ends:

Want to print the modes? 1 for YES, 0 for NO [0]: 0

Give 0 is you agree with this options, 1 if you want to reintroduce them [0]:0

Calling the S parameter function:

=====

The number of cylindrical elements to solve for General Scattering Matrix:

3

Number of waveguide Junction problems to be solved:

2

Number of modes for all waveguides in succession:

8 20 32

Junction

Junction

1

of

2

2

of

2

Frequency Iteration: 1 ... 200

S Parameters Computed:

Save Data Section:

Do you want to save the Geometry in a file? 1 for Yes, 0 for No: [1]: 1

Select the folder in the UI:

Input the file name you want: Use single quotes when writing file name such as: 'Test':
'3DPlot_Antenna_Geometry_a2'

Data saved in/path/3DPlot_Antenna_Geometry_a2.mat

For plotting the Geometry from a mat file, please use Plot_Geomat.m File

Save Data Section:

Do you want to save the results in a file? 1 for Yes, 0 for No: [1]: 1

Select the folder in the UI:

Input the file name you want: Use single quotes when writing file name such as: 'Test':
'Antenna_Geometry_Results_a2'

Data saved in/path/Antenna_Geometry_Results_a2.mat

>> Plot_Geomat

Do you want to plot the Geometry from a mat file? : 1 for Yes, 0 for No: [0]: 1

=====

Plot section:

=====File Selection=====

User selected in/path/3DPlot_Antenna_Geometry_a2.mat

- c. in Attempt 3, the codechecker followed the same instructions but switched the instructions the radius and length between Elements 1 and 3.

>> REF

Select, 1: Cascaded cylinders, Select, 2: Cylinder base with Cascaded Cone structure: 1

Number of cylinders you want: 3

Radius of Element 1 in [m]: 4e-2

Length of Element 1 in [m]: 2e-2

Relative permittivity of Element 1 [1]: 1

Relative permeability of Element 1 [1]: 1

Radius of Element 2 in [m]: 3e-2

Length of Element 2 in [m]: 3e-2

Relative permittivity of Element 2 [1]: 1

Relative permeability of Element 2 [1]: 1

Radius of Element 3 in [m]: 2e-2

Length of Element 3 in [m]: 2e-2

Relative permittivity of Element 3 [1]: 1

Relative permeability of Element 3 [1]: 1

Do you want to plot the Geometry?: Select 1 for YES, Select 2 for NO, Default is NO: 1

=====

Plotting the Antenna Geometry

Input the start frequency of the operation in [GHz]: 5

Input the end frequency of the operation in [GHz]: 10

Input the number of frequency points you need: 100

Smart mode selection strategy starts:

Smart mode selection strategy ends:

Want to print the modes? 1 for YES, 0 for NO [0]: 0

Give 0 is you agree with this options, 1 if you want to reintroduce them [0]:0

Calling the S parameter function:

=====

The number of cylindrical elements to solve for General Scattering Matrix:

3

Number of waveguide Junction problems to be solved:

2

Number of modes for all waveguides in succession:

32 20 8

Junction

Junction

1

of

2

2

of

2

Frequency Iteration: 1 ... 100

S Parameters Computed:

Save Data Section:

Do you want to save the Geometry in a file? 1 for Yes, 0 for No: [1]: 1

Select the folder in the UI:

Input the file name you want: Use single quotes when writing file name such as: 'Test':
'3DPlot_Antenna_Geometry_a3'

Data saved in/path/3DPlot_Antenna_Geometry_a3.mat

For plotting the Geometry from a mat file, please use Plot_Geomat.m File

Save Data Section:

Do you want to save the results in a file? 1 for Yes, 0 for No: [1]: 1

Select the folder in the UI:

Input the file name you want: Use single quotes when writing file name such as: 'Test':
'Antenna_Geometry_Results_a3'

```
Data saved in/path/ Antenna_Geometry_Results_a3.mat
```

```
>> Plot_Geomat
```

```
Do you want to plot the Geometry from a mat file? : 1 for Yes, 0 for No: [0]: 1
```

```
=====
```

```
Plot section:
```

```
=====File Selection=====
```

```
User selected in/path/3DPlot_Antenna_Geometry_a3.mat
```

In the three attempts, the codechecker plotted the figures by running the command `Plot_Geomat` and then selected the file in/path/3DPlot_Antenna_Geometry_aX.mat.

More details can be found in the [repository](#) created for this CODECHECK report.

Reproducing README's Figure

- In Matlab, navigate to the main folder of code repository
- In the Command Window, run `Plot_Geomat` and selected the pre-existing file `.\TWORIT\S_param\Cone_minxp\Minxp_GEO.mat`. This will lead to the 3D representation of the first figure displayed in the code repository's README:

```
>> Plot_Geomat
```

```
Do you want to plot the Geometry from a mat file? : 1 for Yes, 0 for No: [0]: 1
```

```
=====
```

```
Plot section:
```

```
=====File Selection=====
```

```
User selected .\TWORIT\S_param\Cone_minxp\Minxp_GEO.mat
```

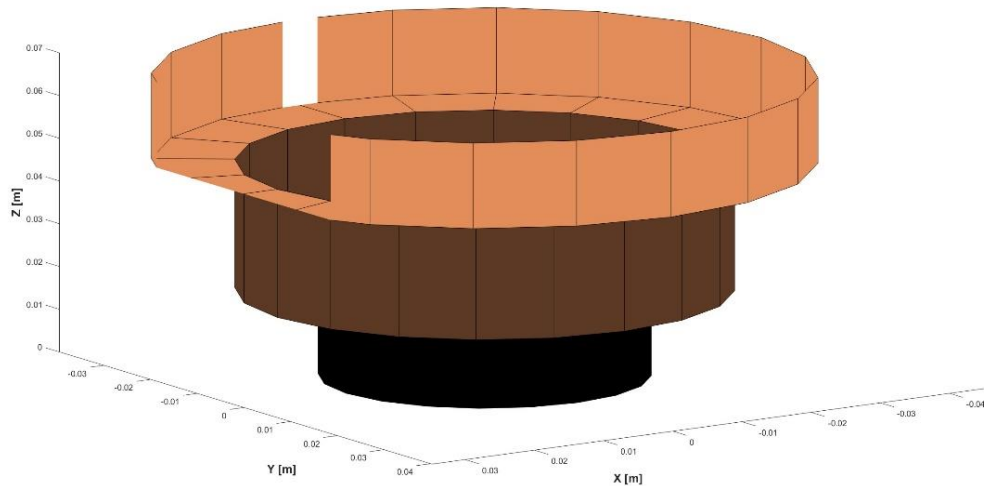
More details can be found in the [repository](#) created for this CODECHECK report.

Manifest Files

Code Execution

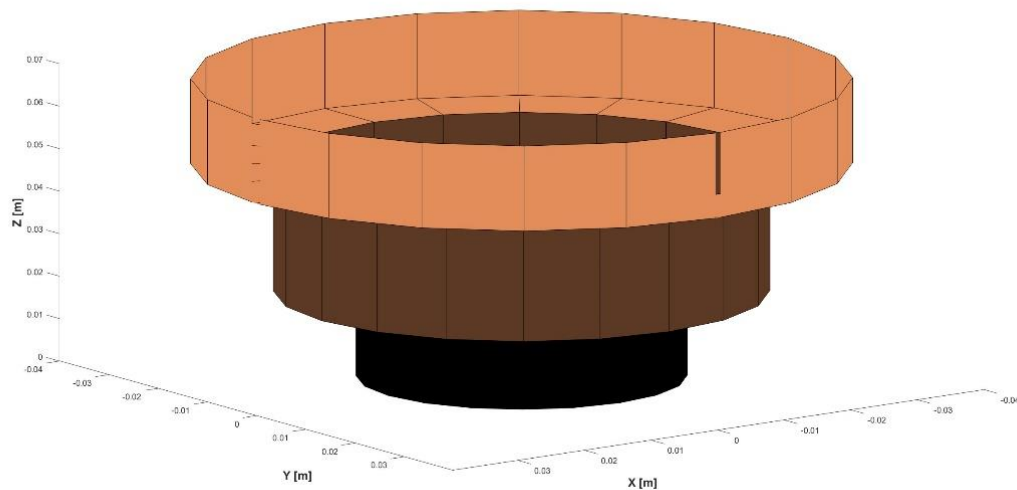
`./TWORIT_Results/ Antenna_Geometry_Generation_REF/ Attempt1/3DPlot_Antenna_Geometry_a1.jpg`

Comment: Figure showing geometric structure retrieved by executing REF.m as instructed in the README.



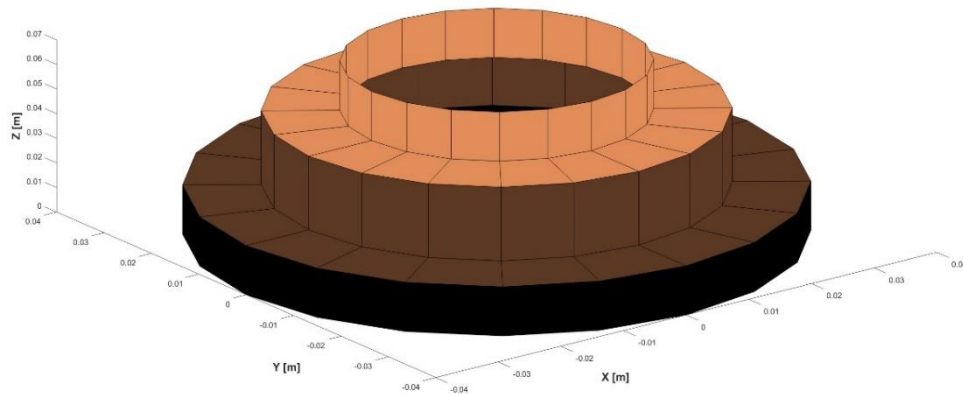
`./TWORIT_Results/ Antenna_Geometry_Generation_REF/ Attempt2/3DPlot_Antenna_Geometry_a2.jpg`

Comment: Figure showing geometric structure retrieved by executing REF.m following the same instructions in the README, except 200 frequency points were requested instead of the suggested 100.



./TWORIT_Results/ Antenna_Geometry_Generation_REF/Attempt3/3DPlot_Antenna_Geometry_a3.jpg

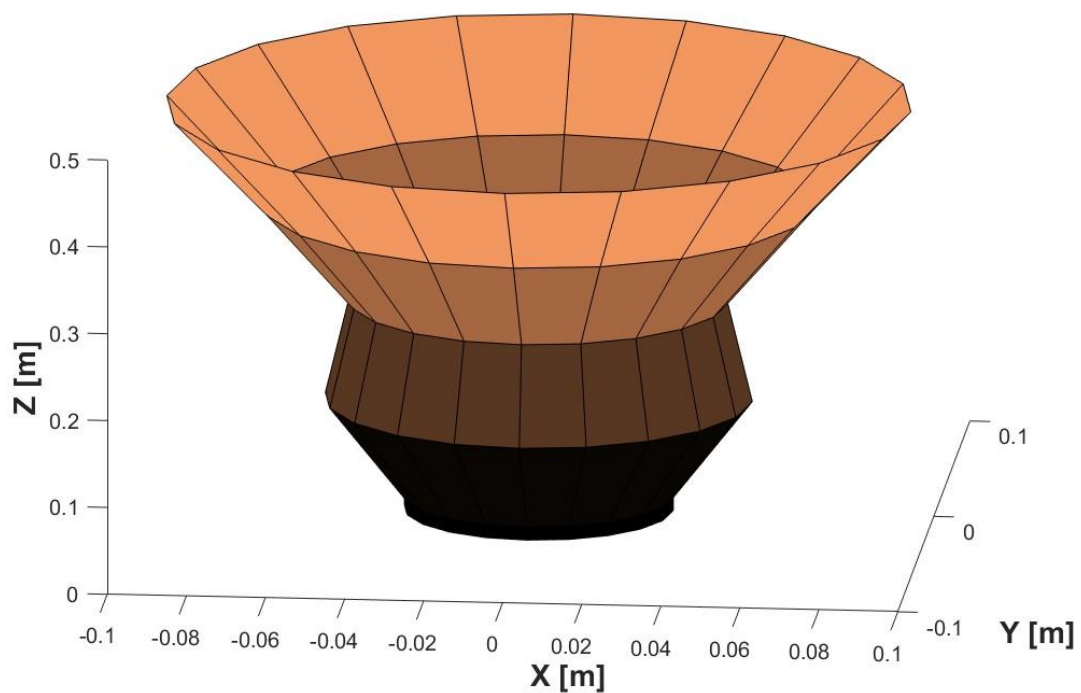
Comment: Figure showing geometric structure retrieved by executing REF.m following the same instructions in the README, except the instructions to define the radius and length of Elements 1 and 3 are switched between the two elements.



Reproducing README's Figure

TWORIT_Results/Geometry_Figure_in_README/readme_1stGeomFigure.jpg

Comment: Figure showing geometric structure represented in the README's first figure



More details can be found in the [repository](#) created for this CODECHECK report.

Acknowledgements

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Citing this document

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About CODECHECK

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