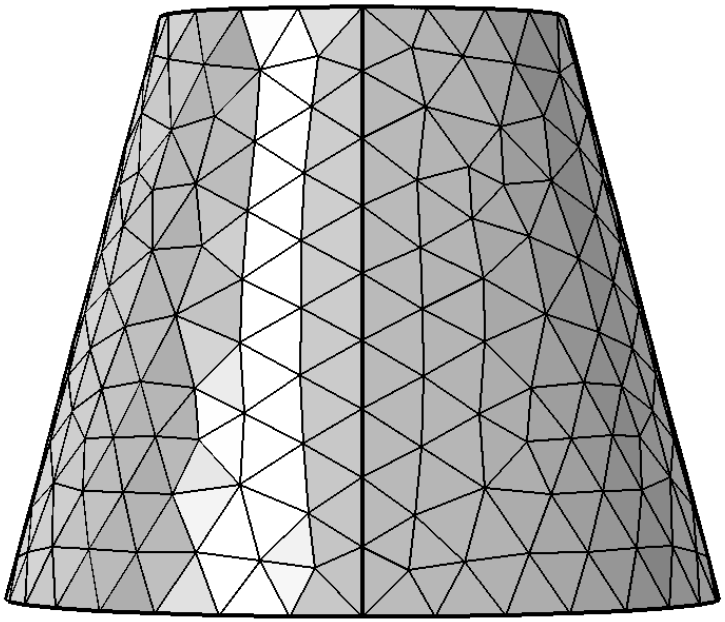
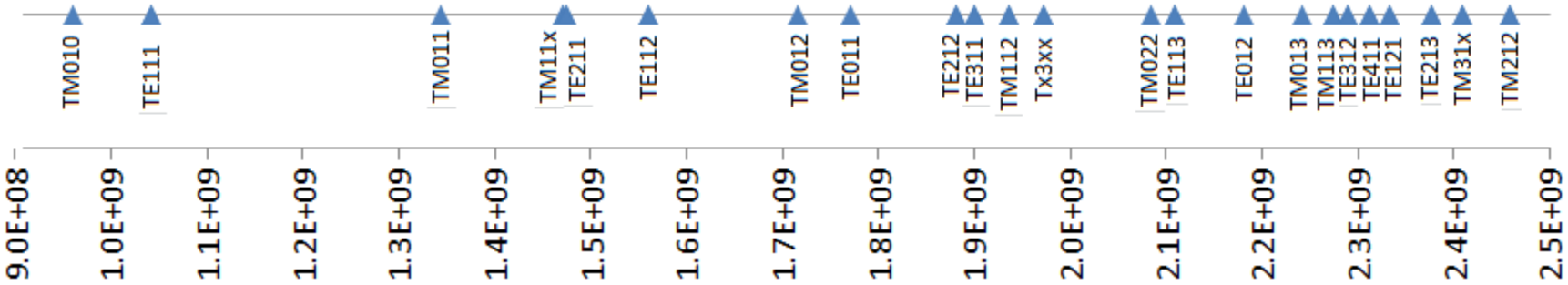
Copper Frustum modes

Frank Davies NASA/JSC/EP5



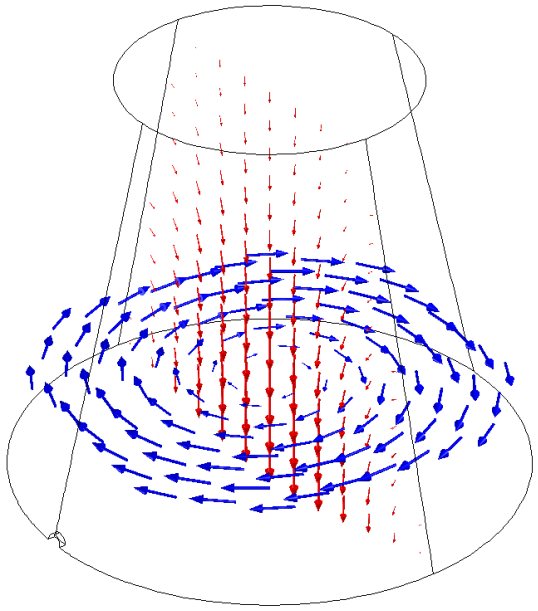
Height: 9.00 inch (228.6 mm)
Top diam.: 6.25 inch (0.1588 mm)
Bottom diam.: 11.01 inch (279.7 mm)
Material: 101 Copper Alloy

Spectrum up to 2.5 GHz:



TM010

Frequency: 0.9598 GHz (957.833 MHz, Q= 20,379)

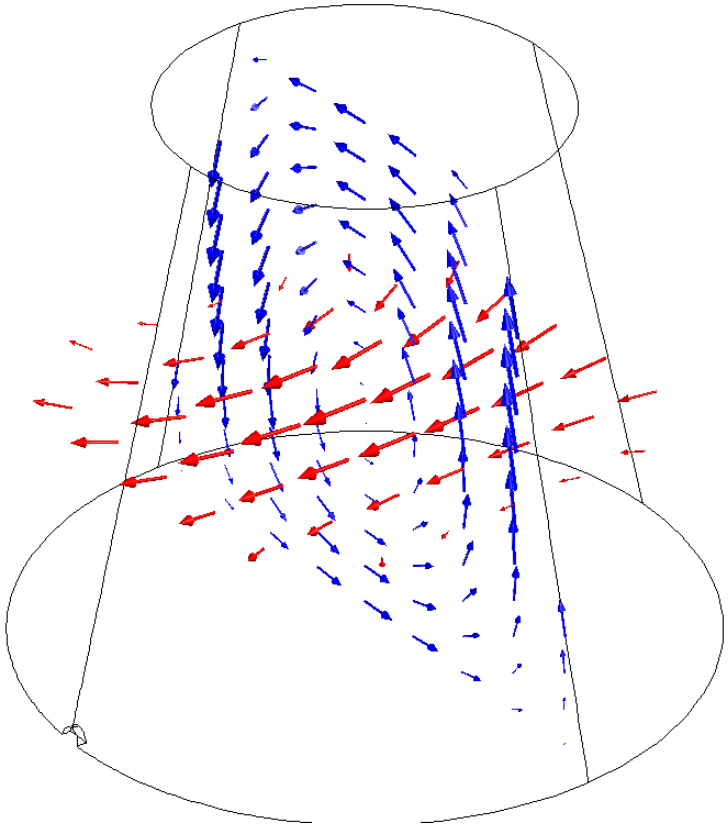


```
Sensitivity to dimensions:
(MHz per inch)
dF/dH   dF/d(top_diam)  dF/d(bottom_diam)
-8.4        -19.3          -69.5
```

Note:

TE111

Frequency: 1.0420 GHz (1,034.425 MHz Q=25,861)



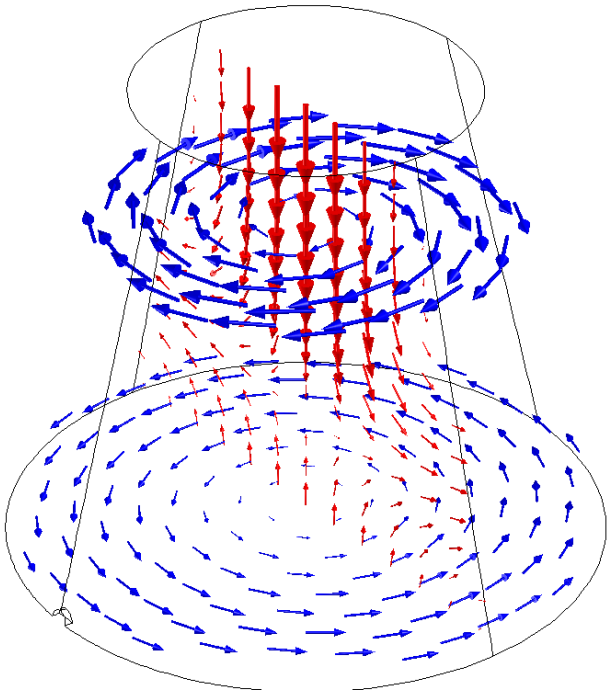
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-46.6	-39.1	-34.4

Note:

TM011

Frequency: 1.3435 GHz (1,341.508 MHz, Q=16,561)

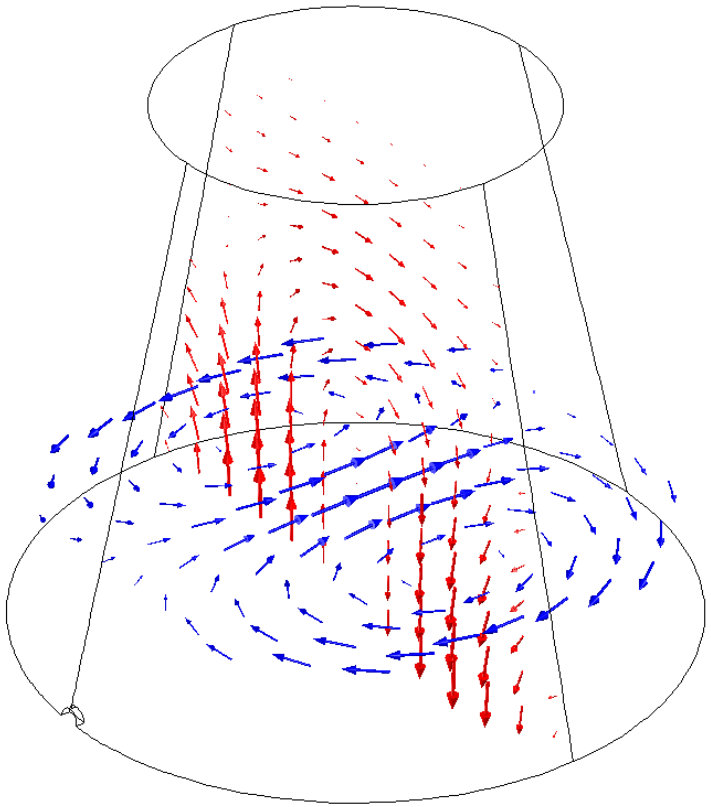


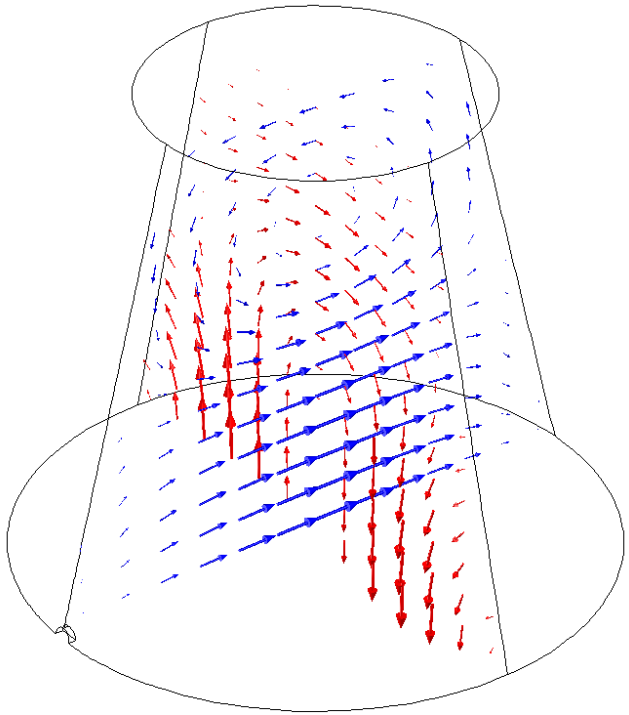
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-36.9	-96.4	-37.2

Note:

TM11x Frequency: 1.4692 GHz (1,462.535 MHz, Q= 18,282)



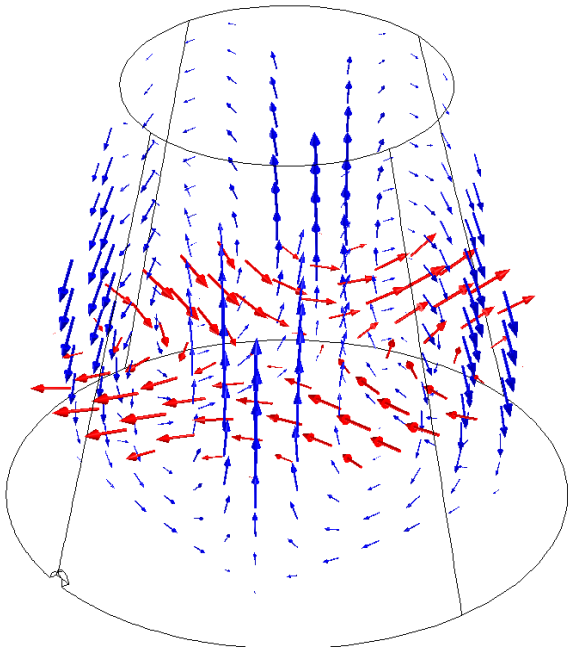


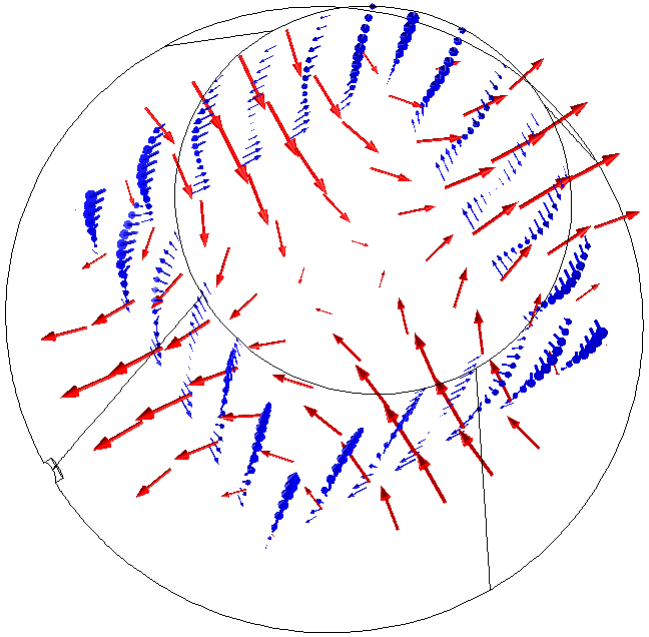
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-26.3	-20.0	-100.7

Note: Bottom looks like TM, top looks like TE,
"Pants" type mode

TE211 Frequency: 1.4746 GHz, (1,466.071 MHz, Q= 20,944)



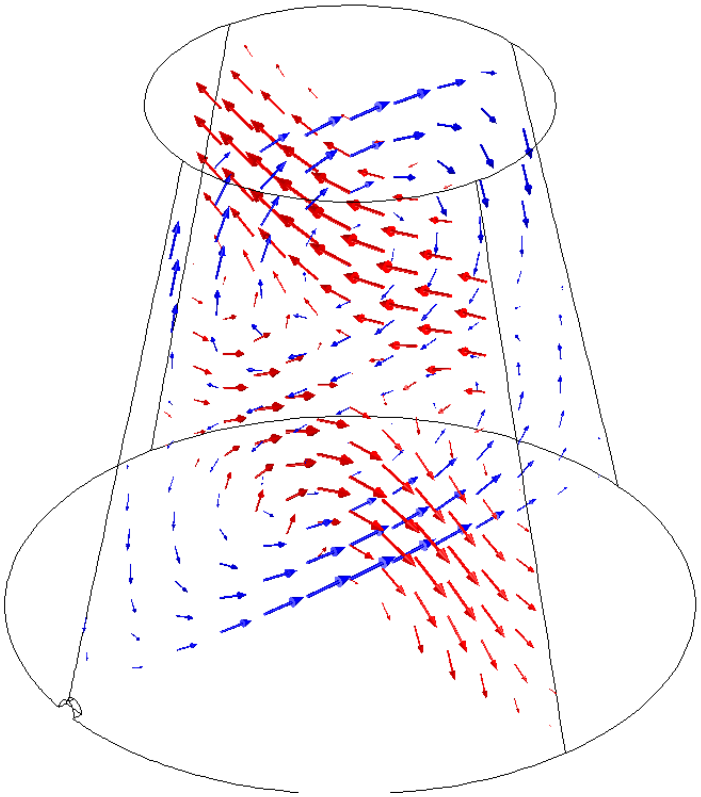


```
Sensitivity to dimensions:
(MHz per inch)
dF/dH  dF/d(top_diam) dF/d(bottom_diam)
-38.5     -60.3     -68.3
```

Note: 2 fold symmetry (quadrapole) zero fields along the axis

TE112

Frequency: 1.5591 GHz (1,542.388 MHz, Q= 25,706)



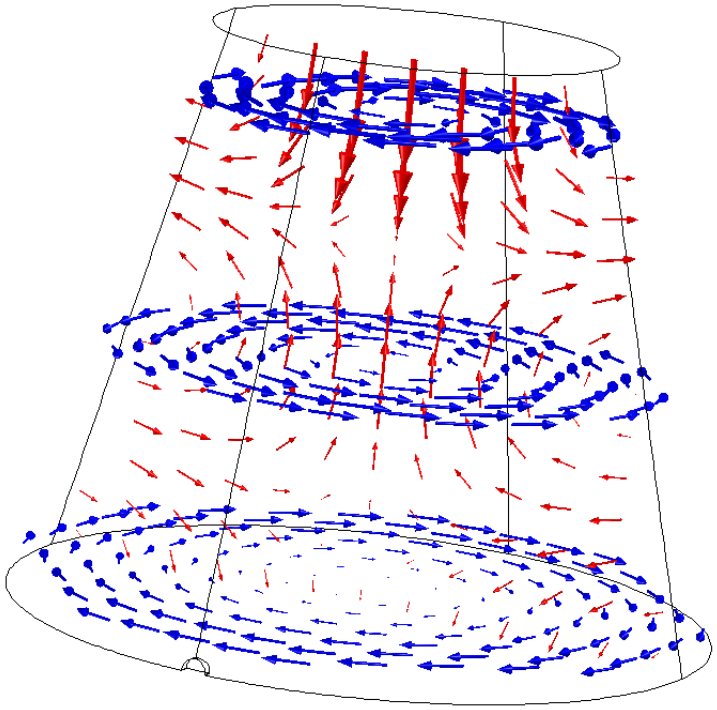
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-106.1	-38.8	-32.8

Note:

TM012

Frequency: 1.7160 GHz, (1,705.742 MHz, Q= 5,667)



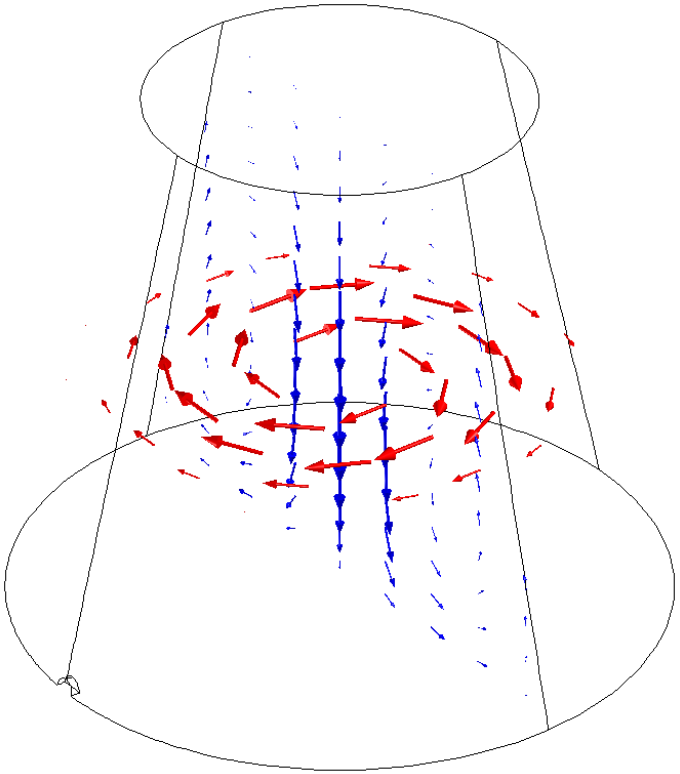
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-99.7	-72.1	-33.4

Note: Electric field concentrates at top (short end)

TE011

Frequency: 1.77048 GHz, (1,762.648 MHz, Q= 46,385)



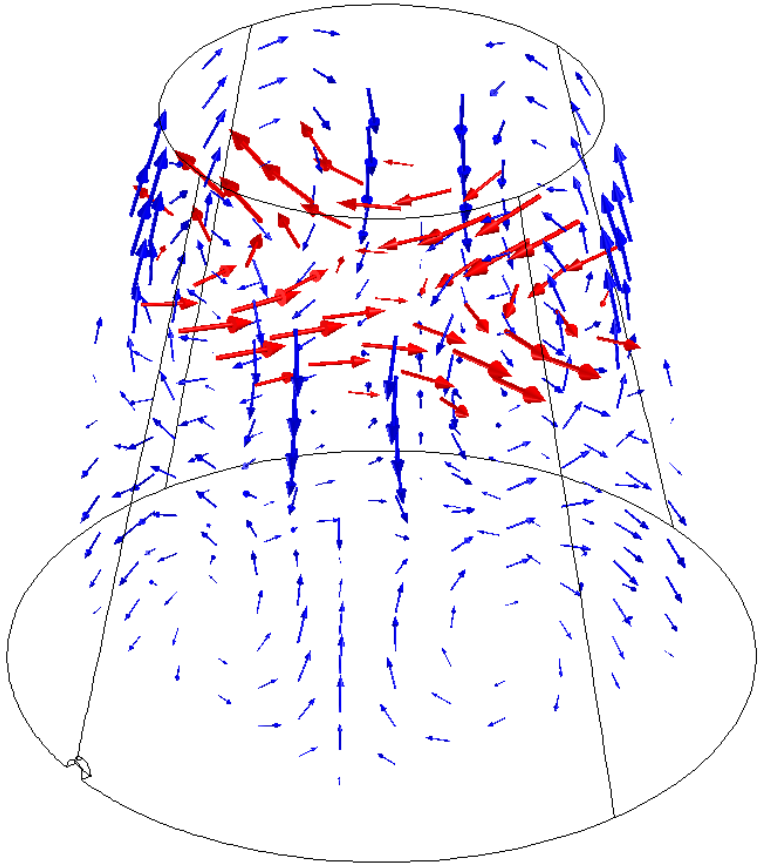
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-40.1	-72.3	-86.7

Low loss, wall currents do not cross junctions between conical side walls and circular ends.

TE212

Frequency: 1.8800 GHz



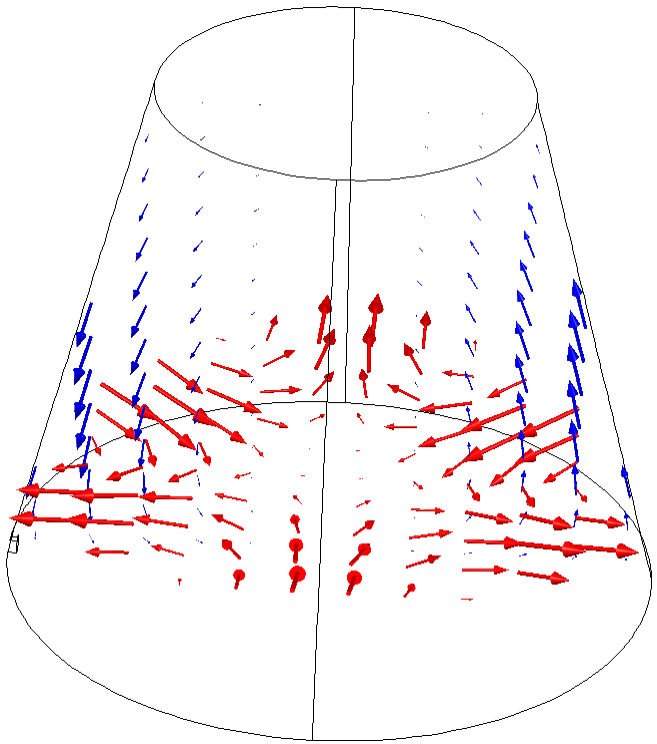
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-73.0	-58.5	-77.9

Note:

TE311

Frequency: 1.8987 GHz



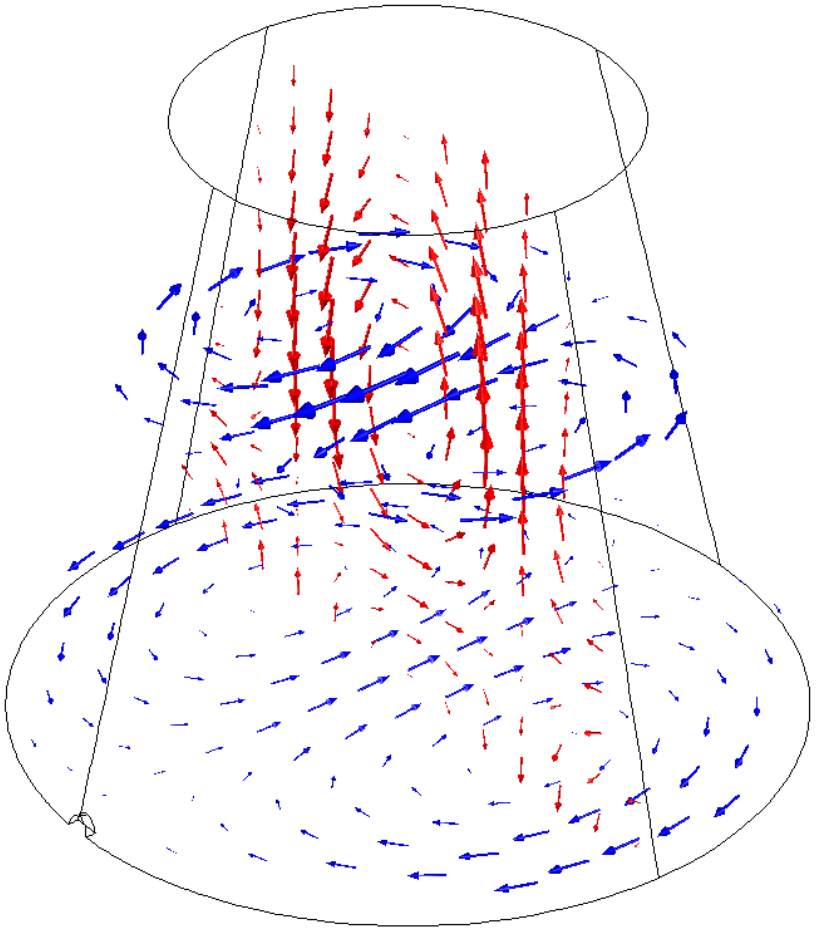
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-37.5	-69.5	-102.8

Note:

TM112

Frequency: 1.9355 GHz

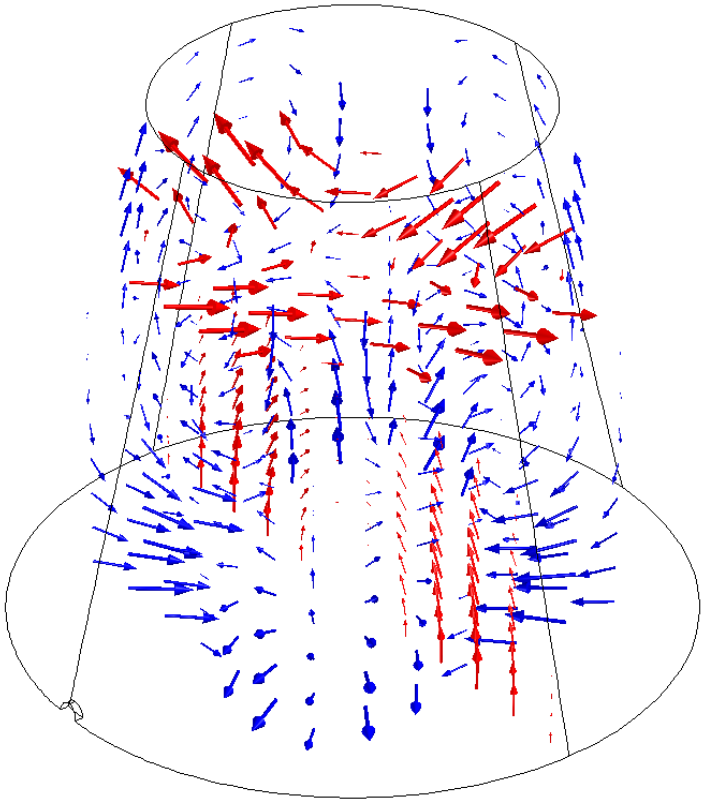


```
Sensitivity to dimensions:
(MHz per inch)
dF/dH   dF/d(top_diam)  dF/d(bottom_diam)
-49.1       -102.7        -77.1
```

Note: like TM110 at top, and TM111 at bottom

Tx3xx

Frequency: 1.9701 GHz



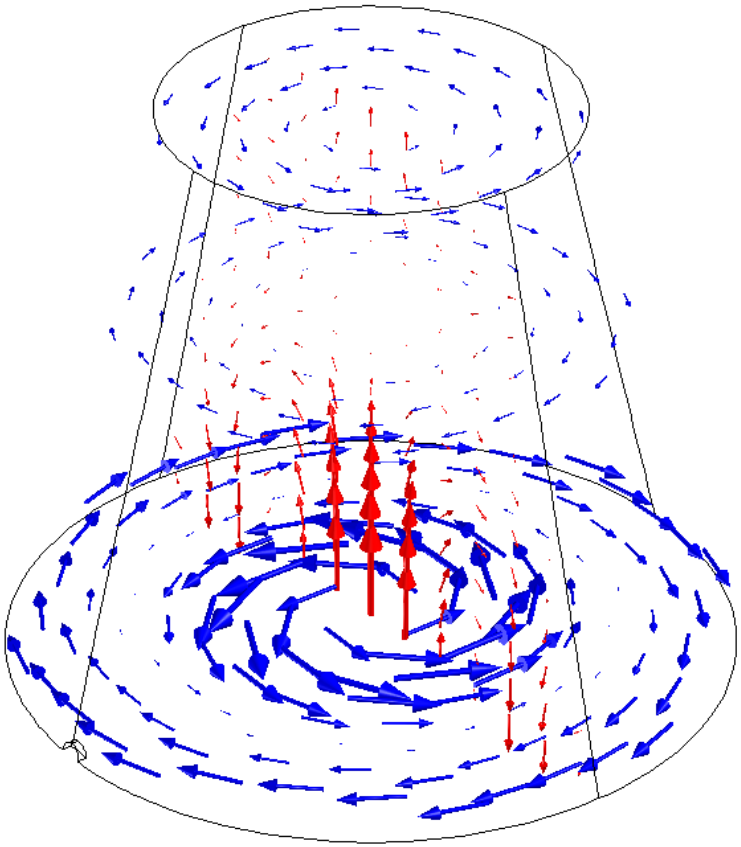
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-40.4	-47.9	-118.6

Note: TE at top, TM at bottom

TM022

Frequency: 2.08301 GHz



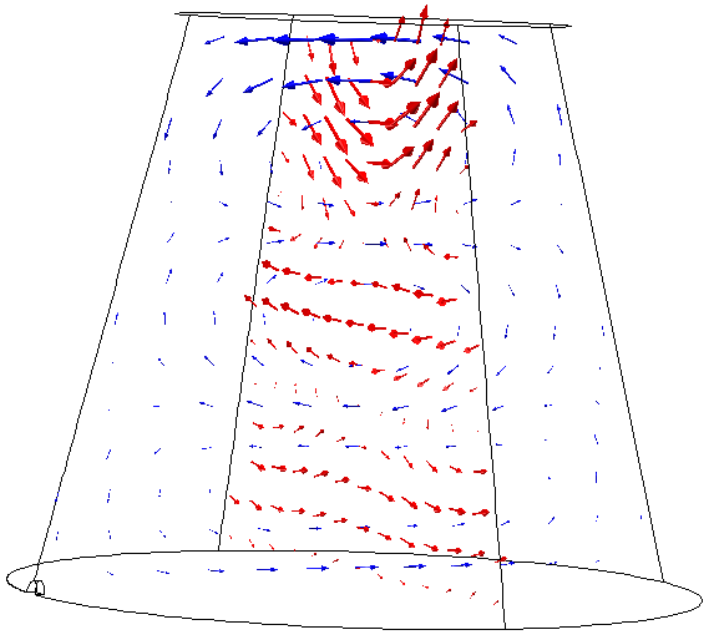
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-29.3	-29.1	-148.8

Note: Very intense E field at the bottom (big end)

TE113

Frequency: 2.1079 GHz



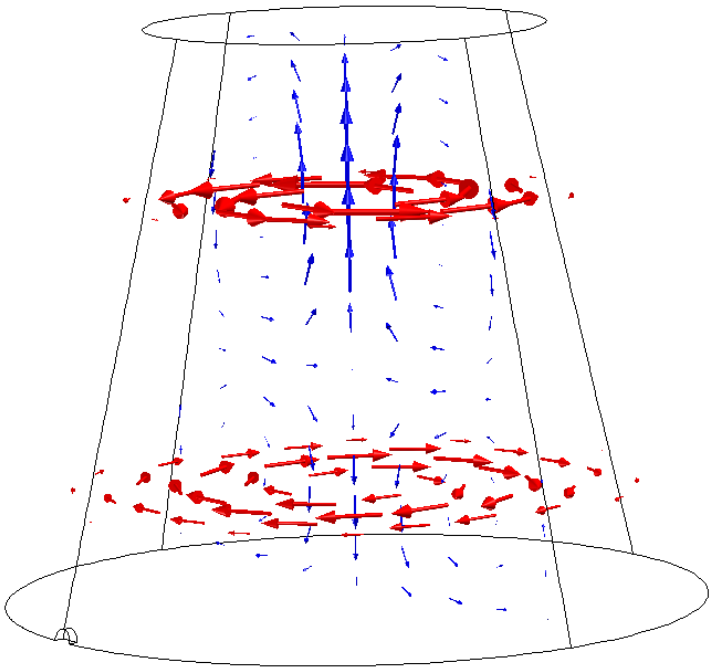
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-171.5	-38.0	-28.7

Note: string E and H at the top

TE012

Frequency: 2.1794 GHz



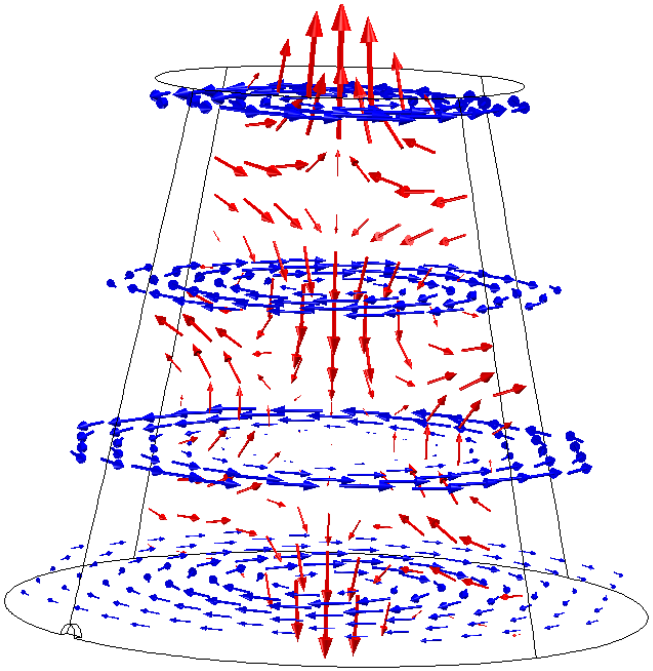
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-90.0	-106.1	-64.3

Note: Low loss, note high H field in center at top.

TM013

Frequency: 2.2402 GHz



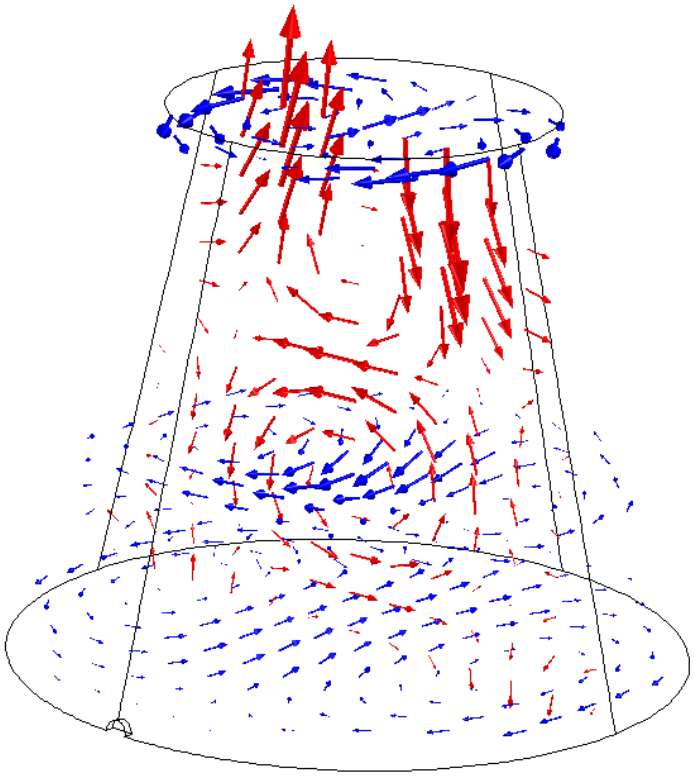
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-167.2	-46.1	-39.6

Note:

TM113

Frequency: 2.2730 GHz



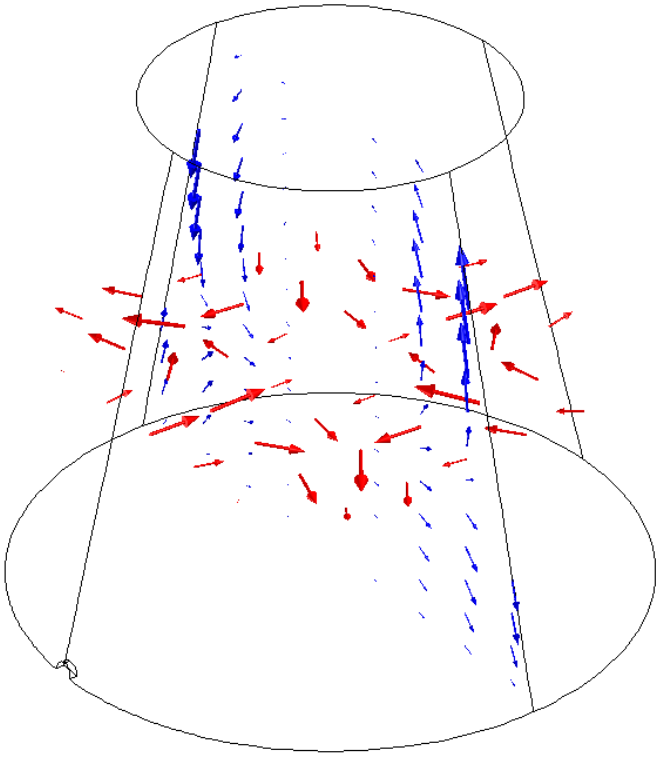
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-94.1	-148.0	-45.5

Note: intense fields at top

TE312

Frequency: 2.2887 GHz



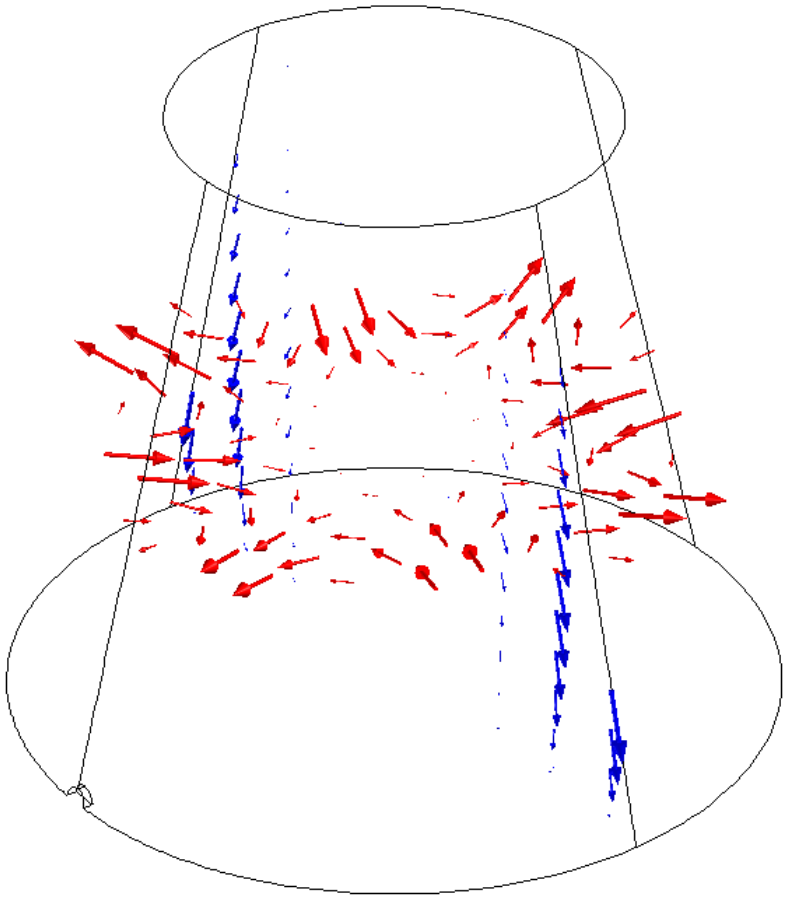
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-68.7	-95.1	-97.1

Note:

TE411

Frequency: 2.3100 GHz



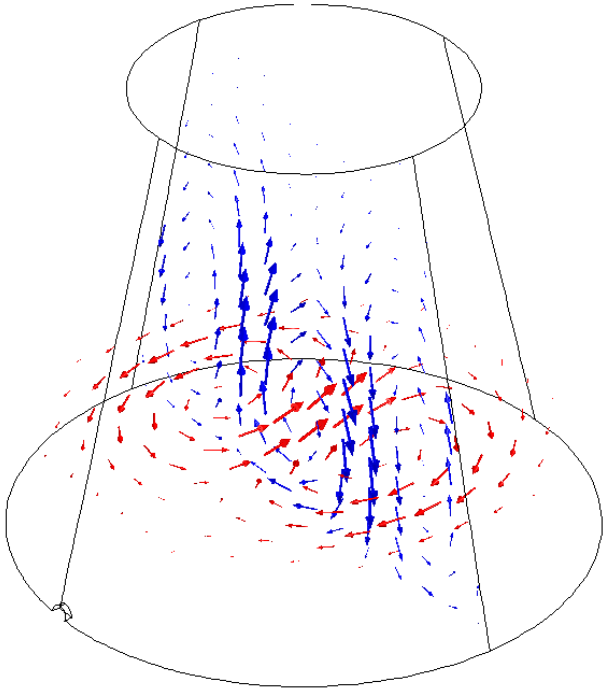
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-39.1	-73.2	-138.0

Note: octopole, whispering gallery mode, no fields on axis.

TE121

Frequency: 2.3310 GHz



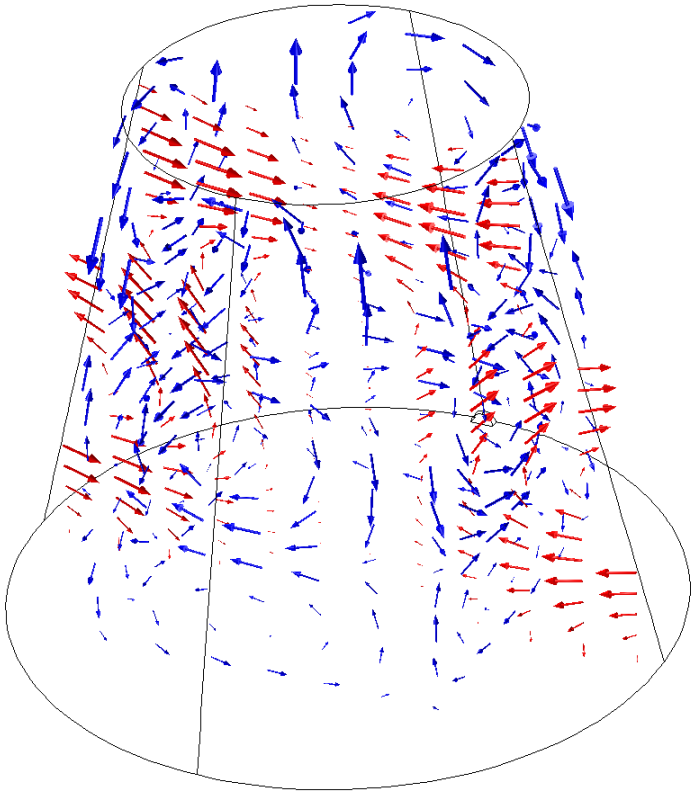
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-47.7	-83.0	-127.6

Note: Lower loss? Transverse E field on axis

TE213

Frequency: 2.3754



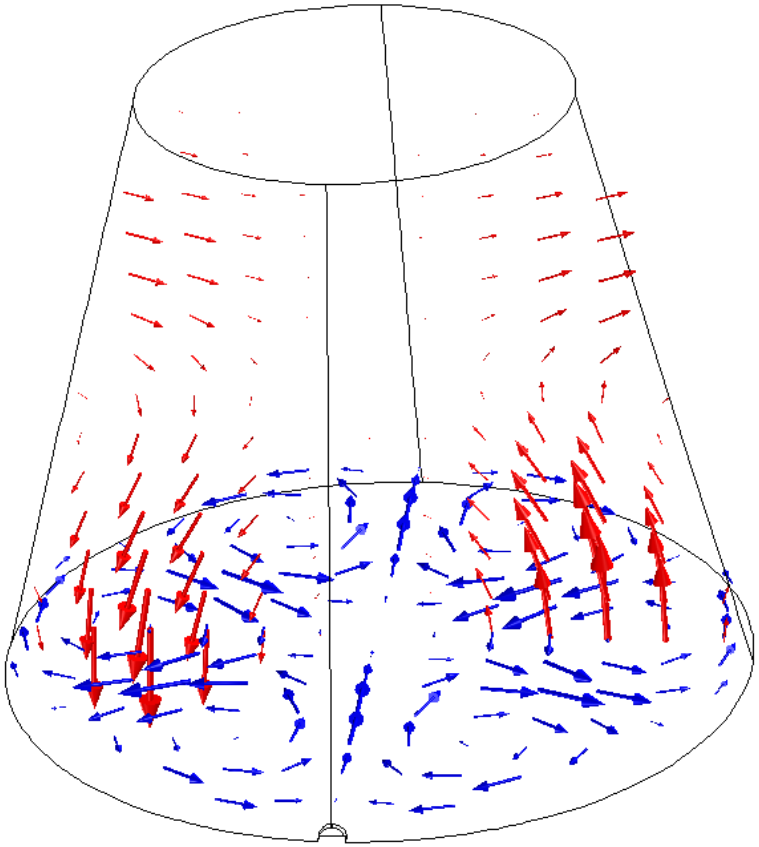
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-144.3	-62.0	-63.6

Note:

TM31x

Frequency: 2.4068 GHz



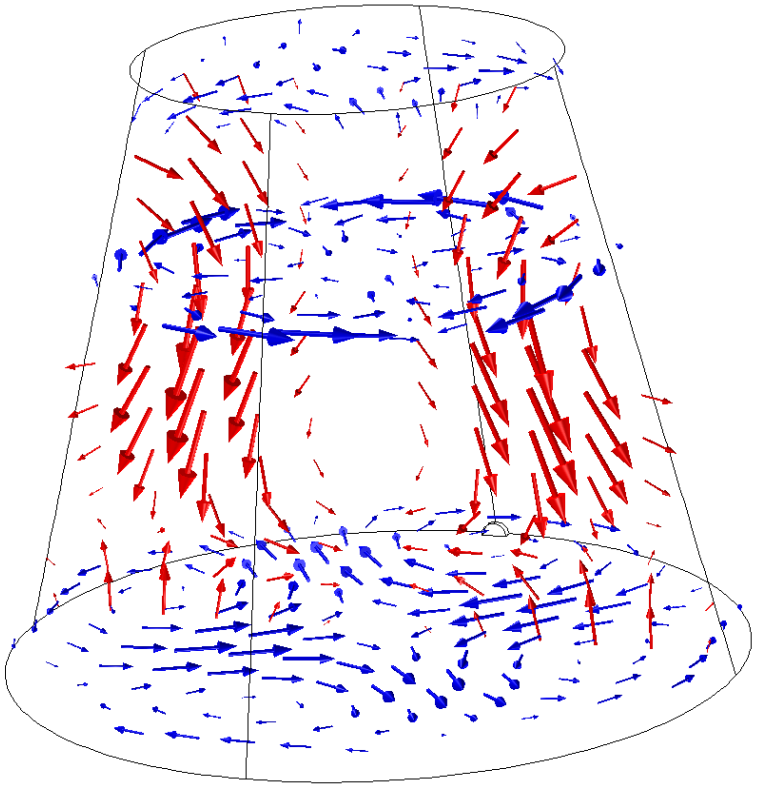
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-32.6	-51.8	-162.3

Note: No fields in center

TM212

Frequency: 2.4575



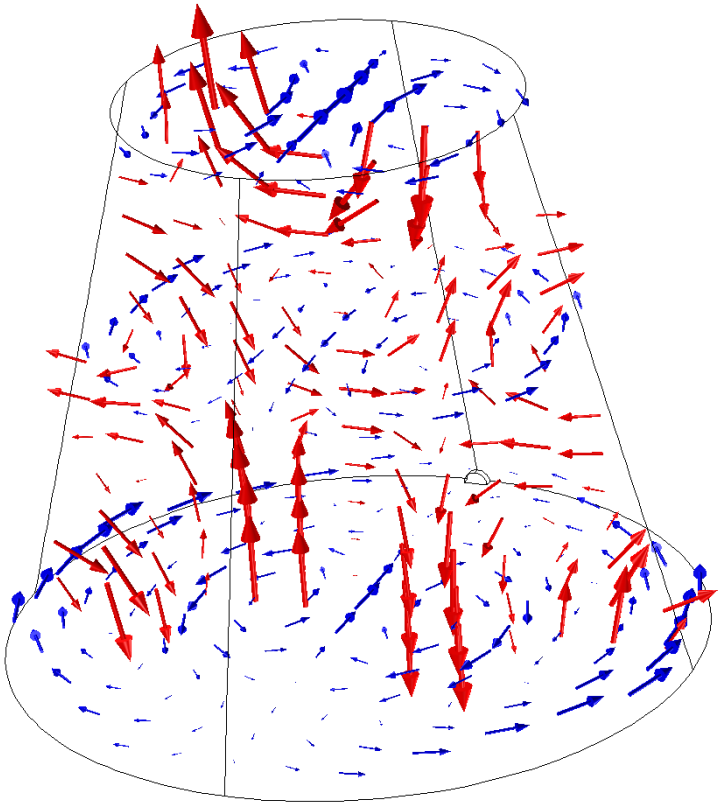
Sensitivity to dimensions:
(MHz per inch)

dF/dH	dF/d(top_diam)	dF/d(bottom_diam)
-77.2	-110.2	-98.0

Note:

TM1x2

Frequency: 2.5712



```
Sensitivity to dimensions:
(MHz per inch)
dF/dH   dF/d(top_diam)  dF/d(bottom_diam)
-101.4     -60.0        -116.7
```

Note: bottom looks like TM122, top looks like TM112