Diffraction Monitor in Tidy3D

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Here I explored the use of Diffraction Monitor (Documentation) on Huygen's Metasurface.

```python
# Import the necessary packages
import matplotlib.pyplot as plt
import numpy as np
import tidy3d as td
import tidy3d.web as web
import scienceplots

# Set logging level to ERROR to reduce output verbosity
td.config.logging_level = "ERROR"
```

```python
# 0 Define a FreqRange object with desired wavelengths
fr = td.FreqRange.from_wvl_interval(wvl_min=1.1, wvl_max=1.6)
N = 301 # num_points
freq0 = fr.freq0
lda0 = td.C_0 / fr.freq0
```

```python
# 1 Computational Domain Size
h = 0.220  # Height of cylinder
spc = 2
Lz = spc + h + h + spc

Px = Py = P = 0.666 # periodicity
sim_size = [Px, Py, Lz]
```

```python
# 2 Grid Resolution
dl = P / 128
```

Diffraction Monitor Results

```
dD = batch_data["actual"]["diffraction_monitor"]
norm_data = batch_data["norm"]["diffraction_monitor"]

# diffraction_data.help()
```

```
dD.monitor
```

```
DiffractionMonitor(attrs={}, type='DiffractionMonitor', center=(0.0, 0.0,
-0.8718518518518521), size=(inf, inf, 0.0), name='diffraction_monitor', interval_space=(1, 1,
1), colocate=False, freqs=(187370286250000.0, 187654180623106.06, 187938074996212.12,
188221969369318.2, 188505863742424.25, 188789758115530.3, 189073652488636.38,
189357546861742.44, 189641441234848.47, 189925335607954.53, 190209229981060.6,
190493124354166.66, 190777018727272.72, 191060913100378.78, 191344807473484.84,
191628701846590.9, 191912596219696.97, 192196490592803.03, 192480384965909.1,
192764279339015.16, 193048173712121.22, 193332068085227.28, 193615962458333.34,
193899856831439.38, 194183751204545.44, 194467645577651.5, 194751539950757.56,
195035434323863.62, 195319328696969.7, 195603223070075.75, 195887117443181.8,
196171011816287.88, 196454906189393.94, 196738800562500.0, 197022694935606.06,
197306589308712.12, 197590483681818.2, 197874378054924.25, 198158272428030.3,
198442166801136.34, 198726061174242.4, 199009955547348.47, 199293849920454.53,
199577744293560.6, 199861638666666.66, 200145533039772.72, 200429427412878.78,
200713321785984.84, 200997216159090.9, 201281110532196.97, 201565004905303.03,
201848899278409.1, 202132793651515.16, 202416688024621.2, 202700582397727.25,
202984476770833.3, 203268371143939.38, 203552265517045.44, 203836159890151.5,
204120054263257.56, 204403948636363.62, 204687843009469.7, 204971737382575.75,
```

```
dD.Er
```

Phase

```
phase = np.unwrap(np.angle(amps))
```

```
new_amps = batch_data["actual"]["diffraction_monitor"].amps
```

```
monitor = td.DiffractionMonitor(
    center=(0, 0, -Lz/2 + spc - (td.C_0 / fr.freq0)),
    size=(td.inf,td.inf,0),
    freqs=fr.freqs(N),
    name='diffraction_monitor',
    normal_dir='-', # away from structure
)
```

```
sims = simulation_helper(
    background=[polymer],
    monitors=[monitor],
    run_time=700 / (fr.fmax - fr.fmin)
)
```