MODE TRIALS

Si (Silicon) - Palik

Si (Silicon) - Palik

FDTD Trials

Screenshot of Ansys Lumerical 2023 R2.3 Finite Difference IDE showing the Bragg bandstructure simulation with MAIN_Bandstructure.lsf script editor.

Script File Editor — MAIN_Bandstructure.lsf:

```
23  wl_min = 1.27e-6; # simulation wavelength start
24  wl_max = 1.33e-6; # simulation wavelength stop
25
26  pol = 'TE'; # simulation polarization
27
28  # Simulation time determines the frequency resolution
29  # If the time is too short, you will not be able to resolve the two p
30  #  and find the bandwidth
31  sim_time = 1500e-15; # E-15 is femto...
32  # Mesh accuracy from 1 to 8 determines the accuracy
33  # 1 is fast but inaccurate
34  # 2 is probably good enough
35  # 4 is very accurate
36  mesh = 2;
37
38  # higher resolution mesh in the waveguide region
39  mesh_y = 5e-9;
40  mesh_x = 5e-9;
41  mesh_z = 20e-9;
42
43
44  ###############################
45  # Device geometry             #
46  ###############################
47
48  W = 350e-9; # average waveguide width
49  dW = 5.25862e-08; # waveguide corrugation
50  period = 272e-9; # corrugations period
51
52  sinusoidal = false; # enable or disable sinusoidal, versus rectangula
53  rib = false; # enable or disable rib layered waveguide type (do not e
54  sidewall_angle = 90;
55
56  thickness_device = 220e-9; # waveguide full thickness
57  thickness_rib = 90e-9; # waveguide rib layer thickness
58  thickness_superstrate = 2e-6; # superstrate thikness
59  thickness_substrate = 2e-6; # substrate thickness
60  thickness_handle = 1e-6; # handle substrate thickness
61
62  mat_device = 'Si (Silicon) - Dispersive & Lossless'; # device materia
63  mat_superstrate = 'SiO2 (Glass) - Palik'; # superstrate material
64  mat_substrate = 'SiO2 (Glass) - Palik'; # substrate material
65  mat_handle = 'Si (Silicon) - Dispersive & Lossless'; # handle substra
```

Script Prompt output:

```
1st largest peak is at wavelength = 1.3003e-06
2nd largest peak is at wavelength = 1.31936e-06
Bragg wavelength = 1309.83 nm
Delta lambda = 19.0598 nm
> MAIN_Bandstructure;
1st largest peak is at wavelength = 1.3003e-06
2nd largest peak is at wavelength = 1.31936e-06
Bragg wavelength = 1309.83 nm
Delta lambda = 19.0598 nm
> MAIN_Bandstructure;
1st largest peak is at wavelength = 1.3003e-06
2nd largest peak is at wavelength = 1.31936e-06
Bragg wavelength = 1309.83 nm
Delta lambda = 19.0598 nm
> MAIN_Bandstructure;
1st largest peak is at wavelength = 1.3003e-06
2nd largest peak is at wavelength = 1.31936e-06
Bragg wavelength = 1309.83 nm
Delta lambda = 19.0598 nm
>
```
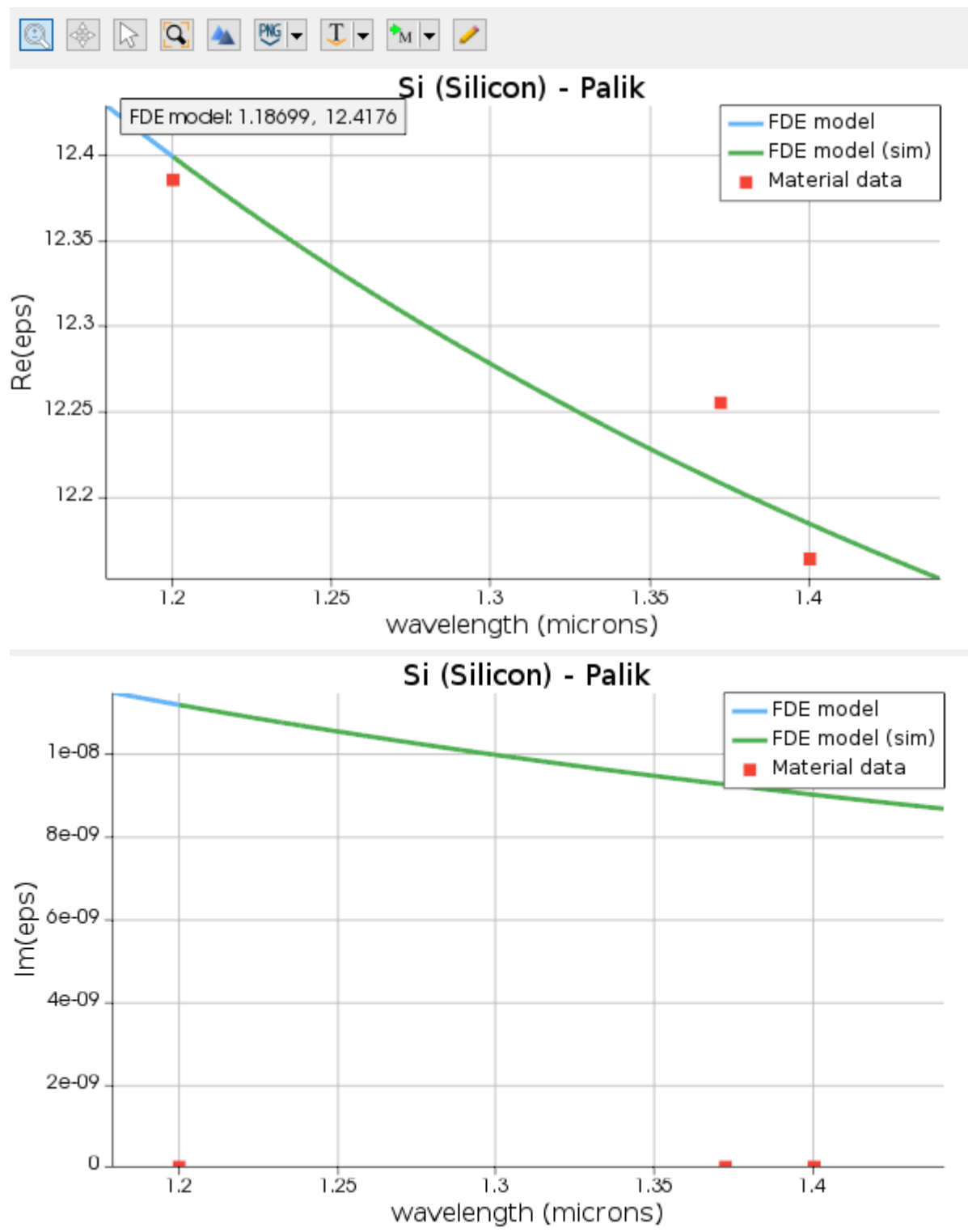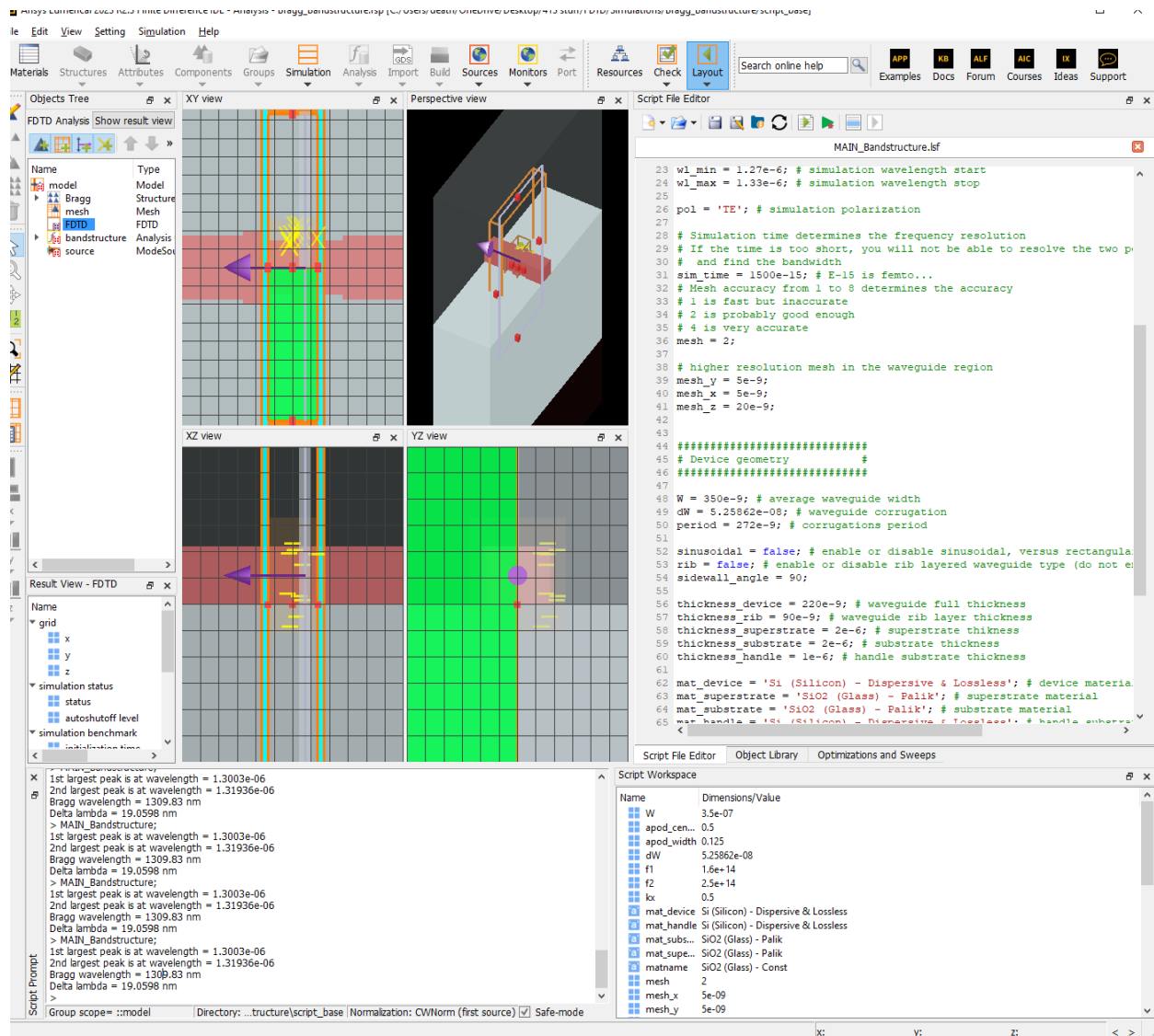
dw, Y
4.5e-08, 137013
4.56897e-08, 137798
4.63793e-08, 136229
4.7069e-08, 137014
4.77586e-08, 138583
4.84483e-08, 141722
4.91379e-08, 146503
4.98276e-08, 148159
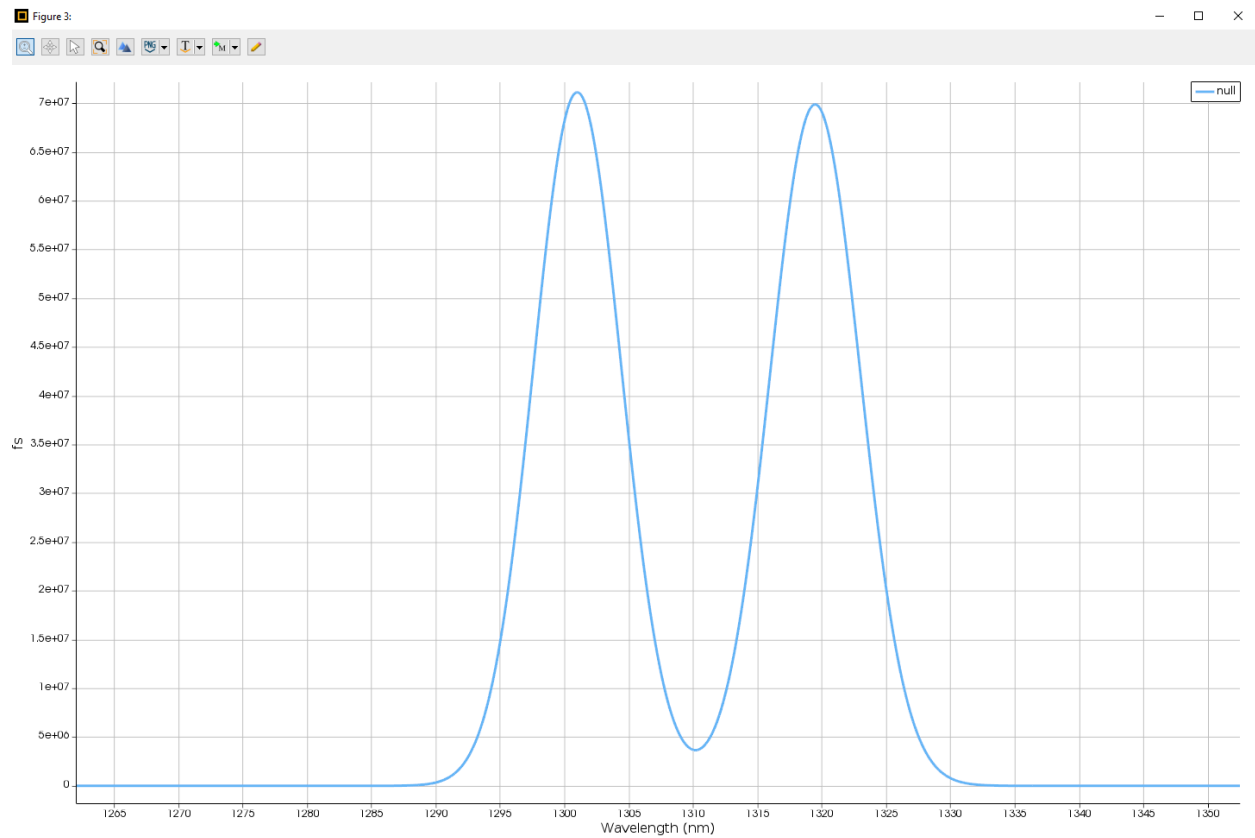5.05172e-08, 148986
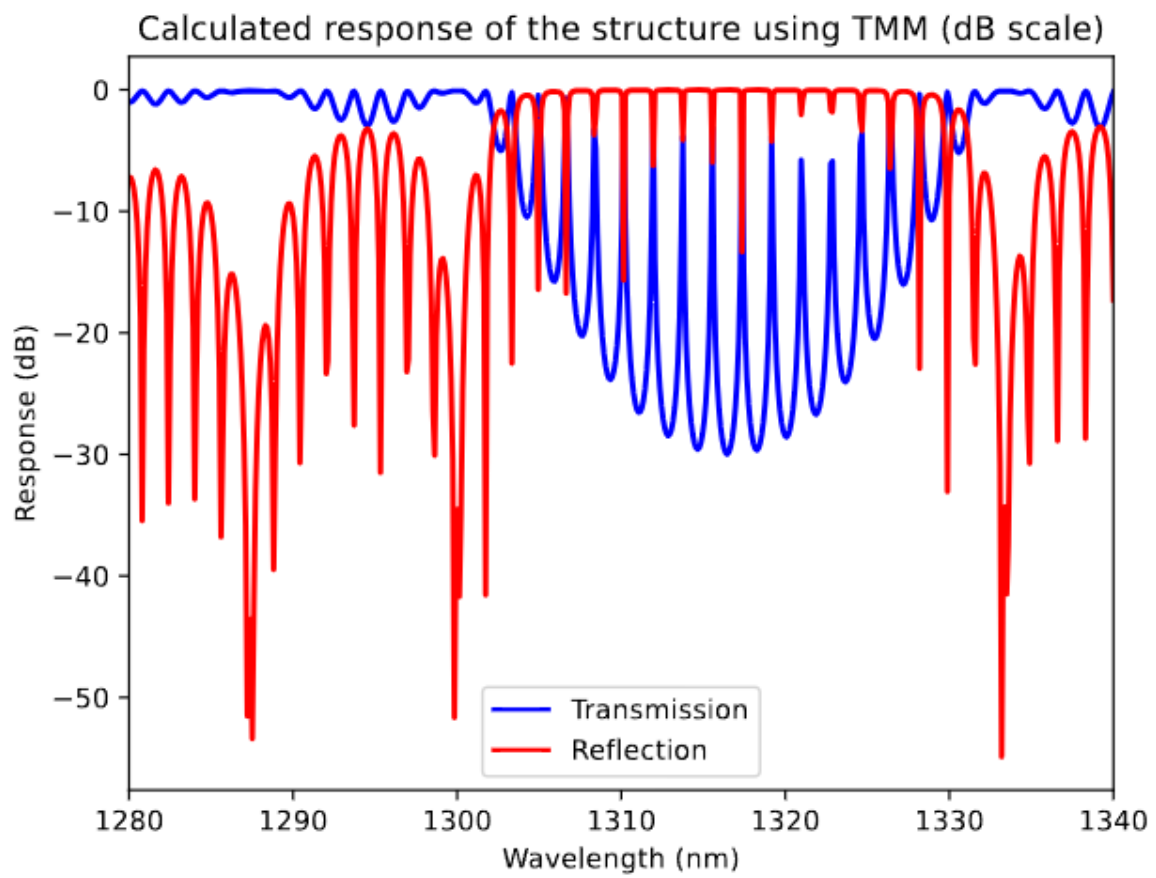5.12069e-08, 150642
5.18966e-08, 152297
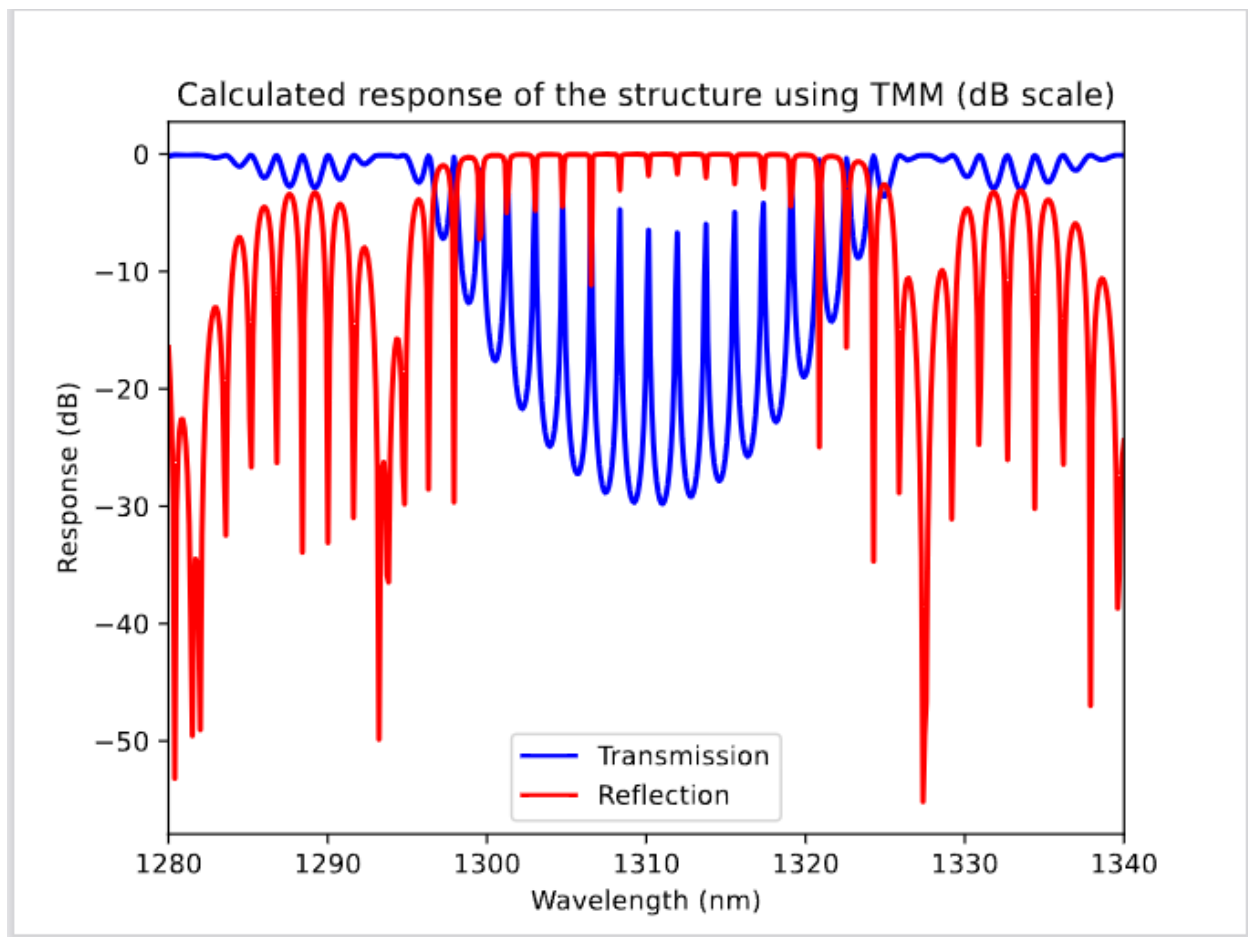5.25862e-08, 153124
5.32759e-08, 143193

```
5.39655e-08, 143193
5.46552e-08, 143193
5.53448e-08, 144021
5.60345e-08, 144848
5.67241e-08, 141538
5.74138e-08, 141538
5.81034e-08, 143193
5.87931e-08, 144848
5.94828e-08, 145676
6.01724e-08, 146504
6.08621e-08, 147331
6.15517e-08, 148159
6.22414e-08, 148986
6.2931e-08, 136572
6.36207e-08, 137400
6.43103e-08, 136572
6.5e-08, 136572
```

PICKED BEST KAPPA

Calculated response of the structure using TMM (dB scale)

Shift problem

Calculated response of the structure using TMM (dB scale)

Incorrect is next step